International Journal of Mathematical, Engineering and Management Sciences
Vol. 11, No. 1, 295-331, 2026
https://doi.org/10.33889/IJMEMS.2026.11.1.013

An Empirical Literature-Based Cluster Analysis of Sustainability Practices and Their Performance Impacts in Supply Chains

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(Received on February 16, 2025; Revised on June 10, 2025 & October 2, 2025; Accepted on November 3, 2025)

Abstract
This study employs cluster analysis to examine how sustainable supply chain (SSC) practices influence performance outcomes addressing the fragmented understanding in prior reviews. Based on 78 peer-reviewed articles published between 2014 and 2021 the analysis investigates how different practices relate to performance dimensions. The two-step cluster analysis yielded two configurations: Cluster 1 linked environmental practices to positive economic outcomes while Cluster 2 linked social practices to positive economic outcomes. Although clustering quality was modest thematic analysis extended these findings by revealing broader but uneven associations. Environmental practices such as eco-design and cleaner production consistently supported both economic and environmental performance while reverse logistics and green procurement produced more variable effects. Social practices produced more fragmented effects: supplier development sometimes enhanced efficiency but labour rights and community initiatives were tied more to legitimacy and reputation than to measurable economic gains. Operational practices also surfaced in Cluster 2 contributing primarily to operational and social outcomes. These results highlight the uneven maturity of SSCM research: environmental practices are more consistently theorized and empirically validated whereas social and operational practices remain less systematic and context-dependent. The study further clarifies how theoretical frameworks map onto these findings with capability-oriented lenses (RBV, NRBV, dynamic capabilities) explaining internal resource advantages and adoption-oriented lenses (Institutional, Stakeholder, Legitimacy) capturing external pressures and legitimacy concerns. By moving beyond descriptive reviews to provide a cluster-based and thematic synthesis this study deepens theoretical understanding and offers actionable insights for scholars, practitioners and policymakers seeking to advance sustainable supply chain management.

Keywords- Sustainable supply chain management (SSCM), Supply chain performance, Triple Bottom Line (TBL), Environmental and social practices, Two-step cluster analysis, Thematic analysis.

1. Introduction

The concepts of sustainability, Triple Bottom Line (TBL) and sustainable supply chain management (SSCM) are highly relevant to this research paper and have been widely discussed in the literature. The concept of sustainability stated in the Brundtland Report (Brundtland, 1987) as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" has been widely accepted and quoted in literature. The TBL coined by Elkington (1997) refers to the three dimensions of sustainability: economic, environmental and social. The concept of SSCM developed by Carter & Rogers (2008) and Seuring & Müller (2008) extends supply chain management to encompass the environmental and social dimensions of sustainability. SSCM involves managing material, information and capital flows and promoting cooperation among companies along the supply chain while taking into account economic, environmental and social goals derived from customer and stakeholder requirements. In recent

Research Paper

Volume : 4 | Issue : 8 | Aug 2015 • ISSN No 2277 - 8179

Solid Waste Management Trendsand its Divisional Frames of GHMC Wards of Hyderabad City.

Management

KEYWORDS : Geographical Information System; Municipal wards; Greater Hyderabad Municipal Corporation.

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ABSTRACT

The aim of this study is to find out the sustainability scenario of solid waste management with respect to the rising population in the city of Hyderabad. The use of Geographical Information System (GIS) in classifying the city into sustainability classes based on the grouping of different circles and municipal wards based on the per capita waste generated by each. It is generally found out that a bigger percentage of the municipal wards are low in sustainable waste management. A considerably significant number of the wards were rated 'very good' in sustainable waste management. By this a proper and sustainable waste management can be achieved through proper collection, transportation and disposal of wastes.

1. INTRODUCTION

With the increase in population, urbanization and economic development, there has been a significant increase in municipal solid waste generation in Hyderabad making its management and disposal a problem. Urbanization is a worldwide phenomenon. The process of Urbanization is very rapid. The solid waste generated by the daily activities of the people needs is to be properly managed in such a way that it minimizes the risk to the environment and also human health (Amar M.R 2012). The main problem of urban waste management is worth noting not only due to the large quantities of waste produced and the spatial spread, but also the problems encountered in the setting up of the systems for collection, transportation and disposal of the wastes (Anand.G 2014)

2. OBJECTIVES

- To map the population density and solid waste characteristics of the municipal wards of Hyderabad
- To determine the main sources of waste generators and waste characteristics in Hyderabad
- To determine the sustainability ratings of municipal wards of Hyderabad and the expected future waste generation trends

3. STUDY AREA

The area under study is the city of Hyderabad Urban Agglomeration situated in the state of Telangana. Hyderabad is the capital city of Telangana and is the sixth largest city in India, closely behind Bangalore [6]. The city has been divided into five (5) zones namely North, South, East, West and Central zones with 18 circles and around 150 municipal wards.

4. MATERIALS AND METHODOLOGY

Use of spatial and non-spatial.obtained from SOI, NRSC and GHMC. The circles and ward boundaries are digitised from top sheet and updated from satellite imagery. The attribute data was used based on the size of this study area. The information acquired highlighted the status of waste management in Hyderabad city, discussed under sources and characteristics of the wastes, wastes collected and transported to disposal sites, availability of the number of sanitary workers, predicted future trends in waste production with respect to population density. Based on the per capita solid waste generation data of the wards in the city, GIS analysis was performed and the wards were categorized into different groups to show their sustainability.

(i) Population characteristics of municipal wards of Hyderabad

The city of Hyderabad is ranked the sixth largest urban agglomeration in the entire country. The population growth experienced (4.3 to 5.7 million) during the decade 2001-2011 is further expected to continue to increase by 13.64 million 2021 (Singh, 2010). Courtesy of the Greater Hyderabad Municipal Corporation (GHMC), the city is divided into five zones whose average population densities in persons per square kilometer are: East zone (7899.86), South zone (32777.42), Central (27257.28), West (6684.3) and North (16590.98) zones.

(ii) Solid waste in Hyderabad

Urban areas in the state of Telangana have generated solid waste more than 11.5 thousand tons/day which is a 9% of all solid waste generated in India. Every individual in Telangana generates solid waste on an average 570gm/day which is close to other states, such as, Tamil Nadu (630 g/day) and Jammu and Kashmir (600 g/day). Greater Hyderabad generates about 5,000 tonnes of waste per day (TPD), which accounts for 1.83 million tons per year (Bhambulkar A.V.2011). It is an appalling phenomenon how wastes in Hyderabad, just like in other cities, can be thrown from one's house without considering the long-term effect of the same. Much as there are waste containers provided by the GHMC, dumping wastes anyhow is not a concern to some people. One of the adverse effects is the loss of the natural attraction of River Musi which separates the old from the new city of Hyderabad(Huang.A 2006)

Table1: Solid waste generated and disposed by administrative division in Hyderabad.

Circle	Total waste generated per day in metric tonnes	No. of Vehicles	Total waste lifted per day	Waste left over per day
1	181	28	164	17
2	117	23	96	21
3	238	25	184	54
4	144	21	106	38
5	131	14	110	21
6	150	16	130	20
7	210	27	150	60
Total	1171	154	940	231

(Source: Snel, 1997)

Table.2 Solid waste generated in M.T in the year 1994 & 2011.

Sl.No	Solid waste generated (M.T/day)in 1994	Solid waste generated in (M.T/day) in 2001
1	181	370
2	117	372
3	238	234
4	144	206
5	131	402
6	150	48
7	210	590

International Journal of Advance Research in Science and Engineering
Vol. No.4, Issue 08, August 2015
www.ijarse.com
IJARSE
ISSN 2319 - 8354

COMPARATIVE ANALYSIS FOR THE MAJOR CITIES OF NATIONAL AND INTERNATIONAL SCENERIO OF SOLID WASTE MANAGEMENT

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ABSTRACT

Municipal Solid Waste Management (MSWM) is one of the major environmental problems of Indian and International scenario of the world. Solid waste generated by the daily activities of the people needs to be properly managed in such a way that it minimizes the risk to the environment and human health. Site suitability analysis for resource collection and disposal requires an integrated approach and can be addressed most economically an efficiently using geospatial technology. In the present study, an attempt has been made to provide a comprehensive review of the characteristics, generation, collection and transportation, disposal and treatment technologies of Municipal Solid Waste practiced in India. The study carried out to evaluate the current status and identify the major problems. The study is concluded with fruitful suggestions, which may be beneficial to encourage the competent authorities to work towards further improvement of the present system.

Keywords: Solid waste, Comprehensive & Comparison etc

I. INTRODUCTION

Solid waste generated by the daily activities of the people needs to be properly managed in such a way that it minimizes the risk to the environment. The risk problems facing society today have many characteristics that complicate the application of formal analysis (Merkhofer 1987). The Solid Waste Management process includes collection, transportation and disposal. The observed trend of waste material is a continually growing issue of concern not only at local or regional levels but also at the larger global level. Each city produces tonnes tonnes of solid wastes daily from households, hospitals, industry offices, market centres etc. Some of these are biodegradable some are non-biodegradable and hazardous waste. The increased consumption of electronic items and IT hardware increased obsolescence rate of these products, which will results in the higher generation of electronic waste (e-waste). This waste is ultimately thrown into municipal waste collection centres from where it is collected to be further thrown into the landfills and dumps. With the increase in population, urbanization and economic development, there has been a significant increase in municipal solid waste generation in Hyderabad making its management and disposal a problem. Municipal Solid Waste Management (MSWM) is one of the major environmental problems of Indian cities. The management of municipal solid waste (MSW) is a high priority issue for many communities throughout the world including India.

RESEARCH PAPER | Environmental Science | Volume : 5 | Issue : 8 | August 2015 | ISSN - 2249-555X



An Appraisal and Sustainability Trends of Municipal Solid Waste Management And Proposed Collection Point for Circle 8 of Hyderabad City

KEYWORDS: Geographical Information System; Solid waste management; Hyderabad urban agglomeration, Municipal wards; Greater Hyderabad Municipal Corporation

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ABSTRACT *Waste is a major health hazard with a very high potential to undermine people's right to life, and a threat to the environment. In India, waste is generally littered on roadsides and mostly dumped in the outskirts of the cities in areas that are low lying without compliance with the regulations. Proper and sustainable waste management can be achieved through the establishment of appropriate channels for the collection, transportation and disposal of wastes. The aim of this study was to find out the sustainability scenario of solid waste management with respect to the rising population in the city of Hyderabad. The use of Geographical Information System (GIS) was of great essence in classifying the city into sustainability classes based on the grouping of different municipal wards based on the per capita waste generated by each. It was generally found out that a bigger percentage of the municipal wards are low in sustainable waste management.*

1.INTRODUCTION

Before introducing solid waste management, it is prudent to begin the discussion with outlining the scope of solid waste, the material to be managed. Solid waste refers to the range of garbage arising from animal and human activities that are discarded as unwanted and useless. Solid waste is commonly generated from industrial, residential and commercial activities in a given area. As such, landfills are typically classified as sanitary, municipal, construction and demolition or industrial waste sites. Waste can be categorized based on its contents, including such materials as plastic, paper, glass, metal, and organic waste; based on its hazard potential, including categories such as radioactive, flammable, infectious, toxic, or non-toxic; or based on its origin, characterized as industrial, domestic, commercial, institutional or construction and demolition (Ohri.A 2010).

The management of municipal solid waste is a high priority issue for many communities throughout the world including India. The observed trend of waste material is a continually growing issue of concern not only at local or regional levels but also at the larger global level. The increased growth rate of the IT and electronics industry in India is propelled by increased consumption of electronic items and IT hardware, and it leads to higher generation of electronic waste (e-waste). Deciding where to locate a municipal sanitary landfill is a difficult problem in which qualitative criteria compete with quantitative, economic and engineering criteria in a process that is highly political and emotional. Site suitability analysis for resource collection and disposal requires an integrated approach and can be addressed most economically and efficiently using geospatial technology. In order to manage the Solid Waste Management properly in different aspects, GIS is a tool it provides a means of rapid data access and query based on both geographic location and attribute data (HBSHD 2011).

2.STUDY AREA

The present study area was chooses as Hyderabad city. Hyderabad is the 5th largest city in India. It has twin cities viz., Hyderabad and Secunderabad with its suburbs extending up to 16 miles. The Hyderabad city is situated in 17d 18'30" & 17d 28'30" North Latitude and 78d 22'30" & 78d 32'30" East Longitude. The study area covers an area of 179 Sq.Km. The total population of the district according to 2011 Census is 38,29,753 which is purely urbanised.

3.STUDY OBJECTIVE

- To map the population density and solid waste characteristics of the municipal wards of Hyderabad
- To determine the main sources of waste generators and waste characteristics in Hyderabad
- To determine the sustainability ratings of municipal wards of Hyderabad and the expected future waste generation trends

4.DATA USED

The study made use of data gathered from the Greater Hyderabad Municipal Corporation. The data included population information of Hyderabad municipal wards, volumes of waste generated and the predicted future trends in waste management. The data obtained was fed into GIS software for the generation of spatial maps to show the population distribution and the extent of waste management in various wards.

5.METHODOLOGY

DATA USED

The following data was used for the study.

Spatial Data:-

- Topographical maps of 56k/7 and 56k/11 from Survey of India in the form of hard copy at 1: 50000 scale
- Maps of Greater Hyderabad Municipal Corporation showing different circles with ward details in the form of hard copy.
- www.ghmc.gov.in.

Non spatial data:-

- Census of India for Hyderabad city containing information about population of different wards, No. of households etc.,
- Hand Book of Statistics Hyderabad District 2011.

International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391

Evaluation of Land Use Planning, Transport Scenario with Reference to Express Highways in and Around Hyderabad City, Telangana

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Abstract: ***Transport planning is intrinsically linked to land use planning and both need to be developed together in an integrated manner. In developing such plans, attention should also be paid to the future growth of the city. Transport plans should, therefore, enable a city to take an urban form that best suits the geographical constraints of its location and also one that best supports the key social and economic activities of its residents.***

Keywords: Land Use, Transport, Express Highways, GIS.

1. Introduction

The Transportation concept is one such growth/ development strategy to assist the City in implementing the guiding principles of the Land Use Element. In the TOD strategy, new moderate and high density housing as well as new public uses and a majority of neighbourhood-serving retail and commercial uses will be concentrated in mixed-use developments located at strategic points along the regional transit system. This linkage between land use and express highways is designed to result in an efficient pattern of development that supports a regional transit system and makes significant impact in reducing traffic congestion and urban sprawl.

The mixed-use of land for residential and commercial activities, designed to minimize the need for transport and maximize the access to public transport, and often incorporates features to encourage transit ridership. A neighbourhood typically has a centre with a train/transit station, metro station, monorail station, tram stop, or high capacity bus stop, surrounded by relatively high-density development with progressively lower-density development spreading outwards from the centre.

2. Study Area

Hyderabad City is situated in the river Musi and Krishna basin, which is a tributary of river Krishna, passes through the city and bifurcates it into Northern and Southern Hyderabad. It is situated between 78022'30" & 78032'30" east longitude & between 17018'30" & 17028'30" north latitude. The ground levels vary from 487 meters to 610 meters above mean sea level (B.Purushothama Reddy 2004).

3. Land Use Management

According to LU.LC map, the proposed residential use is 46.05%. The proposed usage under public and semi-public zone is 10.10% and makes a total of 14.84% including 4.83% of defence area. A total area of 8.8 sqkm constituting 5.10% has been proposed under Multipurpose use zone. As per statistics, this zone comprises the existing mixed development areas, commercial hubs, residential, commercial and public and semi-public usages. Including rocks and hillocks a total of 12.7 sq.km constituting 7.36% of total area has been proposed under Open spaces, parks and playgrounds. A total area of 20.52 sq.km constituting 11.49% has been proposed under transportation land use category.

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Original Research Paper Engineering

ENVIRONMENT IMPACT ANALYSIS AND SOCIAL EVALUATION FOR LONG TERM TRANSPORTATION IN HYDERABAD, TELANGANA

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ABSTRACT Environment and social evaluation can be carried out as part of the Long Term Transportation Strategy for the study area to understand the sustainability of the strategy and its likely implications on the environment and social conditions of the region. The evaluation has been carried out for the identified network development and for alternative scenarios. Good transport planning should be more than just engineering and should encompass other important considerations such as land use planning, energy efficiency, emission characteristics, traffic management, human behavior, economics, finance, public policy, governance, health, safety, gender, disability, affordability

KEYWORDS : Environment, Transportation, Sustainability etc.

1. INTRODUCTION

Environmental conditions in study area have to be understood in context of the growing urbanisation and industrialisation of the fringe areas coupled with slow pace of infrastructure development. The study area in general exhibits deterioration of environmental conditions in the core areas i.e., cluster 1 to 6 while rest of the clusters are following the trend of deterioration. The deterioration is closely followed by rapid urbanisation and lack of physical infrastructure.

The major environmental implications of the urbanisation as observed in the region has been increase in air pollution levels, increase in ground and surface water pollution, high noise levels, reduction of water bodies and declining levels of ground water. These are simultaneously associated with urban stress and increasing migration patterns. Hence it is important to understand the social conditions as well in order to appreciate the environmental conditions in the region in a coordinated manner.

2. STUDY AREA

Hyderabad City is situated in the river Musi and Krishna basin, which is a tributary of river Krishna, passes through the city and bifurcates it into Northern and Southern Hyderabad. It is situated between 78022'30" & 78032'30" east longitude & between 17018'30" & 17028'30" north latitude. The ground levels vary from 487 meters to 610 meters above mean sea level (B.Purushothama Reddy 2004).

3. RESULTS AND DISCUSSIONS

3.1 ENVIRONMENT CONSIDERATION IN TRANSPORTATION STATERGIES

Environmental conditions in the study area are observed in the context of the project interventions and likely environmental implications instead of conducting an overall inventory of environmental conditions of the region. The main parameters considered to be impacted for these research project interventions are studied in detail and their existing condition is established. The parameters considered to have implications from the project are as below:

- Environmentally Sensitive Areas
- Water Bodies
- Forests
- Sanctuaries
- Air Pollution
- Water Pollution
- Energy Efficiency

3.2 ENVIRONMENTALLY SENSITIVE AREAS

The study area boundary is dotted with several water bodies, vegetated areas, forests, three national parks, and a deer park. The areas that are susceptible to major ecological changes are the Water Bodies that are scattered all through the area. While the major water bodies as Osman Sagar and Himayat Sagar are used as drinking water sources and reservoirs for storage for Hyderabad drinking needs, rest of the water bodies are used for local domestic needs or for sullage disposal. Some of the water bodies that are located close to industrial areas are receiving industrial effluents as well. Only few water bodies are preserved in thier natural state with water that is suitable for domestic needs. In order to protect the water bodies in the catchment areas of drinking water sources, GoT has issued directives to notify the area surrounding the Osman Sagar and Himayat Sagar as Conservation areas with limited intervention for development.The area is dotted with several vegetated areas but with few forest patches notified as Reserve Forests. These are open forests with low vegetation cover except near few locations as near Vikarabad and its surroundings where moderately dense forests are found.

a) Air Pollution

Ambient air quality of the project area is deteriorating with the increase in population, traffic and industrial activities. The ambient air quality as monitored by the Pollution Control Board in about 10 locations in and around Hyderabad indicates high levels of particulate pollution.

An observation of the above table indicates that the RSPM levels at all locations are higher by 2 to 3 times the National Standards for annual average levels. Similarly the SPM levels are also higher by 2 to 3 times. The SO2, NO2, and Ammonia levels at all locations are lower than the NAAQS. NO2 levels are approaching the national standards indicating increase in pollution from vehicular traffic which is to be controlled prior to their escalation.

b) Water Pollution

Water quality in the water bodies in and around Hyderabad have been deteriorating rapidly due to increase of human activity and discharge of sullage. These water bodies though are to a large extend polluted, they form a major part of the fresh water reserves in the area and are potential recharge areas for ground water.

Location of Co-Ordinates with Reference to Circle Numbers: Hyderabad City

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INTRODUCTION

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STUDY AREA

The present study area was chooses as Hyderabad city. Hyderabad is the 5th largest city in India. It has twin cities viz., Hyderabad and Secunderabad with its suburbs extending upto 16 miles. The Hyderabad city is situated in 17d 18'30" & 17d 28'30" Northe Latitude and 78d 22'30" & 78d 32'30" East Longitude. The study area covers an area of 179 Sq.Km. The total population of the district according to 2001 Census is 38,29,753 which is purely urbanised.

METHODOLOGY

DATA USED

The following data was used for the study.

Spatial Data:-

- Topographical maps of 56k/7 and 56k/11 from Survey of India in the form of hard copy at 1: 50000 scale
- Maps of Greater Hyderabad Municipal Corporation showing different circles with ward details in the form of hard copy.
- Fused data of IRS-ID PAN and LISS-III satellite imaginary from National Remote Sensing Agency (NRSA), Hyderabad.

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IF : 3.63 | IC Value 70.36 Volume 5 Issue 11 November 2016 ISSN No 2277 - 8160

Original Research Paper Engineering

Environmental Impacts and Their Effects on Various Enterprises

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KEYWORDS :

INTRODUCTION

The process of evaluating the likely environmental impacts of a development or proposed is known as Environmental Impact Assessment (EIA), taking into account inter-related socio-economic, human health and cultural, both beneficial and adverse.

UNEP defines Environmental Impact Assessment (EIA) as a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers. By using EIA both environmental and economic benefits can be achieved, such as reduced cost and time of project implementation and design, avoided treatment/clean-up costs and impacts of laws and regulations.

Although legislation and practice vary around the world, the fundamental components of an EIA would involves Screening, Scoping, Assessment and evaluation of impacts and development of alternatives, Reporting the Environmental Impact Statement (EIS) or EIA, Review of the Environmental Impact Statement (EIS), Decision-making and Monitoring, Compliance, enforcement and environmental auditing.

TYPES OF ENVIRONMENTAL IMPACTS:

1. Direct Impact,
2. Indirect Impact,
3. Cumulative impacts and
4. Induced Impact

Direct Impacts:

These impacts occur through direct interaction of an activity with an environmental, economic component or social.

For example, a discharge of any industry or an effluent from the Effluent Treatment Plant (ETP) from the industrial estates into a river may lead to a decline in the quality of water in terms of Dissolved Oxygen (DO) or rise of water toxins.

Indirect Impacts:

These impacts on the environment, which are not a direct result of the project, often produced away from or as a result of a complex impact pathway. Secondary or even third level impacts are also known as Indirect Impacts.

For example, ambient air SO_2 rise due to stack emissions may deposit on land as SO_4 and cause acidic soil. Another example of indirect impact is the decline in water quality due to rise in temperature of water bodies receiving cooling water discharge from the nearby industry.

This may, in turn, lead to a secondary indirect impact on aquatic flora in that water body and may further cause reduction in fish population. Reduction in fishing harvests, affecting the income of fisherman is a third level impact. Such impacts are characterized as socioeconomic (third level) impacts.

The indirect impacts may also include growth- inducing impacts and other effects related to induced changes to the pattern of land use or additional road network, population density or growth rate (e.g. around a power project). In the process, air, water and other natural systems including the ecosystem may also be affected.

Cumulative Impacts:

Cumulative impact consists of an impact that is created as a result of the combination of the project evaluated in the EIA together with other projects causing related impacts. These impacts occur when the incremental impact of the project is combined with the cumulative effects of other past, present and reasonably foreseeable future projects.

Induced Impacts:

The cumulative impacts can be, due to induced actions of projects and activities that may occur if the action under assessment is implemented such as growth inducing impacts and other effects related to induced changes to the pattern of future land use or additional road network, population density or growth rate. Induced actions may not be officially announced or be part of any official plan. Increase in workforce and nearby communities contributes to this effect.

They usually have no direct relationship with the action under assessment and represent the growth- inducing potential of an action. New roads leading from those constructed for a project, increased recreational activities, and construction of new service facilities are examples of induce actions.

However, the cumulative impacts due to induced development or third level or even secondary indirect impacts are difficult to be quantified. Because of higher levels of uncertainties, these impacts cannot be normally assessed over a long time horizon. An EIA practitioner usually can only guess as to what such induced impacts may be and the possible extent of their implications on the environmental factors.

ENVIRONMENTAL IMPACTS:

There are two main types of Environmental impacts.

1. ENVIRONMENTAL EFFECTS OF NUCLEAR POWER GENERATION
2. Environmental Impacts of Solar Power

ENVIRONMENTAL EFFECTS OF NUCLEAR POWER GENERATION

A nuclear power plant starts disturbing the environment during construction, and is common problem to any major enterprise, as for example, a non-nuclear power plant. Normal processes of plant construction as well as ancillary operations, not necessarily related to the nuclear nature of the power plant fuel, do disturb the surrounding environment. New roads, increasing traffic flow in the existing roads, excavations, cutting trees and other plants, frightened animals, are some of the environmental impacts to be expected from the construction of a power plant. In the case of a hydroelectric plant a large man-made lake which will replace free-flowing rivers is also to be built. In addition to all these impacts the builders of power plants should minimize, under the guidance of the legally competent authorities, disturbance to any prehistoric petrified plants and animals or to any archaeological remains of early civilizations, graveyards, monuments, ruins, aqueducts and so on. Site selection for nuclear power plants should be carefully made to avoid, or minimize to the extent possible, most of these impacts.

2. Environmental Impacts of Solar Power

Land Use

Water Use

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MAPPING OF CONCENTRATION OF POSITION VECTORS FOR ALL THE 18 CIRCLES: HYDERABAD CITY

Dr. Manorama Kumari Talla

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ABSTRACT:

The aim of this article deals with Study area of Hyderabad and Secunderabad municipalities. Present study area consists of 18 circles. Data used for conducting this study is its population, Total road network in KM and existing dumping places and Intermediate Transit Points. Finally this paper aims to work on Assigning all the nearest solid Waste Collection points of the study area and its optimal Road network.

INTRODUCTION

Solid waste management is an essential service. Before introducing this process, however, let's start with a discussion of the Solid waste material being managed at various levels.

It mainly refers to the wide range of garbage materials—arising from human activities and animal —that are to be discarded as unwanted and useless. Solid waste is generated from residential, industrial, and commercial activities in a given area, and it can be handled in various ways. As such, landfills are typically classified as municipal, construction, sanitary and demolition, or industrial waste sites.

Waste can be categorized based on material, such as paper, glass, plastic, metal, and organic waste. Categorization may also be based on hazard potential, including flammable, radioactive, infectious, toxic, or non-toxic wastes. Categories may also pertain to the origin of the waste, whether industrial, domestic, commercial, institutional, or construction and demolition.

Regardless of the origin, content, or hazard potential, solid waste must be managed systematically to ensure environmental best practices. As solid waste management is a critical aspect of environmental hygiene, it must be incorporated into environmental planning.

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A STUDY ON SOLID WASTE MANAGEMENT SCENERIO IN KURNOOL CITY

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Abstract

This paper aims to give brief note on kurnool municipality viz., Number of dumper bins and their locations. Transportation network through which solid waste transported to final destination (Dumping Site), Number of vehicles engaged for the transportation of solid waste from initial position (door to door collection) upto the final dumping site, Details of the dumping site viz., distance from the residential area and other precautions for site selection etc.,

Key words - Municipal Solid Waste(MSW), landfills, Environmental conditions, Garbage, Solid Waste Management(SWM)

I. INTRODUCTION

The fact about Indian towns and Cities are found littered with Municipal Solid Waste and represent an unpleasant look at many of the places within the town/city. In most of the cities/towns, only important locations are maintained with cleanliness leaving other most of the places chocking with littered waste. These collected wastes are disposed on un-authorised land-fills; and it is a long-way to see that the entire collected waste by a town or city is processed and only the remnants disposed in landfill. In fact, remnants classified as “non-recyclable / inert have to be converted into other type of useable product so to realize the mission and vision of achieving ‘Zero’ land filling. Drawing of time-targeted action plan for management of MSW by each city and town is essential against the population and developmental growth, otherwise, with the increasing huge quantity of waste will lead to un-healthy and hazardous environmental conditions.

IJISEM
INTERNATIONAL JOURNAL OF INNOVATIONS IN SCIENCE ENGINEERING AND MANAGEMENT

International Journal of Innovations In Science Engineering And Management

Integrated Municipal Solid Waste Management (IMSWM): A Critical Review of Sustainable Practices, Optimization and Environmental Review

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OPEN ACCESS

Volume: 5

Issue: 3

Month: September

Year: 2026

ISSN: 2583-7117

Published: 21.09.2026

Citation:

Dr. T. Manorama Kumari "Integrated Municipal Solid Waste Management (IMSWM): A Critical Review of Sustainable Practices, Optimization and Environmental Review" International Journal of Innovations in Science Engineering and Management, vol.5, no.3, 2026, pp. 688-692

DOI:

10.69968/ijisem.2026v5i3688-692

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Abstract

Municipal solid waste management (MSWM) is one of the rapidly growing urban and environmental challenges, associated with population explosion, rapid urbanization, waste management, population, and changing consumption patterns. Modern MSWM is moving from collection-and-disposal systems to the modern integrated approaches involving source segregation, recycling, resource recovery, optimized transportation, treatment and environmentally sound disposal. This paper critically reviews 26 technical studies covering metropolitan waste management, risk assessment, waste characterization, GIS-based route optimization, recycling, life-cycle assessment (LCA), mathematical modeling, facility-location planning, waste-to-energy, landfill management, environmental monitoring, economic instruments, policy and e-waste. The literature was thematically synthesized to identify major methodological developments, contributions and research gaps. The review indicates that individual MSWM components have been extensively studied, but their integration within a practical decision-support framework remains limited. Through this research an integrated framework combining waste characterization, GIS-based collection planning, route optimization, recycling and resource recovery, environmental assessment and economic evaluation is proposed. Such integration can support evidence-based and resource-efficient MSWM planning in rapidly developing urban areas.

Keywords; Municipal solid waste management; GIS; recycling; life-cycle assessment; waste characterization; transportation optimization; resource recovery; environmental assessment; sustainability.

INTRODUCTION

Rapid urban development has increased both the quantity and diversity of waste generation from residential, commercial, institutional and other urban activities, creating challenges in collection, transportation, treatment and disposal. Poor quality of waste management always leads to hazardous air, water and soil pollution and adversely affects the urban environmental quality.

MSWM has progressively developed from a primary focus on collection and disposal towards integrated management, in which waste prevention, source segregation, recycling, recovery, treatment and final disposal are considered together. The reviewed literature reflects this transition, with studies addressing metropolitan planning, comparative risk, GIS, decision-support systems, LCA, mathematical optimization, recycling incentives and environmental monitoring.

The present study synthesizes 26 supplied technical papers to identify common themes, methodological contributions, limitations and opportunities for integration.

OBJECTIVES

1. To critically analyze 26 selected studies related to MSWM.
2. To identify major methodologies and thematic areas in previous research.
3. To compare the principal contributions of the reviewed studies.
4. To identify limitations and research gaps.
5. To propose an integrated framework combining GIS, optimization, LCA, resource recovery and economic evaluation.

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State-of-the-Art Review

Sustainable Approaches to Dye Degradation: A Review of Eco-Sustainable Techniques, Recent Strategies, and Emerging Solutions

Praveen Kumar[1]; Kalpana Singh[2]; Jeet Singh[3]; Manorama Kumari Talla[4]; Sajid Ali[5]; Ritu Chauhan[6]; and Anuj Ranjan[7]

Abstract: The rapid expansion of the textile industry, while contributing significantly to global economic growth, has also intensified environmental concerns due to the large-scale discharge of dye-contaminated wastewater. Developing effective and sustainable treatment strategies for diverse and persistent dyes remains a major challenge. This review presents a comprehensive assessment of recent progress in dye remediation, encompassing conventional treatment limitations, bioremediation approaches, nanomaterial-assisted systems, hybrid technologies, and nanobioaugmentation, along with considerations of circular economy principles, regulatory frameworks, and future research directions. A combined bibliometric and systematic review methodology was employed to ensure a structured evaluation of the field. Relevant studies published between 2010 and January 2025 were collected from major scientific databases using defined keyword combinations. After duplicate removal and a two-stage screening process, a refined set of high-quality studies was analyzed, and bibliometric tools were used to identify key research trends and emerging themes. The analysis indicates that integrated approaches, particularly those combining nanomaterials with biological or advanced oxidation processes, offer strong potential for practical application due to improved efficiency and adaptability. While microbial systems provide environmentally benign solutions, their slower kinetics may limit scalability. In parallel, machine learning techniques, including the artificial neural network, support vector machine, response surface methodology, and fuzzy logic, have enhanced process optimization and predictive capability, though their reliability depends on data quality. The integration of multidisciplinary strategies, reinforced by life-cycle assessment, plays a critical role in enabling sustainable and scalable dye wastewater treatment within a circular economy context. **DOI: 10.1061/JOEEDU.EEENG-8462.** *© 2026 American Society of Civil Engineers.*

Author keywords: Sustainable dye degradation; Artificial intelligence; Machine learning; Artificial neural networks (ANNs); Nanohybrid bioaugmentation; Circular economy; Global regulatory frameworks; Life-cycle assessment.

Introduction

Around the world, surges in industry, technology, and urbanization have had significant effects on the environment, especially on water quality (Ahmed et al. 2025). Water pollution is a critical global concern, with industry contributing 17%–20% of this issue (Ayele et al. 2021). Dyes from the textile industry are a significant contributor to industrial effluents and cause considerable damage to the environment and public health (Tian et al. 2021). This wastewater contains hazardous dyes from both the textile and dye manufacturing industries. Each year, more than 280,000 tons of dyes are discharged into the environment, worsening global water pollution (Singh and Singh 2015). Conventional dyeing methods are also known to consume a significant amount of water and emit harmful chemicals, leading to significant environmental pollution. The World Bank estimates that the dyeing and cleaning of textiles causes up to 20% of industrial water pollution worldwide (Scott 2015). Hitam and Jalil (2020) reported that several synthetic dyes such as Congo red, methyl red, methylene blue, and acid blue-25 (Mensah et al. 2024) are complex, polar, bioresistant OMPs that have the potential to cause cancer and mutagenesis.

Azo dyes, which constitute more than 70% of synthetic colors worldwide, are significant environmental hazards, and approximately 10%–15% of these dyes are lost or spilled during procedures, increasing the degree of pollution concern (Ajaz et al. 2020). These dyes are the most common synthetic dyes. Their aromatic structures and one or more —N=N— linkages distinguish them from other dyes (Munagapati et al. 2021). They are harmful to both humans and aquatic life. The color and intensity of synthetic dyes depend upon the interaction between chromophores and autochrome groups. These groupings comprise vital chromophores, including N=N, CO, NO_2, quinoids, NH_3, OH, SO_3H, and CO_2H (Mohamed et al. 2019). Different types of advanced oxidation processes (AOPs), such as photocatalysis, chlorination, ozonation, and the Fenton reaction, and their ability to break down harmful organic micropollutants (OMPs), which break them downto CO_2 and H_2O, have led to interest in treating wastewater (Prakruthi et al. 2022).

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Note. This manuscript was published online on July 3, 2026. Discussion period open until December 3, 2026; separate discussions must be submitted for individual papers. This paper is part of the *Journal of Environmental Engineering*, © ASCE, ISSN 0733-9372.

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JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Analysis of Water Sample Parameters at MANUU Polytechnic, Nagarabhavi, Bangalore

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Abstract

Water is the most valuable natural resource after air. Water makes up the majority of the earth's surface. Water is a limited and valuable resource because only a small portion of it can be used. Its suitability must be examined before use, and it can be put to various uses depending on the situation. Regular monitoring of all water sources is necessary to determine whether or not the drinking water meets standards.

Degradation of the environment poses a threat to the ecosystem in addition to being an indicator of poor water quality. Inappropriate water use in industries can result in serious risks and financial loss. Therefore, water quality according to standards for various uses is extremely

Key Words: *Water Quality analysis,*

1. INTRODUCTION

1.1 Quality of Water?

The various physical, chemical, and biological properties of water, typically in relation to its suitability according to standards for a specific use, can be referred to as water quality.

Water can be used for industry, agriculture, drinking, fishing, and washing. For instance, the water used for swimming or drinking has stricter regulations than that used for industry or agriculture.

1.2 Water Quality Analysis?

Water standards are established following many years of research studies to guarantee the appropriate and effective use of water for a specified purpose. The purpose of water quality analysis is to measure the necessary water parameters using accepted practices and determine whether they meet the standards.

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Journal of Mines, Metals and Fuels, 73(6): 1819-1832; 2025. DOI: 10.18311/jmmf/2025/49112

Print ISSN : 0022-2755

INFORMATICS JOURNALS

Journal of Mines, Metals and Fuels

Contents available at: www.informaticsjournals.co.in/index.php/jmmf

Machine Learning-Driven Fatigue Life Prediction in Notched Friction Welded UNS S31603 Stainless Steel

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Abstract

Welded joints are used in many engineering applications, including aerospace, automotive, and structural engineering. However, notches in the welded components reduce their fatigue strength and lead to early failure through stress concentration. It is, therefore, crucial to comprehend and estimate the fatigue behaviour of friction-welded joints with a notch to ensure the structural integrity and component durability. This study aims to examine the notch fatigue behaviour of friction welded joints of UNS S31603 stainless steel and to build up regression models based on Machine Learning, such as Gaussian Process Regression (GPR) and Support Vector Regression (SVR) for accurate fatigue life prediction. Fatigue tests were performed on friction-welded UNS S31603 stainless steel specimens under strain-controlled conditions with fully reversed loading (R=-1) at a constant strain amplitude of 0.3%. The effect of notch width, depth and central angle on fatigue life was investigated. Experimental data was used to train the ML models, and hyperparameter tuning was done using grid search and 4-fold cross-validation. Model accuracy was measured by R^2, RMSE and MAPE values. The experimental results indicated that the fatigue life of notched welded joints is drastically reduced compared to the base metal, and deeper notches reduce the fatigue strength by up to 84%. It was observed that GPR outperformed SVR in the prediction of fatigue life and had an R^2 value of 0.9932 with RMSE of 8.61 for the parent material and an R^2 value of 0.9933 with RMSE of 15.76 for the welded joints. The results highlight the need to optimise notch design and welding conditions to enhance fatigue resistance in engineering applications.

Major Findings: The current research investigated the detrimental effect of notch parameters on the fatigue life of both parent material and friction welded joints of UNS S31603. The work also found the GPR model to be the best fit regression model compared to the SVR .

Keywords: *Friction Welding, GPR, Notch Fatigue Life, SVR, UNS S31603*

1.0 Introduction

The utilisation of welded joints is important in a wide range of engineering domains, encompassing automotive, aerospace, as well as structural engineering. Nevertheless, the existence of notches within welded components can have a substantial impact on their fatigue resistance and overall structural integrity. Notch fatigue failure

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J. Electrical Systems 20-10s (2024): 8551-8560

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Development of Road Network Connecting Mandals of East Godavari District using the Concept of Center of Mass

JES Journal of Electrical Systems

Abstract: - The aim of this paper is to propose a road network connecting each and every mandalusing the concept of Center of mass. It consists of five revenue divisions/ Administrative frames of the East Godavari district viz., Kakinada revenue division which includes 10 mandals, Peddapuram Revenue Division which includes 12 mandals, Rampachodavaram Revenue division which includes six mandals, Rajahmundry Revenue Division which includes fifteen mandal and Amalapuram Revenue Division which includes sixteen mandals. "**In view of the above details,in this article study was conducted forPedapudimandal using the concept of Centre of mass.Final Position vectors (+ai+bj)are developed for PedapudiMandal".** The proposed road network is developed using the Census data. The Center of mass concept plays a vital role, by using the data the data pertaining to the demographic and socio-economic activities like population, Number of Households, Total main workers, Total area of the village irrigated by source were collected from the records of 1991 census for the study area(East Godavari District).

Keywords: mandalusing, Administrative, Peddapuram, socio-economic.

1.0 INTRODUCTION

Amongst various modes of transport, highways a vital role to play, providing most flexible and door to door service. It has been established that it suits well for short and medium trip length, thus become a most sought after mode at regional and micro regional level . While the transportation fulfils the fundamental requirements of mobility, connectivity and accessibility needs, highways provide the much needed accessibility and minimum connectivity in India. When even today three-fifth of the nearly six lakh villages have no connection to the civilized world.

India itself has a very low Road density, an index of accessibility and many states and districts suffer from further inadequacy in terms of road length compared to the national average as brought out by Indian Roads Congress (IRC). In the context of constraint on available resources for road sector, it becomes obligatory to develop a demand oriented ideal net work.

Most noteworthy attempts have been made for the systematic development of roads in India through a series of 20- Years road development plans at national level. Even though the plans are well drawn and may satisfy the transport needs at National level, very few attempts are made to develop a systematic road network At regional level. There are not many specific studies for road planning at district level that gives a much needed to or to the development to those entrusted with such a task. The formulae adopted at national level may not be followed in totality for lower level plans, but the general strategy may certainly hold good for the exercise in district road planning. The main principle behind such strategy is the understanding of the characteristics of study area, assessment of road requirement and incorporation of location specific parameters for the network development on scientific basis.

1.1 THEORY OF CENTER OF MASS

HYPOTHETICAL VIEW AND ITS INTERPRETATION

The center of mass is the unique point at the center of a distribution of mass in space that has the property that the weighted position vectors relative to this point sum to zero. In analogy to statistics, the center of mass is the mean location of a distribution of mass in space.

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Modeling Using Coupled FEM-SBFEM for Three-Dimensional Seismic SSI in Time Domain

N. M. Syed[1] and B. K. Maheshwari, M.ASCE[2]

Abstract: For soil-structure interaction (SSI) problems, accurate modeling of the unbounded domain is an important issue. This paper deals with the three-dimensional seismic SSI analysis based on the substructure method by coupling the FEM and the scaled boundary FEM (SBFEM) approaches. The entire analysis is performed in the time domain making the proposed approach capable of dealing with nonlinearity of soil. To verify the developed program, the results from the present analysis are compared with those available in the literature. This verification has been performed for both externally applied dynamic load and seismic load. The effect of boundary conditions on the SSI response is evaluated. The numerical study performed indicates that the SBFEM can act as a computationally efficient boundary when compared with the conventional viscous dashpots. Next, application of the FEM-SBFEM for SSI problems is demonstrated. A dam-foundation interaction analysis is carried out, and the effect of the inhomogeneity of the foundation soil on the dynamic response of the structure is evaluated. In addition, seismic SSI analysis of a building is carried out for a real earthquake excitation. The effects of the dynamic characteristics of soil and structure on the dynamic SSI response are analyzed. **DOI: 10.1061/(ASCE)GM.1943-5622.0000296.** © *2014 American Society of Civil Engineers.*

Author keywords: Soil-structure interaction; Radiation condition; Finite-element method-scaled boundary finite-element method (FEM-SBFEM); Viscous dashpots; Kelvin elements.

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Introduction

Efficient yet accurate modeling of the unbounded soil medium has been of long-standing interest in research for the dynamic soil-structure interaction (SSI) problems. The major methods available for the analysis of SSI problems can be classified into two groups: direct method and substructure method. In the direct method of SSI analysis, the artificial boundary has to be placed sufficiently far from the soil-structure interface because approximate or local boundary conditions are imposed on this boundary. This leads to an increase in the number of degrees of freedom (DOF) and the computational effort, although the direct method in itself is computationally efficient because the interaction force-displacement relationship involved is local in time and space. On the contrary, in the substructure method, the boundary conditions imposed on the interaction horizon are rigorous, making the force-displacement relationship global both spatially and temporally. A large amount of data has to be processed, which results in expensive computations, especially for large-scale problems and long-time calculations. However, this computation leads to an accurate solution.

Most of the local procedures used in the direct method are mainly based on the theory of wave propagation, enforcing outgoing plane waves (Wolf and Song 1996). The classical viscous boundary (Lysmer and Kuhlemeyer 1969), the unified viscous boundary (White et al. 1977), various higher-order transmitting boundaries (Liao and Wong 1984), infinite elements (Yang et al. 1996), absorbing layers, such as the sponge layer (Israeli and Orszag 1981), perfectly matched layers (Berenger 1994), and frequency-dependent Kelvin elements (Maheshwari et al. 2004, 2005; Maheshwari and Sarkar 2011; Sarkar and Maheshwari 2012) are some of the local boundary conditions used in the direct method of SSI analysis.

The rigorous modeling of the unbounded domain is performed when the dynamic SSI problem is analyzed with the substructure method. Some of the established rigorous procedures used in the substructure method of analysis are the boundary element method (BEM) (Kaynia and Kausel 1982; Maheshwari and Watanabe 1998; Hall and Oliveto 2003), thin-layer method (Kausel 1994), exact nonreflecting boundary conditions (Keller and Givoli 1989), consistent infinitesimal finite-element cell method (CIFCEM) (Wolf and Song 1996; Emani and Maheshwari 2009), and the scaled boundary FEM (SBFEM) (Wolf 2003). Combined models based on the coupling of different approaches, such as FEM-BEM (von Estroff and Prabucki 1990; von Estroff and Firuziaan 2000), FEM-SBFEM (Wolf and Song 2000; Bazyar and Song 2006), and FEM-BEM-SBFEM (Genes and Kocak 2005), have also been proposed.

The SBFEM has been developed for the dynamic analysis of unbounded domains, taking the advantages of both the FEM and the BEM approaches and evading their respective drawbacks. Using the SBFEM, the radiation condition for the unbounded medium is satisfied exactly, no fundamental solution is required, and no singular integral needs to be evaluated. The detailed derivation and the analytical and numerical solution procedures of the SBFE equations in displacement and dynamic stiffness, for both bounded and unbounded media, are discussed in Wolf and Song (2000) and Song and Wolf (2000).

Du and Lin (2008) used an improved time domain numerical approach based on a reduced set of base functions in the SBFEM and analyzed the arch dam–unbounded foundation interaction problem. Wegner et al. (2009) studied the structural response of multistory

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Note. This manuscript was submitted on August 29, 2012; approved on February 20, 2013; published online on January 15, 2014. Discussion period open until July 1, 2014; separate discussions must be submitted for individual papers. This paper is part of the ***International Journal of Geomechanics***, Vol. 14, No. 1, February 1, 2014. ©ASCE, ISSN 1532-3641/2014/1-118–129/$25.00.

Int. J. Geomech. 2014.14:118-129.

Computers and Geotechnics 67 (2015) 204–212

Contents lists available at ScienceDirect

Computers and Geotechnics

journal homepage: www.elsevier.com/locate/compgeo

Research Paper

Improvement in the computational efficiency of the coupled FEM–SBFEM approach for 3D seismic SSI analysis in the time domain

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ARTICLE INFO

Article history:
Received 24 July 2014
Received in revised form 11 March 2015
Accepted 12 March 2015

Keywords:
Soil–structure interaction
Radiation condition
FEM–SBFEM
Computational efficiency

ABSTRACT

The scaled boundary finite element method (SBFEM) is an attractive approach for modelling unbounded media because it offers the advantages of both the finite element method (FEM) and the boundary element method (BEM) avoiding their respective drawbacks. Unfortunately, being a rigorous method, the SBFEM exhibits non-locality in both time and space, which results in significant numerical effort, especially for large problems with many degrees of freedom and a long simulation time. In order to improve the performance of this method, two different approximation techniques – one in time and one in space have been combined and implemented in the present work. A three-dimensional embedded footing problem was solved for the dynamic load, including a chirp load and a sinusoidal load. The combination of the two approximation techniques implemented in the time domain-coupled FEM–SBFEM approach for 3D analysis leads to significant reduction in computational time and storage requirements with insignificant loss in accuracy. The computational time required for the approximation techniques was found to be only 5% of that required using the conventional method, whereas the loss in accuracy was found to be less than 5%. Further, numerical problems for the externally applied dynamic load as well as the seismic load demonstrate the applicability of the coupled FEM–SBFEM approach for modelling dynamic soil–structure interaction (SSI) problems.

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1. Introduction

Efficient yet accurate modelling of the unbounded soil medium has been of long-standing interest in the research addressing dynamic soil–structure interaction (SSI) problems. In the substructure method of dynamic SSI analysis, rigorous modelling of the unbounded domain is performed. Some of the established rigorous procedures used in the substructure method of analysis are the boundary element method (BEM) [1], the thin layer method [2], the exact non-reflecting boundary conditions [3], the consistent infinitesimal finite element cell method (CIFECM) [4] and the scaled boundary finite element method (SBFEM) [5]. Although the BEM satisfies the radiation condition exactly while dealing with unbounded domain problems, its application to practical problems is limited because the complexity of the fundamental solution satisfying the integral equation of motion increases dramatically while addressing certain types of problems, e.g., problems with anisotropic materials. The thin layer method is applicable only for horizontally layered media resting on a rigid rock base. Similar to the BEM, the exact non-reflecting boundary conditions for unbounded domains demand exact solutions and hence are limited to problems with simple geometry and material properties. Combined models based on coupling of the finite element method (FEM) with different approaches, such as the FEM–BEM [6–8], the FEM–CIFECM [9,10], the FEM–SBFEM [11,12], and the FEM–BEM–SBFEM [13], have also been proposed.

The SBFEM combines the advantages of both the FEM and the BEM, avoiding their respective drawbacks [5]. It satisfies the radiation condition exactly and is based entirely on finite elements but with a discretization on the boundary only, thus reducing the spatial dimension by one. No fundamental solutions are required while implementing the SBFEM, and hence, it is suitable for problems with anisotropic material properties. The SBFEM has been used for problems such as elasto-statics and elasto-dynamics [5,14], fluid flow problems [15], fracture mechanics [16], and geomechanics [17]. Recently, the SBFEM has gained popularity as a tool, especially for SSI problems in unbounded domains [13,18,19].

The major drawback of the SBFEM is the tremendous demand that it exerts on the computational time and storage requirements.

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http://dx.doi.org/10.1016/j.compgeo.2015.03.010
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Verification of Implementation of HiSS Soil Model in the Coupled FEM–SBFEM SSI Analysis

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Abstract: The scaled boundary FEM (SBFEM) has become an attractive alternative to traditional rigorous methods available for modeling the unbounded media for soil–structure interaction (SSI) analysis using the substructure method. Most of the coupled FEM–SBFEM schemes available in the literature are only for the linear-elastic SSI analysis. Very few studies have considered the nonlinearity in the near-field, and most of them have adopted elastic-perfectly plastic models to simulate the nonlinearity. In the present study, an advanced plasticity-based model known as hierarchical single surface (HiSS)-δ_0, which is based on isotropic hardening and associated response, has been implemented in the coupled FEM–SBFEM scheme in the time domain. The HiSS model provides a general formulation for the elastoplastic characterization of the material behavior. Problems from the literature have been solved using the presently developed code, and the results have been verified, thus validating the developed code. **DOI: 10.1061/(ASCE)GM.1943-5622.0000511.** © *2015 American Society of Civil Engineers.*

Author keywords: Nonlinear soil–structure interaction; Radiation condition; FEM–SBFEM; HiSS model.

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Introduction

The scaled boundary FEM (SBFEM) developed by Song and Wolf (1997) has been applied to many problems in engineering, including soil–structure interaction (SSI) analysis. The SBFEM offers the advantages of both the FEM and the boundary element method (BEM), evading their respective drawbacks, and hence, is an attractive alternative to other rigorous methods available for modeling the unbounded media for the SSI analysis (Wolf 2003). Combined models using the coupling of different approaches, such as the FEM–BEM (von Estroff and Prabucki 1990; von Estroff and Firuziaan 2000), the FEM-consistent infinitesimal finite-element cell method (CIFECM) (Emani and Maheshwari 2009; Maheshwari and Emani 2015), the FEM–SBFEM (Wolf and Song 2000; Bazyar and Song 2006; Syed and Maheshwari 2014a), the FEM–BEM–SBFEM (Genes and Kocak 2005), etc., have also been proposed.

In the FEM–SBFEM coupling, using the substructure method of SSI analysis, modeling of the bounded domain is performed by the FEM, whereas the behavior of the far-field is simulated by the SBFEM. Most of the coupled FEM–SBFEM schemes developed for the SSI analysis until now included only linear-elastic behavior, and very few studies have considered material nonlinearity in the near-field. Doherty and Deeks (2005) proposed an adaptive FEM–SBFEM coupling for a nonlinear near-field. In this technique, an additional layer of finite elements in the far-field region are added to the existing mesh of the near-field, if the Gauss point in the outer band of finite elements is yielded and the SBFE domain is stepped out accordingly. They adopted an ideal elastic–plastic Tresca model to simulate the material nonlinearity. Bransch and Lehmann (2011) used the nonlinear Hilber–Hughes–Taylor–alpha method (Hilber et al. 1977) with full Newton–Raphson iteration within the framework of the coupled FEM–SBFEM approach. They used the elastic–plastic cap model given by DiMaggio and Sandler (1971) to capture the nonlinearity in the near-field. Although the cap model has been used in the characterization of materials that exhibit continuous yielding, it suffers certain limitations in handling a number of important attributes of the behavior of materials (Desai 2001). Ooi et al. (2014) developed a scaled-boundary polygon formulation using polygon shape functions to model the nonlinear material responses in structures. However, they also used elastic-perfectly plastic nonlinearity using Tresca and von Mises yield criteria to simulate material nonlinearity.

In this paper, a more advanced plasticity-based model, known as the hierarchical single-surface (HiSS) plasticity model (Desai 2001), has been used to model the material nonlinearity in the near-field. HiSS models provide a general formulation for the elastoplastic characterization of the material behavior. They provide hierarchical adoption of models of increasing sophistication, say, linear elastic to nonassociated elastoplastic to elastoplastic with softening. Although HiSS is an advanced model, implementing it in a FEM code is simpler compared with other plasticity-based models, such as the cap model.

In this paper, the basic and simplest version of the HiSS models, the HiSS-δ_0, which allows for isotropic hardening and associated response, has been used in the dynamic SSI analysis carried out using the coupled FEM–SBFEM approach. The work presented in this paper is an extension of Syed and Maheshwari (2014b), where the verification shown for the nonlinear soil model was very limited.

Governing Equations and Numerical Solutions

The basic equations of motion in time domain of the unbounded medium–structure interaction for the prescribed dynamic loads as well as externally applied transient loading are given by (Wolf 1988)

$$\begin{bmatrix} M_{ss} & M_{sb} \\ M_{bs} & M_{bb} \end{bmatrix} \begin{Bmatrix} \ddot{u}_s^t \\ \ddot{u}_b^t \end{Bmatrix} + \begin{bmatrix} C_{ss} & C_{sb} \\ C_{bs} & C_{bb} \end{bmatrix} \begin{Bmatrix} \dot{u}_s^t \\ \dot{u}_b^t \end{Bmatrix} + \begin{bmatrix} K_{ss} & K_{sb} \\ K_{bs} & K_{bb} \end{bmatrix} \begin{Bmatrix} u_s^t(n\Delta t) \\ u_b^t(n\Delta t) \end{Bmatrix} + \begin{Bmatrix} 0 \\ R_b(t) \end{Bmatrix} = \begin{Bmatrix} P_s(t) \\ P_b(t) \end{Bmatrix} \quad (1)$$

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Note. This manuscript was submitted on September 5, 2014; approved on February 21, 2015; published online on June 18, 2015. Discussion period open until November 18, 2015; separate discussions must be submitted for individual papers. This paper is part of the ***International Journal of Geomechanics***, © ASCE, ISSN 1532-3641/04015034(8)/$25.00.

Syed, N. M. & Maheshwari, B. K. (2017). *Géotechnique* **67**, No. 7, 572–580 [http://dx.doi.org/10.1680/jgeot.16.P.029]

Non-linear SSI analysis in time domain using coupled FEM–SBFEM for a soil–pile system

N. M. SYED* and B. K. MAHESHWARI†

The scaled boundary finite-element method (SBFEM) coupled with the finite-element method (FEM) is increasingly being employed to study soil–structure interaction (SSI) problems. However, most of the coupled FEM–SBFEM models for dynamic SSI analysis include only linear behaviour of the soil in the near field. In the present work, a coupled FEM–SBFEM scheme is presented in the time domain for non-linear dynamic SSI analysis. An advanced plasticity-based model, namely the hierarchical single-surface (HiSS)-δ_0, is incorporated to simulate soil non-linearity. A three-dimensional single pile–soil system is solved for externally applied dynamic load as well as ground excitation. A parametric study is done to gain insight into the effects of soil stiffness and intensity of loading on the non-linear response of a single pile–soil system by calculating its dynamic impedances and kinematic interaction factors. Also, the displacement response at the pile head due to the El Centro earthquake is calculated for linear and non-linear cases.

KEYWORDS: numerical modelling; plasticity; soil/structure interaction

INTRODUCTION

The scaled boundary finite-element method (SBFEM), developed by Wolf & Song (2000) and Song & Wolf (2000) is being increasingly employed for modelling the unbounded domain in dynamic soil–structure interaction (SSI) problems (Zhang *et al*., 1999; Bazyar & Song, 2006; Wegner *et al*., 2009; Seiphoori *et al*., 2011; Syed & Maheshwari, 2014). The SBFEM combines the advantages of both the finite-element method (FEM) and the boundary-element method (BEM), evading their respective drawbacks (Wolf, 2003).

Ekevid & Wiberg (2002) employed a hybrid FEM–SBFEM scheme to study the dynamic response of a railroad. Borsutzky & Lehmann (2006) analysed the damage risk of buried lifelines considering the seismic wave propagation effects. Lin *et al*. (2007) carried out dynamic analysis of a dam–reservoir–foundation system employing the SBFEM for modelling of an unbounded medium. Seiphoori *et al*. (2011) carried out three-dimensional non-linear earthquake analysis of rockfill dams. They restricted the non-linearity in the rockfill material of the dam, whereas the unbounded medium was modelled using the SBFEM. Liu *et al*. (2012) carried out a dynamic response analysis of a two-dimensional dam–foundation–reservoir system in the frequency domain. Lo *et al*. (2012) adopted the coupled FEM–SBFEM approach to study the ground vibrations due to a pile-driving process into layered ground. Yaseri *et al*. (2014) employed the coupled FEM–SBFEM approach to study the effect of speed of an underground train on the ground response.

Most of the coupled FEM–SBFEM models for dynamic SSI analysis include only linear behaviour of the soil in the near field. However, Doherty & Deeks (2005) applied adaptive coupling of the FEM–SBFEM interface considering non-linearity in the near field. Bransch & Lehmann (2011) used the non-linear Hilber–Hughes–Taylor-α algorithm with full Newton–Raphson iteration within the framework of the coupled FEM–SBFEM approach to study a non-linear SSI problem. In all of the above works, non-linearity was restricted to the near field and the far field, which was modelled using the SBFEM, was assumed to behave linearly. Lin & Liao (2011) combined the traditional SBFEM with the homotopy analysis method (HAM) extending the conventional SBFEM to non-linear differential equations, thus enabling modelling of the far field with a non-linear material as well.

Doherty & Deeks (2005) in their study modelled the near field with an ideal elastic–plastic Tresca material, whereas Bransch & Lehmann (2011) employed the elastic–plastic cap model given by DiMaggio & Sandler (1971). Although the cap model has been used in the characterisation of materials that exhibit continuous yielding, they suffer certain limitations in handling a number of important attributes of the behaviour of materials, such as the non-associative response of many frictional materials (Desai, 2001). The hierarchical single-surface (HiSS) plasticity models provide a general formulation for the elastoplastic characterisation of material behaviour. They provide hierarchical adoption of models of increasing sophistication, say, linear elastic to non-associated elastoplastic to elastoplastic with softening. In the present work, the basic and simplest version of the HiSS models, the HiSS-δ_0 model, which allows for isotropic hardening and associated response, has been used to model the soil in the near-field region.

Syed & Maheshwari (2014) have presented modelling of seismic SSI using coupled FEM–SBFEM. Syed & Maheshwari (2015) reported the computational efficiency for the algorithm developed using the coupled FEM–SBFEM approach. Maheshwari & Emani (2015) employed the FE–CIFECM (finite element–consistent infinitesimal finite-element cell method) for modelling unbounded domain and the HiSS soil model to demonstrate the effect of material non-linearity of the soil. Recently, Maheshwari & Syed (2016) verified the implementation of the HiSS soil model in coupled FEM–SBFEM analysis.

Manuscript received 28 January 2016; revised manuscript accepted 21 November 2016. Published online ahead of print 3 January 2017. Discussion on this paper closes on 1 December 2017, for further details see p. ii.

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Liquefaction Potential of Sites in Kalyani Region based on Shear Wave Velocity Data

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Abstract
Liquefaction hazard is one of the most catastrophic effects of an earthquake. When dynamic loading occurs, saturated sandy soil in undrained conditions loses its shear strength due to the development of excess pore water pressure. Therefore, it is imperative to evaluate a site for its susceptibility to liquefaction. The main objective of the present study is to calculate the liquefaction potential of 6 sites in Kalyani region which are located at around 50 km from the City of Kolkata in the State of West Bengal, India. For this purpose, six bore locations are selected in the All India Institute of Medical Sciences, Kalyani, Kolkata Campus.

The liquefaction potential of the site is calculated at all the six locations for an earthquake of magnitude 7.5 and peak ground acceleration (PGA) of 0.16 g. The water table is considered at the ground level. Liquefaction potential in terms of Factor of Safety against liquefaction is calculated with the depth based on the shear wave velocity data. Further, liquefaction potential index is also evaluated for all the considered sites. It is observed that the possibility of liquefaction is very high at shallow depths. Moreover, a parametric study is carried out for various values of the magnitudes of earthquakes and PGA values to show its effects on liquefaction susceptibility.

Keywords: Peak Ground Acceleration, Shear Wave Velocity, Liquefaction Potential, Liquefaction Potential Index, SPT N Value, Seismic Hazard.

Introduction

Geotechnical investigation is carried out to identify the properties of the soil, where any major civil engineering structure is to be constructed. If the investigation is done for the site which comes under the earthquake prone areas then it is necessary to establish whether the given site is liquefiable or not. Standard Penetration Test (SPT), Cone Penetration Test (CPT), Becker Hammer Test (BHT) and Multichannel Analysis Surface Wave (MASW) Test are some of the field methods used to measure the liquefaction potential of soil. Earlier, the liquefaction potential of a site was calculated by the simplified procedure developed by Seed and Idriss[35] using the Cyclic Resistance Ratio (CRR) value obtained by N values of SPT. Since then, the method has been continuously reformed and simplified by various authors.[36-38,47]

Another popular method for the evaluation of the liquefaction potential using the CPT was given by Robertson and Campanella[32]. This method of evaluation has also been reformed and updated several times.[30,34,41]

The shear wave velocity (Vs) method for determination of the liquefaction potential is preferable over other methods such as SPT, CPT etc. because it is not affected by large particles and is less sensitive toward soil compression and reduced penetration resistance due to the presence of fines, thus requiring minor corrections.[31] It is also a non-destructive test and can be used both in the field and in the laboratory.[14,44]

In this method, shear wave velocity is considered as an index property of soil to determine liquefaction potential resistance. Both liquefaction potential resistance and shear wave velocity are similarly influenced by stress history, age of soil geology, void ratio and different states of stress.

In the last two decades, many researchers have given relationships between liquefaction potential resistance and shear wave velocity. They have used different methods like field test, penetration –Vs correlation, numerical investigation, laboratory experiments etc.[3,6,10,12,20,24,33,37,43,44] All these evaluations were based on the simplified procedure of Seed and Idriss[35] method. Several corrections have been applied to Vs for overburden stress and an analytical expression is established with Cyclic Stress Ratio (CSR). Several seismic tests have been used to measure shear wave velocity in the field like CPT, MASW, suspension logger, down-hole and cross-hole.[22,47] Sensitiveness of the calculation and condition of soil are highly affected by the precision of the tests. Stokoe et al[42] and Belloti et al[5] have shown that the velocity achieved by the shear wave is equally dependent on the motion of the particle and principal stresses.

The evaluation of liquefaction potential index (LPI) is required to mitigate the damages caused by liquefaction. Iwasaki et al[18] proposed LPI to overcome the limitations associated with Factor of Safety (FoS). LPI is frequently used by researchers to evaluate the liquefaction potential of soils. LPI offers an advantage by providing a single value for the entire location for liquefaction hazard maps instead of several factors at different layers.[11,40,46] LPI has been calibrated using SPT test data to characterize the liquefaction potential of sites.[11,29,40,45] Iwasaki et al[19] categorized levels of liquefaction severity as very low, low, high and very high

Indian Geotech J
https://doi.org/10.1007/s40098-022-00658-4

ORIGINAL PAPER

Soil Liquefaction Potential of Kalyani Region, India

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Received: 13 May 2022 / Accepted: 2 August 2022
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Abstract High-magnitude earthquakes can result in severe destruction in regions susceptible to liquefaction. To avoid such casualty, one needs to specify the liquefaction susceptibility of the area and suggest proper measures for construction designs. In the present work, the liquefaction potential of the Kalyani region is evaluated. Three moderate- to high-magnitude earthquake scenarios (M_w = 6.5, 7.0, and 7.5 and $PGA = 0.143g$, $0.170g$, and $0.202g$, respectively) are considered for the present analysis at the six selected borehole sites in the study region. Liquefaction potential in terms of the factor of safety (*FoS*) against liquefaction is evaluated using a field approach based on *N* values with the help of a simplified method commonly known as Seed and Idriss method. Further, an attempt is made to define the severity against liquefaction by drawing the liquefaction hazard map of the study area based on the liquefaction potential index (*LPI*) values. It is found from the results that, for the shallow depths, susceptibility towards liquefaction decreases as the magnitude of earthquake decreases. We also observed that the minimum difference in the *FoS* obtained for a 7.0 magnitude earthquake was found to be 40% greater than that for the 7.5 magnitude earthquake. The same result is valid for the *LPI* analysis; for 7.5 M_w, the *LPI* is very high and the susceptibility towards liquefaction is about 93%. For the 7.0 M_w, the *LPI* is high and the severity against liquefaction is between 58 and 93% probability, whereas for 6.5 M_w, the *LPI* is moderately high with less than 53% susceptibility towards liquefaction.

Keywords Liquefaction · Liquefaction potential index · Cyclic stress ratio · Cyclic resistance ratio · Factor of safety

Introduction

Whenever a major earthquake occurs, it is observed that it causes serious damage to the foundation, structure, and underground structure constructed on the extensive areas of reclaimed land due to soil liquefaction and displacement of ground in the horizontal direction [1]. It has been shown that the determination of liquefaction potential of any region must be taken into account for ground improvement before the construction of any structure [2]. When a high-intensity earthquake hits a sandy soil deposit which is in loose, saturated, and undrained cohesionless condition, then the rapid decrease in the shear strength of the soil takes place such that the shear strength of the soil eventually becomes zero. This phenomenon is termed as liquefaction. As the pore water pressure increases, soil particles lose their contact with each other and move in unidentified directions resulting in sinking of heavyweight structures and floating of low-weight structures. The occurrence of soil liquefaction depends on various factors like the type of soil, thickness of the soil strata, soil grain size, relative density, water table depth, fines content, etc. [2]. Correspondingly, severity of liquefaction is influenced by the reduction of effective stress, shear modulus degradation, and intensity and magnitude of the earthquake, duration of the ground motion, distance from the source of the earthquake, ground acceleration, etc. [2–4]. Ground

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Published online: 05 September 2022

Environmental Science and Pollution Research (2023) 30:99127–99146
https://doi.org/10.1007/s11356-022-23680-8

Ground response analysis and liquefaction for Kalyani region, Kolkata

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Received: 7 May 2022 / Accepted: 12 October 2022 / Published online: 21 October 2022
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Abstract
The main focus of this research is the ground response analysis and liquefaction potential analysis of AIIMS Kolkata based on SPT-N values at six different locations. The analyses are performed for the earthquake magnitude $M_w = 7.0$ and peak ground acceleration of 0.170 g. For this, Equivalent-linear Earthquake Response Analysis (EERA), Nonlinear Earthquake Response Analysis (NERA), and PLAXIS-2D software are utilized. In ground response analysis, various parameters such as shear stress, peak ground acceleration, relative displacement, and amplification ratio are evaluated. In liquefaction potential analysis, the factor of safety against liquefaction is calculated from different methods, such as the simplified method, EERA, and NERA, and their results have been compared. Further liquefaction potential index is also evaluated for the same earthquake magnitude and PGA using the factor of safety value evaluated from liquefaction potential analysis and ground response analysis for all the borehole locations. It is observed from the results that the equivalent linear analysis gives conservative results when compared with those obtained from the nonlinear analysis. Moreover, the simplified method too fails to predict the liquefaction susceptibility of certain regions that are found to be prone to liquefaction from the EERA and NERA analyses.

Keywords Liquefaction potential · Equivalent linear and nonlinear earthquake response · CSR · CRR · Factor of safety

Introduction

It has been shown by various researchers that the study of ground motion during an earthquake is essential to determine its effect on the structures constructed on soft soils. In the list of hazardous phenomena, earthquake always has severe effect as compared to others, and over the last many decades, the loss of lives and property due to earthquakes are uncountable. Kolkata is one of the metro cities lying on the eastern coastal belt (Putti and Neelima 2018). It is a highly populated city and has a population of approximately 4.5 million over the approx. area of 185 km^2 (Roy and Sahu 2012a, b). Since the city is very old and largely has unplanned development, there are many high-rise buildings constructed in congested areas, increasing the risk of loss several times in the event of a major earthquake. Kalyani is also one of the ancient parts of the Nadia district which lies in seismic zone III according to IS 1893–2016. The regions in this zone are considered susceptible to liquefaction. Considering the importance of the city in terms of seismic history, population density, and growth of public sectors, the authors were motivated to carry out the present research work.

Linear and nonlinear analyses are employed in the prediction of ground motion at the surface for the development of design response spectra. They are also used to calculate the stresses and strains which are again used in the assessment of liquefaction potential (Kramer 1996).

Many researchers have carried out linear and nonlinear analyses for various urban locations of the world (Schnabel et al. 1972; Idriss & Sun 1992; Kramer 1996; Sugito et al. 1994; Assimaki et al. 2000). Several site-specific studies have also been performed for various sites like Santiago de Cuba (Alvarez et al. 2004, Zagreb (Herak et al. 2004), Bursa (Topal et al. 2003), Algiers (Harbi et al. 2004), Alexandria (El-Sayed et al. 2004), Beijing (Ding et al. 2004), and Napoli (Nunziata 2004). Various comparative studies on linear and nonlinear analysis have also been conducted (Youd & Carter 2005; Zeng

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Parametric Study on Stone Column for improving Seismic Response of Foundation

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Abstract

Nowadays, due to higher rate of construction activities, useful and effective lands are harder to find for construction purposes. So, the lands which are problematic are now used for construction purposes. The techniques used for improving these problematic lands are called ground improvement techniques. Among all the ground improvement techniques, stone columns are most effective and economical to improve the shear strength and bearing capacity of soil and thus, to reduce the settlement phenomenon. The main objective of the present study is to determine the total displacement of the soil foundation.

For this purpose, parametric analysis was carried out to study the effect of two parameters namely stone column diameter and stone column spacing on the total displacement values. Finite element analysis was used to evaluate the displacement of soil strata reinforced with stone column using PlAXIS-2D software. The analysis was carried out for static load applied from top and Bhuj earthquake prescribed as dynamic loading. From present study, it was found that by decreasing the column spacing at a constant diameter of 1m, the maximum total displacement reduction was 36.73% and by increasing the column diameter at constant column spacing of 2m, the maximum total displacement reduction was 39.75%. Thus, it was concluded that by decreasing the column spacing at constant diameter and by increasing the column diameter at constant spacing respectively, there is a tremendous decrease in total displacement of the soil foundation which increases the load bearing capacity of the soils.

Keywords: Stone column, PlAXIS-2D, Earthquake, Seismic loading.

Introduction

Ground improvement techniques are used to increase the bearing capacity of poor and problematic soils and thus to reduce the settlement. There are several ground improvement techniques like deep mixing method, precompression, stone columns, vibroflotation, grouting and stabilization. Stone column technique is one of the most efficient and cost-effective soil improvement techniques. This method was initiated in France in 1830s and was widely used especially in Europe since 1950s. Stone columns are easy in installation and are cheaper than any other methods. Where chemical treatment for soil improvement is not feasible due to its hazardous environmental impact, stone column is better alternative since stone column technique is an environment friendly method which does not cause any serious hazard to the environment. Stone columns are basically constructed at a depth of at least four meters below the ground surface.

Numerical analyses based on stone column were carried out by many researchers.[3,4,7,9,10,11,13]. Sakr et al[14] analysed stone columns for drained and undrained conditions in soft and loose clay. Ziaie et al[18] studied increase in the diameter of stone column, the shear strength and bearing capacity of soil. Ambily and Gandhi[1] performed the experimental and analylitical study of load settlement of stone columns.

Zahmatkesh and Choobbasti[17] evaluated the settlement behaviour of stone columns in soft clay. Fathi and Mohtasham[6] analysed the stability of stone columns. Tilva[16] studied the stone column on soft and stiff clay. McKelvey et al[12] performed the shear strength analysis of stone column. Haresh and Mittal[8] studied stone column as an effective ground improvement method. Elsiragy[5] concluded from his numerical study that by decreasing the column spacing from 3m to 1m, displacement reduction could be achieved upto 47% and by increasing the column diameter from 0.5m to 1m, displacement reduction could be upto 49.83%.

Basic design parameters that are considered in the construction of stone columns are diameter, spacing and depth of stone columns, stone aggregate size etc. Among these parameters, diameter and spacing are the most important parameters that influence the design of stone columns. Stone column surrounded by soft clay will bulge additional as lateral confinement to soil is considerably less. Weak layers of soil can be reinforced and densified by manipulating and changing the spacing and diameter of stone columns.

If there is no proper selection of diameter and spacing, then the stone column structures will not be effective and economical as a ground improvement technique. The improvement of soft soil properties like bearing capacity, shear strength, displacements, lateral densification, compressibility etc. is greatly influenced by the diameter and the spacing of stone column.

Indian Geotechnical Journal
https://doi.org/10.1007/s40098-026-01623-1

ORIGINAL PAPER

Evaluation of Liquefaction Potential of Sites in Gorakhpur Region Based on In-situ and Laboratory Tests Data

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Received: 25 December 2025 / Accepted: 18 August 2026
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Abstract
Assessment of liquefaction potential is essential for evaluating seismic hazard and forms a key component of microzonation studies. In this study, the liquefaction susceptibility of the Gorakhpur region, Uttar Pradesh, India, is evaluated for earthquake magnitudes (Mw) of 7.5, 7.0, 6.5, and 6.0 at a peak ground acceleration (PGA) of 0.24 g. A total of fifteen sites, five in Deoria and ten in Gorakhpur, were selected for analysis. The Cyclic Stress Ratio (CSR) was computed using the simplified procedure of Seed and Idriss [3], while the Cyclic Resistance Ratio (CRR) was estimated using both field-based SPT-N values Seed et al. [8] and laboratory-based D_{50} correlations proposed by Seed and Idriss [3]. The factor of safety (FoS) against liquefaction was evaluated with depth for all sites using field data for all magnitudes and laboratory data for Mw of 7.5 and 7.0. Results indicate that liquefaction susceptibility decreases with decreasing earthquake magnitude. The maximum percentage variation in FoS between SPT N-Value and D_{50} based Simplified Procedure is observed to be 73% and 70% at borehole BH-09 for Mw 7.5 and 7.0, respectively. Depth-wise analysis shows liquefaction potential extending up to significant depths across multiple sites. The Liquefaction Potential Index (LPI) was used to assess the severity of liquefaction, indicating that approximately 93% of the study area falls within high to very high susceptibility zones. Furthermore, D_{50} based Simplified Procedure LPI values are consistently higher than those obtained from field data, suggesting a more conservative estimation of liquefaction severity.

Keywords Cyclic stress ratio · Cyclic resistance ratio · LPI · FOS · D_{50} · Standard penetration test · Gorakhpur City

Introduction

Earthquake-induced hazards can have significant and long-term impacts on infrastructure and the built environment. Among these, soil liquefaction is a critical phenomenon that can lead to ground failures such as differential settlement, embankment instability, and lateral deformation [1]. Liquefaction typically occurs in saturated, loose, and cohesionless soils subjected to cyclic loading during seismic events. Its importance was notably demonstrated during the 1964 Alaska (Mw 9.2) and Niigata (Mw 7.5) earthquakes, which caused extensive damage. More recently, severe liquefaction effects were reported during the 2023 Türkiye–Syria earthquakes (Mw 7.8 and 7.6) [2]. These events underscore the importance of liquefaction assessment in geotechnical site characterization.

Liquefaction potential can be evaluated using both laboratory and in situ testing methods. Laboratory approaches, such as cyclic triaxial testing on undisturbed samples, provide reliable estimates of soil resistance under controlled conditions but are often limited by sampling difficulties and cost. Consequently, in situ methods, including the Standard Penetration Test (SPT), Cone Penetration Test (CPT), Becker Penetration Test (BPT), and shear-wave velocity (V_s) measurements, are widely used in practice.

Over the past four decades, the simplified procedure proposed by Seed and Idriss [3] has been extensively applied and refined for liquefaction assessment [3–7]. This method primarily relies on the normalized SPT blow count, $(N_1)_{60}$, to evaluate the liquefaction resistance of sandy and silty soils [3–9].

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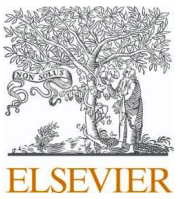
Published online: 06 September 2026

Case Studies in Construction Materials 20 (2024) e02918



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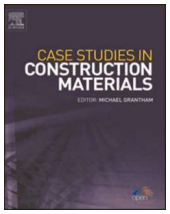

Performance evaluation of ternary blended geopolymer binders comprising of slag, fly ash and brick kiln rice husk ash

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A R T I C L E I N F O

Keywords:
Ternary geopolymer
Slag
Fly ash
Rice husk ash
Sustainability

A B S T R A C T

The use of industrial and agro-based precursor materials from local sources can achieve desirable properties for geopolymer binders, and thus realize the carbon-efficient sustainable materials in the construction industry. At the same time, the synergy between these precursors can be assessed using the multilevel material investigation, which has not been explored extensively. Moreover, there are limited studies on ternary geopolymer synthesized with rice husk ash from uncontrolled burning source such as brick kilns. Therefore, this study evaluates the performance of ternary blended geopolymer binders comprised of ground granulated blast furnace slag (GGBFS), fly ash (FLA), and brick kiln rice husk ask (BRHA), implementing the multilevel material approach. The experimental program includes assessment and comparative analyses of the properties of geopolymer binders such as setting time, flow, compressive strength, density, water absorption, and efflorescence. Additionally, X-ray diffraction (XRD) and scanning electron microscopy (SEM) analyses examine crystallographic structure and microscopic morphology of the composite binders. The initial setting time ranged from 21 min to 47 min for ternary mixes, in comparison to 21 min to 58 min for binary mixes. GGBFS significantly contribute in setting of binder due to hydration reaction and formation of C-S-H gel. The flow of ternary mixes exhibits standard deviation of 11.42 mm when compared to 20.96 mm of binary mixes. Lower dispersion in flow values suggests improved coaction between GGBFS, FLA, and BRHA. The compressive strength of ternary mixes improved when compared to the binary mixes. The optimum performance of 60 MPa was obtained for G60A40F95R5, which was 25% and 66.67% higher than binary mixes G60F40 and G60R40, respectively. Similarly, ternary mix G70A30F95R5 showed the least water absorption of 2.08% which was 53% and 58.4% lower than the binary mixes G70F30 and G70R30, respectively. The improvement in the properties of ternary mixes was confirmed from XRD analysis, which reveal coexistence of C-S-H along with crystalline SiO_2 that positively improve the microstructure of the composite binder. Moreover, SEM analysis showed dense microstructure for ternary mixes when compared to binary mixes, which further validate the improvement in the strength of such binders. The sustainability analysis discloses the enhanced performance of ternary mixes, wherein, G60A40F95R5 showed 19.35% and 46.23% lower carbon dioxide parameter than binary mixes G60F40 and G60R40, respectively. All in all, the multilevel material investigation provides a great avenue to delve in to the best performing ternary mixes which will find desirable applications in construction industry.

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https://doi.org/10.1016/j.cscm.2024.e02918
Received 27 October 2023; Received in revised form 19 January 2024; Accepted 23 January 2024
Available online 28 January 2024
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Journal of Civil Engineering and Applications

E-ISSN: 2707-8396
P-ISSN: 2707-8388
Impact Factor (RJIF): 5.15
www.civilengineeringjournals.com/jcea
JCEA 2026; 7(2): 91-96
Received: 07-07-2026
Accepted: 11-08-2026

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A concise review on sustainable pavements incorporating geopolymer concrete and recycled aggregates

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DOI: https://www.doi.org/10.22271/27078388.2026.v7.i2a.91

Abstract
The increasing demand for sustainable infrastructure has encouraged the development of environmentally responsible materials for pavement construction. Conventional Portland Cement Concrete (PCC), although extensively used in rigid pavement systems, is associated with substantial Carbon Dioxide (CO_2) emissions, high energy consumption, and depletion of natural resources. Geopolymer Concrete (GPC) and Recycled Aggregates (RAs), particularly those derived from Construction and Demolition (C&D) waste, have emerged as promising alternatives for the development of low-carbon and resource-efficient pavement systems. This review critically examines the potential of GPC incorporating recycled aggregates for sustainable pavement construction. The review synthesizes recent research on the constituent materials, geopolymerization mechanisms, mix design strategies, mechanical properties, structural performance, durability characteristics, and environmental benefits of GPC-based pavement systems. Geopolymer binders produced from industrial by-products such as fly ash and Ground Granulated Blast-furnace Slag (GGBS) can provide adequate strength and durability while reducing the environmental impacts associated with conventional cement-based materials. Similarly, the use of recycled coarse and fine aggregates can reduce C&D waste disposal, minimize the consumption of virgin aggregates, and promote circular resource utilization. Particular attention is given to the effects of recycled aggregate content on strength, water absorption, abrasion resistance, shrinkage, and long-term pavement performance. The review also identifies key challenges, including variability in recycled aggregate quality, material compatibility, mix proportioning, curing requirements, and performance under repeated traffic and environmental loading. Finally, future research priorities are proposed to support large-scale implementation, field validation, life-cycle assessment, and standardization of geopolymer–recycled aggregate pavement systems. Overall, GPC with recycled aggregates represents a promising pathway toward sustainable, durable, and resource-efficient pavement infrastructure.

Keywords: Geopolymer concrete, recycled aggregates, sustainable pavement, construction and demolition waste, pavement materials

Introduction
The background for sustainable pavements is rooted in the growing need to address the environmental, economic, and social impacts of traditional pavement construction and maintenance. The use of recycled materials, such as Recycled Concrete Aggregates (RCA) and waste plastics, is increasingly being explored to reduce the carbon footprint, conserve natural resources, and lower life cycle costs associated with pavement construction [1, 2]. The need for sustainable pavements is further emphasized by the environmental concerns linked to conventional road construction methods, which consume significant materials and energy, and the rising costs of raw materials like crude oil for bituminous binders [3]. Sustainable pavement solutions, such as Bitumen-Stabilized Materials (BSM) and porous concrete, offer eco-friendly alternatives that enhance durability and performance while addressing environmental impacts like water and air pollution [4, 5]. The scope of the review on sustainable pavements encompasses various aspects, including the integration of sustainability into pavement maintenance effectiveness evaluation, which highlights the need for a comprehensive understanding of maintenance thresholds, performance, cost, and environmental impacts [6]. Life Cycle Assessment (LCA) and Life Cycle Cost Analysis (LCCA) are critical tools for evaluating the sustainability of pavement projects, yet there is a need for standardized functional units and expanded system boundaries to improve data

Construction and Building Materials 531 (2026) 146685

Contents lists available at ScienceDirect

Construction and Building Materials

journal homepage: www.elsevier.com/locate/conbuildmat

Performance evaluation of binary and ternary geopolymer pavement quality concrete with recycled aggregates

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ARTICLE INFO

Keywords:
Ternary
Geopolymer concrete
Pavement
Recycled aggregates
Stresses

ABSTRACT

The increasing demand for sustainable construction materials has driven significant research on geopolymer concrete (GPC) and recycled aggregates. However, existing studies have predominantly focused on binary systems, with limited attention to ternary geopolymer systems incorporating recycled aggregates for pavement applications. Moreover, comprehensive evaluations integrating mechanical, durability, thermal, microstructural, and pavement stress behavior remain scarce. Therefore, this study investigates the performance of binary and ternary GPC incorporating recycled fine aggregate (RFA) and recycled coarse aggregate (RCA) for concrete pavement applications. The binary mixes composed of 70% ground granulated blast furnace slag (GGBS) and 30% fly ash (FLA), while ternary mixes were made with 70% GGBS, 24% FLA, and 6% rice husk ash (RHA). Natural aggregates were replaced with RFA and RCA at replacement levels of 0–60%, in increments of 15%. Results indicate that compressive and split tensile strength decreased in the range of 14–39% for binary GPC and 7–32% for ternary GPC with an increase in the content of RFA and RCA. In contrast, the flexural strength showed better retention relative to compressive strength, with a maximum increase of 4.4% at 45% addition of RFA and RCA. The elastic modulus ranged between 20.4 and 24.2 GPa and decreased with higher recycled aggregate content. The ternary GPC exhibited better durability with lower water absorption and porosity values when compared to the binary GPC. The drying shrinkage for ternary GPC was 60–120% lower than the binary GPC, and the coefficient of thermal expansion (CTE) ranged from 3.46×10^{-6}/°C to 4.5×10^{-6}/°C for all the mixes with a decrease of up to 23% with the addition of RFA and RCA. The results of finite element analysis (FEA) showed a reduction in slab stresses of up to 21%, with stress ratio (SR) below 0.45 for binary and ternary mixes with 45% recycled aggregates. The microstructure analysis confirmed denser C-A-S-H/N-A-S-H gel with reduced Ca/Si ratio in ternary GPC, showing the positive effect of RHA in improving the durability properties of GPC. Overall, ternary GPC with 45% recycled aggregates emerged as the optimum mix, demonstrating its viability as a sustainable material for concrete pavement applications.

1. Introduction

The highway sector in India has witnessed substantial growth with the construction of National Highways growing at an annual rate of 9.3% between 2016 and 2024 [1]. Despite the disruptions caused by the COVID-19 pandemic and associated lockdowns, the Indian government accelerated highway development, completing approximately 10,457 km of roadway in 2022. Furthermore, the Government of India allocated US $32.68 billion to the Ministry of Road Transport and Highways for the fiscal year 2024–2025, which is expected to further stimulate growth and infrastructure development in the highway sector [2]. While the government continues to expand road construction, there is also emphasis on enhancing the quality and durability of pavements. This has led to policies that prioritize the construction of concrete pavements, owing to their superior performance, lower maintenance requirements, and resilience under the country's challenging climatic

Abbreviations: BGPC, Binary Geopolymer Concrete; C-A-S-H, Calcium–Alumino–Silicate–Hydrate; CTE, Coefficient of Thermal Expansion; EDS, Energy Dispersive Spectroscopy; FEA, Finite Element Analysis; FEACONS IV, Finite Element Analysis of Concrete Slabs Version IV; FLA, Fly Ash; GGBS, Ground Granulated Blast Furnace Slag; GPC, Geopolymer Concrete; IRC, Indian Roads Congress; ITZ, Interfacial Transition Zone; N-A-S-H, Sodium–Alumino–Silicate–Hydrate; PQC, Pavement Quality Concrete; RCA, Recycled Coarse Aggregate; RFA, Recycled Fine Aggregate; RHA, Rice Husk Ash; SEM, Scanning Electron Microscopy; SR, Stress Ratio; SSD, Saturated Surface Dry; TGPC, Ternary Geopolymer Concrete; XRD, X-ray Diffraction.

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https://doi.org/10.1016/j.conbuildmat.2026.146685
Received 30 December 2025; Received in revised form 6 May 2026; Accepted 10 May 2026
Available online 15 May 2026
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construction materials

MDPI

Review

A Review of the Performance Properties of Geopolymer Pavement-Quality Concrete

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Abstract

The construction of concrete pavements has increased due to their better durability, lifespan, and lower maintenance costs. However, this has resulted in the increased consumption of Portland cement, which is one of the major contributors to carbon emissions. Consequently, the research on alternative binders such as geopolymer concrete has increased in recent times. There are several research studies that investigate the feasibility of geopolymer concrete as a construction material, with limited studies exploring its application in concrete pavements. Therefore, this review study explores the material properties of geopolymer concrete pertinent to the performance of concrete pavements. It also discusses the potential of various industrial and agricultural waste as precursor material in geopolymer concrete. The findings of this paper show that most of the studies used fly ash and ground granulated blast furnace slag (GGBFS) as precursor material in geopolymer pavement-quality concrete, and there is a vast scope in the exploration of other industrial and agricultural waste as precursor material. The mechanical and durability properties of geopolymer pavement-quality concrete are superior to conventional pavement concrete. It is also observed that the drying shrinkage and coefficient of thermal expansion of geopolymer pavement-quality concrete are lower than those of conventional pavement concrete, and this will positively benefit the long-term performance of concrete pavements. The results of fatigue analysis and mechanical load test on the geopolymer pavement-quality concrete indicate its improved performance when compared to the conventional pavement concrete.

Keywords: sustainable; geopolymer concrete; pavement; performance; concrete properties

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Received: 17 June 2025
Revised: 16 July 2025
Accepted: 21 July 2025
Published: 25 July 2025

Citation: Chelluri, S.; Hossiney, N.; Chandra, S.; Bekoe, P.; Tia, M. A Review of the Performance Properties of Geopolymer Pavement-Quality Concrete. *Constr. Mater.* **2025**, *5*, 49. https://doi.org/10.3390/constrmater5030049

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1. Introduction

The need for construction of roadway pavement from an economic, environmental, and social viewpoint has become an important priority for highway officials. Pavements should provide durability under various weather conditions and require less repair and maintenance during their service life. Therefore, the popularity of concrete pavement has risen over time due to its better design life, durability, and lower maintenance when compared to asphalt pavements [1]. In India, the government has emphasized the progress of a world-class multimodal transport network. Therefore, in the 2024–2025 budget, the central government sanctioned a massive amount of 32.7 billion USD for the Ministry of Road Transport and Highways (MoRTH) [2]. This will tremendously increase the demand

IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834.p- ISSN: 2278-8735.Volume 12, Issue 4, Ver. V (Jul.-Aug. 2017), PP 01-05
www.iosrjournals.org

Radar Signal Design for Single Target Detection

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Abstract: *A novel design approach has been proposed to evaluate the detection ability of a target using poly-semantic sequences (PSS) in the presence of high additive noise. The PSS are optimized by employing Hamming Backtrack algorithm with figure of merit as the measure of goodness. The simulation results show that the proposed sequences give improved robustness of noise for target detection.*

Keywords: *Hamming Backtrack Algorithm, Poly-Semantic Sequences, Optimal Binary Codes.*

Date of Submission: 31-07-2017 Date of acceptance: 25-08-2017

I. Introduction

The notion of poly-alphabetic radar [1],[2] introduced earlier based on simultaneous multiple interpretations of pre-designed returned waveform, results into improved detection performance of binary pulse compression radar at the affordable cost of an additional signal processing. In fact, the central idea of poly-alphabetic radar signal is poly-semanticism, which was achieved through poly-alphabetism. In the earlier work based on mono-alphabetic poly-semanticism [3], the problem of optimal target detection was discussed in the context of single target in noise free environment. In our approach, Optimal Binary Codes (OBC) and randomly generated mono-alphabetic codes are considered to generate poly-semantic sequences of larger lengths up to 5100. The receiver system is designed by considering single target with noisy environment. The quantitative measures; Discrimination (D) and Figure of merit (F) suggested by Moharir [4],[5] for binary sequences are used to evaluate the detection performance of the poly-semantic codes. The transmitted binary sequence is optimized by employing poly-semantic Hamming backtrack scan algorithm such that each of the poly-semantic interpretations lead to maximum discrimination or figure of merit. The generation of poly-semantic sequences and radar signal processor for application in high resolution radar target detection is discussed in sec II. The rest of this paper is organized as follows. Calculations of figure of merit are presented in section III. In sections IV and V, we present the noise and detection performances of poly-semantic sequences to obtain noise rejection with respect to figure of merit in the application of high resolution radar. Conclusions are made in section VI.

II. Poly-Semantic Radar Signal Processor

The generation of poly-semantic sequences is completed in two steps: first one using restricted (selective) Hamming backtrack scan for interspersed binary sequences and the second, using a complete Hamming backtrack scan for poly-semantic sequences with figure of merit as joint objective function. The block schematic diagram of poly-semantic radar signal processor at the transmitter is shown in Fig.1(a).

First Step in the Signal Design

Consider, optimal binary codes or randomly generated binary codes of length N, given by

$S_1 = A = [a_i]$ (1)

$B = [b_i]$ (2)

and $C = [c_i]$ (3)

where i = 0, 1 ,2, 3 , …, N-1.

The elements of these sequences are drawn from alphabet {-1, +1}.

The sequence S_1 is mutated using Hamming backtrack algorithm to get optimum figure of merit. The sequences S_2 of length 2N and S_3 of length 3N are generated by interleaving the elements of S_1 & B, and S_2 & C respectively as shown in Fig.1(a). Therefore

$S_2 = [a_i\ b_i]$ (4)

and $S_3 = [a_i\ b_i\ c_i]$ (5)

where i = 0, 1 ,2, 3 , …, N-1.

A selective Hamming backtracking algorithm [6] is applied on the sequences S_2 and S_3, so that the figure of merit of the output sequence is optimized. This algorithm performs mutations only on the embedded elements, *i.e.*, b_0, b_1, b_2, b_3 … of the sequence S_2, and c_0, c_1, c_2, c_3 … of the sequence S_3, without disturbing the other elements.

IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 13, Issue 2, Ver. II (Mar. - Apr. 2018), PP 61-64
www.iosrjournals.org

Design Of High Speed Data Transmission Systems Using Cooperative Diversity Wireless Networks.

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Abstract: *Cooperative Diversity (CD) is a method in which different radio terminals deliver to each other for developing the total network channel capacity. We propose a high speed data transmission using efficient queuing system in wireless diversity networks. It provides the simultaneous data transmission of data for multiple users and increases the amount of data packets. To develop the robustness in ad hoc networks, the CD-MAC algorithm is introduced in the physical layer. The MIMO technique sends and receives the same data signal simultaneously on a single radio channel. OFDM is a frequency-division multiplexing scheme used to reduce the interference. The ALOHA in cooperative diversity has the drawback of low throughput under heavy load conditions and collision. It sends the messages any time they want. Introduction of Slotted ALOHA Buffer CD it is expected to add some more advantages reduce the delay and transmits data packets simultaneously for achieving the high channel utilization with less interference. Queuing is used to increase the coverage optimization. The Wireless Channel's broadband characteristics improve the ALOHA network protocol performance.*

Keywords: *Cooperative diversity, Channel capacity, Throughput, Outage probability.*

Date of Submission: 10-04-2018 Date of acceptance: 24-04-2018

I. Introduction

To develop the robustness in ad hoc networks, the CD-MAC algorithm is introduced in the physical layer. Distributed space-time/frequency coding scheme is introduced for improving the SNR. The end to end BER is decreased by considering two power allocation strategies between sources to relay. To develop the robustness in ad hoc networks, the CD-MAC algorithm is introduced in the physical layer. The efficiency and credibility of the cognitive system will be improved by introducing the spectrum, which will have the distinction of finding wrong and missed issues. Slotted ALOHA with buffer for delivering the data packets from one place to another place as well as retransmits the degraded packets from the transmission. The coalescence of Slotted ALOHA (S-ALOHA) and buffer is implemented for delivering data packets from one place to another. The combination of Slotted ALOHA (S-ALOHA) and buffer is implemented for delivering data packets from one place to another. This protocol is expected to improve the throughput, minimize the outage probability and delay for effective transmission from source to destinations. It provides the simultaneous data transmission of data for multiple users. The end-to-end SER probability is enhanced, when the Switched Selection Combining employed with the MPSK. To achieve the best SNR, the combination of the weighing vector and MRC technique is employed. Symbol Error Probability (SEP) is computed and then the diversity order is carried out for developing the confidential capacity of the network. A multiplier and forward two way multi-relay system is used for achieving the SNR and its Probability Density Function (PDF) for each transmission node. Performance and reliability of the cognitive system are improved by introducing the spectrum sensing a problem with diversity in detecting the false and missed probabilities. In MIMO, the co-operative communication is applied for enhancing the coverage and system capacity of wireless environments and its performance depends on a number of intermediate nodes. It is applicable only when the channel estimation error exists. The GBN-ARQ protocols are analyzed by the queuing model and it estimates queue length as well as delay statistics. GBN-ARQ is an error recovery protocol. Data after the delay range is useless. The existing algorithms have some constraints such as high delay and low throughput. In order to overcome these problems, the Slotted ALOHA Buffer CD (S-ALOHA-BCD) method is introduced. The S-ALOHA-BCD method used to improve the

IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834, p- ISSN: 2278-8735.Volume 20, Issue 1, Ser. 1 (Jan. – Feb. 2025), PP 09-13
www.iosrjournals.org

Performance Analysis of Synchronization Bit Errors for the Detection of a Target

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Abstract
In this paper a new approach of signal design for a target detection is presented using poly-semanticsequences with larger code lengths to achieve optimal target detection in high resolution radar (HRR) systems inpresence of high-density additive noise and Doppler environment. The notion of poly-alphabetic radar [1] [2]introduced earlier based on simultaneous multiple interpretations of pre-designed returned waveform, results into improved detection performance of binary pulse compression radar at the affordable cost of an additional signal processing. In fact, the central idea of poly-alphabetic radar signal is poly-semanticism, which was achieved through poly-alphabetism. In the earlierwork based on mono-alphabetic poly-semanticism [3],the problem of optimal target detection was discussed in the context of single target in noise free environment. In our approach, Optimal Binary Codes (OBC) and randomly generated codes are used to generate poly-semantic sequences. In this paper, the sequence is designed by considering a target with noisy and Doppler environment. The quantitative measures;Discrimination and Figure of merit suggested by Moharir [4] for binary sequences are used to evaluate the detectionperformance of the poly-semantic codes. The transmittedbinary sequence is optimized by employing poly- semantic Hamming scan algorithm such that each of the poly-semantic interpretations led to maximum discrimination or figure of merit. The design is completedin two steps: first one using restricted Hamming scan for interspersed binary sequences and the second, using a complete Hamming scan with an appropriate joint objective function (F). The results show a significantimprovement in synchronization bit errors for the detection of target.

I. Design of poly-semantic sequences

Consider, optimal binary codes or randomly generated binary codes of length N, given by

$S_1 = A = [a_j]$ (1)

$B = [b_j]$ (2)

and $C = [c_j]$ (3)

where, $j = 0,1,2,3...N-1$.

The elements of this sequence are drawn from alphabet $\{-1,+1\}$. The sequences S_2 and S_3 are given by

$S_2 = [a_j b_j]$ (4)

$S_3 = [a_j b_j c_j]$ (5)

where $j = 0,1,2,3...N-1$.

A selective Hamming scan algorithm is applied on the sequences S_2 and S_3, so that the figure of merit of the sequence is optimized. The binary sequence S_3 is transmitted as a waveform. As S_3 is interspersed by binary sequences S_1 and S_2, it is equivalent to three sequences with good autocorrelation properties being transmitted in the form of S_3. On reception, the received waveform is decoded into binary sequence (R) and the cross correlation is computed in discrete mode. The decoded sequence R is cross correlated in the receiver with three predesigned sequences, given by

$T_1 = [a_0, 0, 0, a_1, 0, 0, a_2, 0, 0 ... a_{N-1}, 0, 0]$ (6)

$T_2 = [a_0, b_0, 0, a_1, b_1, 0, a_2, b_2, 0 ... a_{N-1}, b_{N-1}, 0]$ (7)

$T_3 = S_3 = [a_0, b_0, c_0, a_1, b_1, c_1, a_2, b_2, c_2 ... a_{N-1}, b_{N-1}, c_{N-1}]$ (8)

Bio-Inspired Optimization Algorithm in Optimum Relay Selection for Cooperative Transmission Networks

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Abstract— **Multipath propagation, which causes channel fading, is one of the significant flaws in wireless network signal transmission. Cooperative Communication (CC) is a technique for reducing the impact of channel fading by leveraging the diversity gain made available by collaborating with several nodes and/or relays. Because of the size and complexity limits of wireless mobile devices, nodes with more than one transmitting antenna are uncommon. The scenario entails investigating a network that includes a sender, a receiver, and a relay. Two common CC mechanisms for increasing transmission reliability are amplifying and forward and decoding and forward. Relay nodes gather, process, and retransmit data to improve the signal-to-noise ratio (SNR) at the receiving end. To improve the overall efficiency of the system, we propose bio-inspired systems in which two parties exchange data via distinct relay nodes. The Artificial Immune System Algorithm (AIS) and Bacterial Foraging Optimization (BFO) are used in this study to provide a strategy for identifying the most effective relay to employ in CC. The Relay Selection (RS) technique considers criteria such as outage likelihood, collision risk, Bit Error Rate (BER), and energy utilization during CC. To validate the effectiveness of both techniques, delay, Packet Delivery Ratio (PDR), Residual Energy (RE), and outage probability are employed.**

Keywords: Bio Algorithm, Optimization, Transmission Network, Delay, Error, Communication

I. INTRODUCTION

According to Cisco's visual networking index forecast report [1], which was released in June 2014, the exponential growth of wireless data traffic is real and will continue. The number of connected devices is expected to increase by a factor of ten to one hundred by 2015, as will the data rate per user increase by a factor of ten to one hundred. Wireless data traffic is expected to grow from less than 3 exabytes in 2010 to 1100 exabytes in 2016, and at a monthly rate of 131.6 exabytes after 2018. This expansion is due to the proliferation of smart devices and the Internet of Things. According to the report, by 2018, there will be approximately 100 million mobile devices in use worldwide, with each owning an average of 1.4 mobile devices, more than half of which will be smart. According to Qualcomm, data traffic will more than tenfold in the decade following 2013. In light of the massive data needs that will inevitably arise, academics and businesses alike have turned their attention to 5G mobile communication technologies [2].

In response to the rising quality of service and data rate expectations, wireless communication research has shifted its focus to finding ways to increase bandwidth efficiency and channel capacity. Cognitive radio is a spectrum-sharing technology that maximizes spectrum utilization by sensing radio environments, dynamic spectrum detection, and adaptive real-time changes to system operating parameters based on learning and decision-making algorithms. However, signal transmission quality will deteriorate due to wireless channel fading, complicating efforts to advance wireless technology even further. CC is becoming more popular as a way to prevent channel fading and improve the received signal-to-noise ratio (SNR). CC in a multi-user situation can boost transmission reliability and error rate while also delivering spatial diversity gain through the use of shared antennas to construct virtual multiple antenna arrays by combining the antennas of numerous users into a single, bigger array. Because of these two promising strategies, there has been a lot of interest in cooperative transmission in Cognitive Radio Networks (CRN), which has

978-1-6654-6275-4/22/$31.00 ©2022 IEEE

High-Speed Data Transmission through High throughput using Slotted-ALOHA BCD Protocol

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Abstract: **The Cooperative Diversity-Media Access Control (CD-MAC) method is implemented at the ad hoc network's physical layer to increase its robustness. Taking into account two power distribution schemes between sources and relay reduces the end-to-end delay and error. By integrating the spectrum, which is uniquely able to identify both incorrect and missed faults, the cognitive system's effectiveness and reliability will be enhanced. Using a buffer, Slotted-ALOHA (S-ALOHA) transfers data packets from one location to another and retransmits those that are lost or corrupted along the way. Several customers can send and receive data at the same time. Spectrum sensing is an issue with variety in identifying false and missed probabilities, and its introduction into the cognitive system improves reliability and performance. Cooperative communication is used in Multi Input Multi Output (MIMO) to increase wireless networks' coverage and system capacity, and the success of this technique is conditional on the presence of a certain threshold number of intermediary nodes. In other words, it's useful only if the channel estimation error occurs. High delay, Packet Delivery Ratio (PDR), average packet drop, residual energy (RE), and optimum packet size are just some of the limitations imposed by the currently available algorithms. Slotted ALOHA-BufferCooperative Diversity (S-ALOHA-BCD) is offered as a solution to these issues. The S-ALOHA-BCD technique is utilized to enhance the PDR and RE while simultaneously reducing the delay, packet drop, and Outlier Probability (OP) to produce an efficient transmission from the origin to the destination.**

Keywords: Data, Transmission, Communication, Packet, Delay, Outlier,

I. INTRODUCTION

Cooperative diversity considers both signals rather than just one, in contrast to standard single-hop systems, which rely entirely on the direct signal for decoding. As a result, with the help of cooperative diversity, the information contained in a mixed signal can be recovered. Cooperative Diversity Networks (CDN) decode the combined signal of the relayed signal and the direct signal in wireless multi-hop networks to improve or maximize total network channel capacity for a given set of bandwidths. To establish cooperative diversity in multi-hop relay networking systems, users must work cooperatively to relay their signals [1].

The S-ALOHAprotocol is a type of Media Access Control (MAC) protocol that transports data packets from one network channel to another. Individual frames in the S-ALOHAprotocol are associated with discrete chunks of time known as slots. It is used to maximize channel utilization while minimizing disruptive collisions and overlapping transmissions by simultaneously transmitting data packets to several receivers. The S-ALOHA-BCD technique is proposed here to enhance CD by combining S-ALOHAwith a buffer. The use of queues can help in coverage optimization. S-ALOHAtime is separated into intervals. By including a buffer in the queuing protocol, the transmission quality of broken packets can be restored. When a damaged packet is detected, the buffer sends an Acknowledgement (ACK) signal to the sender. Coverage delay is estimated to better understand the queue model's coverage optimization, and the overall network's channel capacity is raised as a result. This S-ALOHA-BCD approach minimizes the likelihood and duration of CDN outages while enhancing the PDR [2].

II. LITERATURE REVIEW

Joao Luiz Rebelatto and colleagues [3] investigated Multi-User Cooperative Diversity using Network Coding in the Light of Classical Coding Theory.The study looked into a generic

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Energy Efficient Error-free Cooperative Transmission for Wireless Networks

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Abstract— **Cooperative communication is among the most effective approaches in wireless networks because of the geographical diversity gain it can provide. Relay nodes take advantage of the broadcasting characteristics of wireless transmissions to pick up signals from the source and transmit them to the reception. New requirements, like energy efficiency and quality-of-service (QoS), are placed on certain networks by real-time applications, which cannot be met by the current communication infrastructure. Data loss throughout communication is common in challenging environments, that could degrade transmission reliability. It has been demonstrated that network coding (NC) is a useful approach that may be thought of as a packet-level error-correction technique. Having more redundancy and less time required for retransmitting lost data makes the system more reliable. In this paper, an Energy Efficient Error-free Cooperative Transmission (EEECT) technique for wireless networks is proposed. It has an adaptive burst error correction (ABEC) scheme for correcting the burst losses and a channel state estimation scheme for reliable transmission. By applying these schemes in the relay nodes, cooperative transmission is achieved. Experimental results show that the proposed EEECT technique achieves minimum delay and Packet Error Rate (PER) with increased packet delivery ratio and residual energy.**

Keywords: Wireless Networks, Signal, Relay, Communication, Error, Packet Delivery Ratio

I. INTRODUCTION

The advantages of geographical variety provided by cooperative communication are rapidly making it among the most successful strategies for boosting the efficiency of wireless networks. By using few or many Relay Nodes (RN) to supplement direct connections, this technique alters the conventional "source to destination" communication mechanism. RNs can pick up signals transmitted by the source and relay them to their intended recipients by taking advantage of wireless communications' broadcasting characteristics. The receiver achieves diversity gain by mixing and decoding signals from many channels. Efforts to improve network reliability and scalability through cooperative communications have largely concentrated on physical-layer techniques like Amplify-Forward (AF), Decode-Forward (DF), and code collaboration. Cooperative communications are ideal, but in real-world communications networks like wireless LANs, a media access control (MAC) method is required. In other words, cooperative MAC is a simple framework for reaping the benefits of collaborative discourse. Because RNs play such an important role in team communication, this topic must be properly investigated. As a result, scholars have been researching cooperative MAC approaches in recent years to reap the benefits of cooperative communication in real-world wireless networks. After several cooperative MAC approaches are developed, a remarkable performance boost is observed. [1].

Wireless networked systems can be found in a variety of communication scenarios and are quickly becoming widespread. Contemporary practical networking disseminates information via routing; nodes in the network simply collect and forward signals, with analysis happening solely at terminal nodes. NC, a relatively new area of study in electrical and information technology, challenges assumptions by allowing intermediate network nodes to perform operations other than simple data forwarding's, such as recombining multiple input packets into a single output packet or multiple output packets. When compared to standard routing approaches, NC offers the potential to improve network performance. NC principles, in particular, can have a significant impact on the energy efficiency and throughput of the next generation. [2].

Various cooperative transmission strategies were created as a result of earlier research on relaying that mainly considered the case of a single source-destination couple. Protocols that operate in half-duplex modes, such as AF and repetition-coded DF, have received the greatest attention. These relaying systems improve diversity, but at a hefty cost: forwarding messages require an additional period. [3].

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Optimum Relay Selection using OSBO Algorithm for Cooperative Transmission Networks

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Abstract— **Cooperative networks are widely used in the field of wireless communication technologies. Cooperative communication networks use relaying techniques such as Quantize-and-Forward (QF), Decode-and-Forward (DF), and Amplify-and-Forward (AF) to enhance communication reliability throughout the performance. To improve the signal-to-noise ratio (SNR) at the receiving end, relay systems employ relay nodes that take in data, process it, and then resend it. To enhance the overall efficiency of the system, we recommend adopting bidirectional communication approaches in which two parties transmit and receive data over distinct relay nodes. This study employs the Opposition-based Satin Bowerbird Optimization (OSBO) technique to propose a way of determining the appropriate relay to be employed in cooperative communications. The Relay Selection (RS) process is based on a set of constraints such as Outage probability, collision probability, Bit Error Rate (BER), and Energy consumption during cooperative communication. After selecting the best relay nodes using OSBO, the DF technique is applied at each relay node. The suggested Optimum Relay Selection using the Opposition-based Satin Bowerbird Optimization (ORS-OSBO) approach achieves the lowest possible delay and outage probability while increasing the packet delivery rate and Residual Energy (RE).**

Keywords: Wireless communication, Relay, Outage probability, Delay, Optimization

I. INTRODUCTION

Unmanned aerial vehicles (UAVs) as well as other compact aviation vehicles have contributed greatly to the dramatic increase in air traffic in recent years. Increases in aeronautical communication data transfer are expected as air traffic grows. Future aeronautical communication will rely on high-rate, reliable wireless data transport. Channel fading significantly reduces the effectiveness of wireless communications. Because of the dynamic nature of an aviation link's channel coefficients, wireless fading poses a significant difficulty in the context of aeronautical communication. It is critical to reducing the influence of wireless degradation to enhance the effectiveness of aviation communication. Rather than requiring several antennas at each node, cooperative communication is an effective means of addressing wireless impairments. Intermediary nodes in a cooperative communication system transfer data from the source to the destination across distinct wireless channels using either one-way or two-way relaying. It has been proposed that RS, which directs only part of the relays in a cooperative system to convey data, is an efficient technique to improve cooperative communication efficiency. With the introduction of multi-antenna nodes in cooperative systems, antenna selection is being explored because it has a similar impact on system performance as RS. [1].

Sensors in a Wireless Sensor Network (WSN) use a lot of energy when they are acting as both the data packet's originator and its relay during cooperative transmission. Maximizing sensor power consumption requires thinking about both relay selection (RS) (Relay is used in conjunction with the resource) and power regulation (PR). Furthermore, because Energy Harvesting-based WSN (EHWSN) is distributed, RS and power regulation must be performed comparably. [2].

Cooperative networks are extensively used in WSNs. Long-Term Evolution Advanced (LTE-Advanced), IEEE 802.16j, Third Generation Partnership Project (3GPP), and IEEE 802.16m are all examples of mobile broadband communication systems that have actively investigated and investigated relay-assisted communication. Cooperative communication networks employ relaying technologies to increase available communication channels and boost throughout the system. Investigation on how cooperative communication might boost the speed, storage space, and reach of 5G technology seems to be extensive. Device-to-device (D2D) technique is crucial to the

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AN EFFICIENT SIGNAL PROCESSING TECHNIQUE FOR LANDMINE DETECTION

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ABSTRACT

Landmines and unexploded ordinance (UXO) are laid during a contention against enemy powers. In any case, they slaughter or debilitate regular people a very long time after the contention has finished. There are in excess of 110 million landmines effectively held up in the globe. Consistently more than 26,000 guiltless regular people are slaughtered or harmed. Most present day landmines are for the most part non-metallic or plastic, which are hard to be distinguished utilizing regular metal identifiers. Location utilizing hand-held pushing is a moderate and costly procedure. Impulse Ground Penetrating Radar (ImGPR) is a nondestructive system fit for recognizing shallowly covered nonmetallic anti-personnel (AP) and anti-tank (AT) landmines. The nearness of solid ground mess and clamor corrupt the presentation of GPR. Henceforth, utilizing a GPR sensor is practically unimaginable without the utilization of advanced signal handling. In electromagnetic wave engendering displaying, a multilayer transmission line procedure is applied. It considers distinctive soil types at various dampness levels. Plastic focuses of various widths are covered at various profundities. The demonstrated sign is at that point used to evaluate the ground and covered target parameters. In a parameter estimation strategy, a surface reflection parameter technique (SRPM) is applied. Signal handling calculations are executed for mess decrease and basic leadership purposes. Consideration is for the most part given to the advancement of methods, that are appropriate to constant landmine location. Propelled strategies are gone before by basic preprocessing methods, which are helpful for signal amendment and commotion decrease. Foundation subtraction methods dependent on multilayer demonstrating, spatial separating and versatile foundation subtraction are executed. In addition to that, de-correlation and balance sifting strategies are additionally examined. In the related choice combination system, nearby choices are transmitted to the combination focus to figure a worldwide choice. For this situation, the idea of certainty data of nearby choices is critical to acquire worthy discovery results. The Bahadur-Lazarsfeld and Chow developments are utilized to evaluate the joint likelihood thickness capacity of the connected choices. Besides, a choice combination dependent on fluffy set is executed. All proposed techniques are assessed utilizing recreated just as genuine GPR information estimations of numerous situations.

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The International journal of analytical and experimental modal analysis ISSN NO: 0886-9367

DIGITAL SIGNAL PROCESSING TECHNIQUE FOR RECOGNITION OF DUAL TONE MULTI-FREQUENCY SIGNALING

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Abstract : Digital signal processing techniques for obtaining high accuracy in recognition of dual-tone multi-frequency signaling(DTMF) tones produced by the push buttons of the keypad of a traditional analog telephone which was a major consequence these days. In order to avoid that, the proposed methodologies employ a suitable computations to analyze one selected frequency component from a discrete signal[2][3]. A complete meteorological characterization of the methods, in terms of systematic and random errors, is achieved, demonstrating the high overall performance.

Keywords: DTMF, FFT, discrete signal, DFT, digital filter.

I INTRODUCTION

Digital signal processing (DSP) is the use of digital processing, such as by computers or more specialized digital signal processors, to perform a wide variety of signal processing operations. The signals processed in this manner are a sequence of numbers that represent samples of a continuous variable in a domain such as time, space, or frequency. Digital signal processing and analog signal processing are subfields of signal processing. DSP applications include audio and speech processing, sonar, radar and other sensor array processing, spectral density estimation, statistical signal processing, digital image processing, signal processing for telecommunications, control systems, biomedical engineering, seismology, among others.DSP can involve linear or nonlinear operations. Nonlinear signal processing is closely related to nonlinear system identification [1] and can be implemented in the time, frequency, and spatio-temporal domains. The application of digital computation to signal processing allows for many advantages over analog processing in many applications, such as error detection and correction in transmission as well as data compression.[2] DSP is applicable to both streaming data and static (stored) data.

To digitally analyze and manipulate an analog signal, it must be digitized with an analog-to-digital converter (ADC).[3] Sampling is usually carried out in two stages, discretization and quantization. Discretization means that the signal is divided into equal intervals of time, and each interval is represented by a single measurement of amplitude. Quantization means each amplitude measurement is approximated by a value from a finite set. Rounding real numbers to integers is an example. The Nyquist–Shannon sampling theorem states that a signal can be exactly reconstructed from its samples if the sampling frequency is greater than twice the highest frequency component in the signal. In practice, the sampling frequency is often significantly higher than twice the Nyquist frequency.[4].Theoretical DSP analyses and derivations are typically performed on discrete-time signal models with no amplitude inaccuracies (quantization error), "created" by the abstract process of sampling. Numerical methods require a quantized signal, such as those produced by an ADC. The processed result might be a frequency spectrum or a set of statistics. But often it is another quantized signal that is converted back to analog form by a digital-to-analog converter (DAC).

In DSP, engineers usually study digital signals in one of the following domains: time domain (one-dimensional signals), spatial domain (multidimensional signals), frequency domain, and wavelet domains. They choose the domain in which to process a signal by making an informed assumption (or by trying different possibilities) as to which domain best represents the essential characteristics of the signal and the processing to be applied to it. A sequence of samples from a measuring device produces a temporal or spatial domain representation, whereas a discrete Fourier transform produces the frequency domain representation.

DSP algorithms may be run on general-purpose computers and digital signal processors. DSP algorithms are also implemented on purpose-built hardware such as application-specific integrated circuit (ASICs). Additional technologies for digital signal processing include more powerful general purpose microprocessors, field-programmable gate arrays (FPGAs), digital signal controllers (mostly for industrial applications such as motor control), and stream processors.[6]For systems

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AN EFFECTIVE MECHANISM FOR MEASURING CARDIAC WITH DIGITAL IMAGE PROCESSING

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Abstract : Estimation of cardiovascular constriction speed utilizing M-mode ultrasonography with the assistance of computerized image handling has been done. Investigation of organ development rate is critical in therapeutic imaging as it identifies with conclusion for infections. This exploration is planned for estimating the pace of heart constriction utilizing advanced image preparing that utilizes the dynamic form division strategy. The example utilized is a video of heart check utilizing M-mode USG that keeps going 30 seconds and has a casing pace of 30 edges/seconds. This image was then removed as to get 900 USG images each at 480 x 360 pixels. Estimation of the edges of heart images was led utilizing MATLAB programming. Results demonstrate that the cardiovascular in the video moved most remote at 73/30 seconds, to 10.34 mm against the x-hub and at 28/30 seconds, to 14.00 mm from the y-hub. Then, the constriction speed changed. Introductory focus concentrated on the utilization of entropy in surface investigation to relate a tendon's appearance in a ultrasound image to its mechanical trustworthiness. Bewildering impacts, for example, movement curios and locale of intrigue choice by the client constrained the pertinence of little areas chose for examination, however broad patterns were watched at the point when the whole imagined tendon or shallow foundation district was chosen. Entropy computations recommended a noteworthy change in surface example for tedious locales contrasted with the chose foundation areas.

Keywords : Velocity,Cardiac,USG Image,Digital Image Processing

I INTRODUCTION

Examination of organ development speed is vital in medicinal imaging as it identifies with analysis for ailments. Moves moving speed can likewise be utilized to pack computerized images utilizing squares dependent on movement estimation methods [7]. Estimating organs' movement speed is important so as to know the situation of specific organs at specific occasions, as this likewise identifies with the correct treatment the organs may require [17]. In the course of recent years there have been studies concerning examinations of organ movement speed. Organ movement estimation is utilized in the examination of bosom distortion to know tissue versatility and give signs to tissue firmness by ascertaining the images' relative strain and youthful modulus [10]. Some flexibility imaging systems have likewise been created to quantitatively quantify tissue versatility with the assistance of ultrasound. Models for these incorporate location and analysis of malignant growth in bosom, prostate, and liver.Different models incorporate related clinical applications that measure the flexible property of delicate tissues. Subsequently, the improvement of elastography USG occurred. This method demonstrates extraordinary guarantee because of its continuous capacity and its usability. Restorative ultrasound is a methodology that is usually utilized in a wide assortment of applications because of various advantages it offers: it is non-intrusive, non-ionizing, modest, and has incredible transient resolution. It depends on utilization of high frequency acoustics to a volume of enthusiasm for heartbeats and

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DEEP LEARNING FRAMEWORK FOR SIGNAL DETECTION AND MODULATION RECOGNITION

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Abstract

Deep learning is an efficient technique which has achieved a great success in wide variety of applications. In this paper research is done on multi-signals detection and modulation classification which are used in many communication systems. In this paper an efficient DL framework for multi-signals detection and modulation recognition is proposed. Signal modulation format, center frequency, and start-stop time can be obtained from the proposed method. Further in our research paper two networks are built:(1)Single shot multi-box detector(SSD) for signal detection and (2)Multi inputs convolutional neural networks(CNNs) for modulation recognition.

Keywords : deep learning; signal detection; modulation classification; the single shot multi-box detector networks; the multi-inputs convolutional neural networks

I INTRODUCTION

Deep learning is a piece of a more extensive group of AI strategies dependent on counterfeit neural systems with portrayal learning.Deep learning structures, for example, profound neural systems, profound conviction systems, repetitive neural systems and convolutional neural systems have been applied to fields including PC vision, discourse acknowledgment, normal language handling, sound acknowledgment, informal community sifting, machine interpretation, bioinformatics, tranquilize plan, clinical picture examination, material investigation and pre-packaged game projects, where they have delivered results tantamount to and now and again outperforming human master execution. Artificial Neural Networks (ANNs) were motivated by data handling and dispersed correspondence hubs in natural frameworks. ANNs have different contrasts from natural cerebrums. In particular, neural systems will in general be static and representative, while the natural mind of most living beings is dynamic (plastic) and simple.By using Deep learning predictive models effective signal detection and modulation recognition techniques have been implemented.

Cognitive radio (CR) [1–3] has been utilized to allude to radio gadgets that are equipped for learning and adjusting to their condition. Because of the expanding prerequisites for remote transfer speed of radio range, programmed signal detection and modulation recognition strategies are essential. It can help clients to recognize the tweak configuration and gauge signal parameters inside working groups, which will profit correspondence reconfiguration and electromagnetic condition investigation. Moreover, it is generally utilized in both military and regular citizen applications, which have pulled in a lot of consideration in the past decades [4–7]. Multi-signals location is an errand to distinguish the current signals in a particular wideband, which is one of the basic segments of CR. The most critical difference among signal and non-signal is vitality. Consequently, numerous wideband multi-signals identification calculations depend on Energy Detector (ED). Some limit based wideband sign discovery techniques, for example, [8–13], lessen the likelihood of

AN ENHANCED METHODOLOGY FOR TAMPER DETECTION IN IMAGE FORGERY

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Abstract: The sharing of advanced pictures has become a typical practice in our day by day life, with the hazard that these pictures can be gotten to and effortlessly changed by malevolent individuals with the goal of causing good or monetary harm; or even to implicate guiltless individuals in legitimate issues. This paper proposes a calculation to validate computerized pictures by methods for daze altering identification against one of the chief controls that a picture is gotten through, for example the Copy-Move which expects to delete or imitate a piece of the picture. The advancement and assessment consequences of this proposition are introduced right now.

Keywords : Discrete Fourier Transform,SURF,MSER,Tamper detection.

I INTRODUCTION

These days, a tremendous measure of computerized pictures, with or without business esteem, are effectively shared among the overall population by means of Internet or put away utilizing any of the few accessible advanced organizations. Such pictures, which incorporate private pictures or secret pictures, have by and large high caliber and can be handily controlled utilizing computational apparatuses, for example, Photoshop®, Corel Paint Shop®, and so on. Such sort of noxious assaults can be isolated in duplicate move and reorder assaults. The duplicate move is one of the most considered fraud methods which comprise in replicating a segment of a subjective size and state of a given picture and gluing it in another area of a similar picture. Obviously, this system is valuable when the falsifier needs either to cover up or copy something that is as of now present in the first picture [1][2]. Then again, in the reorder assault or joining, the aggressor right off the bat picks an area of a given picture and glues it into a subsequent one, for the most part to modify its substance and importance. Joining is likely more typical than the duplicate move assault, since it is undeniably increasingly adaptable and permits the making of pictures with a totally different substance regarding the first picture [2].The picture verification has been a subject of dynamic research during the most recent quite a while, in light of the fact that the altered pictures may make good or monetary harms the people identified with the noxiously adjusted pictures, giving subsequently the production of a few picture confirmation procedures, which can be comprehensively grouped into two kinds: dynamic and uninvolved picture validation strategies. The principle distinction among them is that in the dynamic techniques some helpful data is extricated from the picture to be verified and implanted in it or put away independently. This data is then utilized during the confirmation procedure. Then again, in the detached strategies, additionally called measurable techniques, the validation must be completed without past data about the handling that the picture to be confirmed had gone through [1][2]. The dynamic techniques can be arranged into two classifications: the watermarking-based and the picture hashing-based plans, them two with

2022 6th International Conference on Devices, Circuits and Systems (ICDCS) | 978-1-6654-8094-9/22/$31.00 ©2022 IEEE | DOI: 10.1109/ICDCS54290.2022.9780774

Boosting ON-Current in Tunnel FETs (TFETs): A Review

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***Abstract*—In this paper, a review of various techniques implemented to boost the ON-state current in a TFET is presented. The current conduction in a TFET happens due to band-to-band-tunneling (BTBT) taking place through the tunneling junction formed between the source and the channel regions. Thus, controlling the tunneling junction is the key in a TFET for generation of sufficient ON-current. In each case, the technique implemented to control the tunneling junction so as to reduce the height and width of the tunneling barrier is discussed. Further, ON state current, OFF state current, ON-to-OFF current ratio, sub-threshold slope (SS) and the modeling method is discussed. At the end, based on the review, proposal is made for the possible future course of actions to boost the ON-current, suppress the OFF-current and improve the ON-to-OFF current ratio in TFETs.**

Keywords—Tunneling, BTBT, source pocket, high-k dielectric, sub-threshold swing, ON-state & OFF-state currents, vertical tunneling, hetero dielectric BOX.

I. INTRODUCTION

Due to an increasing consumer demand for low power electronic appliances ranging from computing, communication and entertainment to automotive, navigation and other hand held and portable applications there has been unprecedented research [1,2] in the recent past on developing low power transistors. Till recently, CMOS was the only choice for its power and noise performance. But as the consumer demand for compute intensive devices are growing, more and more transistors are being integrated in lesser silicon core area leading to an increase in power consumption.MOSFETs are scaled down to achieve higher packing density along with reduced power consumption. However, the sub-threshold swing (SS) which is a measure of the gate voltage necessary to change the drain current by one order of magnitude, can't be scaled. As a result, it becomes difficult to turn ON and OFF the device at low supply voltages. In order to establish a scenario where sufficient ON-current is achieved with an insignificant OFF-state leakage,curbing of SS is essential.But the prevailing research so far shows that it has become a critical barrier in the journey towards achieving a low power ecosystem of electronics.

Tunneling FET (TFET) has emerged as the most promisingswitching element operating at very low voltage overcoming the 60mV/dec switching limit while physically being perfectly compatible with the dominant CMOS materials and processing[3]. TFETs have a different carrier transport mechanism namely quantum tunneling in contrast to thermionic emission in MOSFETs.TFETs have got an edge over traditional MOSFETs in several aspects such as it operates at low voltage, produces an insignificant leakage current and more importantly SS is less than the physical limit of MOSFET (60 mV/dec). These are its key features that are favorable for low power applications [4,5]. However, it suffers from low ON state current (I_{on}). The I_{on} of TFET is lower than the ITRS limits. High I_{on} is required in design of high speed VLSI circuits to enable high fan-out, reduced delay & increased clock frequencies.

In order to overcome the precarious problem of low ON-state current in TFET, several techniques have been proposed which are related to gate engineering, tunneling junction engineering, material engineering, hetero junctions and modification related to the structure of the TFET.

Out of all the methods of boosting I_{on} mentioned above, tunneling junction engineering stands as the most important mechanism as it is the tunneling junction which controls the overall current generated due to BTBT.

The condition for the tunneling to occur is that the filled and empty states are separated by a narrow potential barrier of finite height [6]. Thus when the empty states in the source valence band and filled states in the channel conduction band are energetically aligned, tunneling occurs. Moreover, it is the width and height of the tunneling barrier which decides the overall ON-current. Smalleris the width and heightof the barrier more will be the drain current.

II. DRAIN CURRENT IN TFET

The drain current I_{DS} is obtained by integrating the band-to-bandtunneling generation rate over the volume of the tunneling region [7],

$$I_{DS} = \iint G \,.dx.dy \tag{1}$$

Where G is the tunneling generation rate defined as the number of carriers per unit volume per unit time, given by Kane's model [8] as,

$$G(E) = A \cdot \frac{|E|^2}{\sqrt{E_g}} \cdot e^{\left[-B\frac{E_g^{\frac{3}{2}}}{|E|}\right]} \tag{2}$$

Where $|E|$ is the magnitude of the electric field defined as $|E| = \sqrt{E_x{}^2 + E_y{}^2}$ where E_x and E_y are the lateral and vertical electrical fields, E_g is the energy band-gap. A & B are constants and are called tunneling parameters [9].

The eq.(1) suggests that the drain current is dependent upon the tunneling generation rate which is a function of the electric field (E) and the band-gap (E_g). The total electric field constitutes the vertical electric field caused by V_{gs} and lateral electric field caused by V_{ds}. Out of both of these fields, lateral electric field plays a significant role in the drain current analysis because the maximum BTBT occurs along this axis, which is shown in Fig.1.[10]. Fig.1 shows the Energy band diagram of a TFET for both ON and OFF states.

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Abstract: **In this paper, we have taken certain partition theorem due to Slater'5; and making use of known identities to establish some new partition theorems in original research work.**

Key words: **Generalized hyper geometric function and Gauss hyper geometric function and Ordinary hyper-geometric series; identities, known transformation formulae.**

2010AMS Subject Classification: 11P82, 11P83 and 11P84.

1. *Introduction:*

In this paper , an attempt has been made to established certain partition theorems similar to Roger's – Ramanujan theorems by adapting the pattern of Hirechorn [1], Subbraao and Agrawal [1] and Singh, S.N. [3],. We consider the following identities due to Slate [5];

$$\sum_{n=0}^{\infty} \frac{q^{2n^2}}{(q;q)_{2n}} = \frac{1}{(q^2,q^3,q^4,q^5,q^{11},q^{12},q^{13},q^{14};q^{16})_\infty} \quad (1)$$

$$[Slater^5; (83)P.160]$$

$$\sum_{n=0}^{\infty} \frac{q^{2n^2}}{(q;q)_{2n}} = \frac{1}{(q,q^3,q^4,q^5q^7,q^9,q^{11},q^{12},q^{13},q^{15},q^{16},q^{17},q^{19};q^{20})_\infty} \quad (2)$$

$$[Slater^5; (79)P.160]$$

$$\sum_{n=0}^{\infty} \frac{q^{2(2n+1)}}{(q;q)_{2n+1}} = \frac{1}{(q,q^3,q^5,q^7,q^9,q^{11},q^{13},q^{15};q^{16})_\infty} \quad (3)$$

$$[Slater^5; (84)P.161]$$

$$\sum_{n=0}^{\infty} \frac{q^{2(2n-1)}}{(q;q)_{2n}} = \frac{1}{(q,q^3,q^5,q^7,q^9,q^{11},q^{13},q^{15};q^{16})_\infty} \quad (4)$$

$$[Slater^5; (85)P.161]$$

$$\sum_{n=0}^{\infty} \frac{q^{2(2n+1)}}{(q;q)_{2n+1}} = \frac{1}{(q,q^4,q^6,q^7,q^9,q^{10},q^{12},q^{15};q^{16})_\infty} \quad (5)$$

$$[Slater^5; (86)P.161]$$

J. of Ramanujan Society of Math. and Math. Sc.
Vol.4, No.1 (2015), pp. 49-60
ISSN : 2319-1023

On Lambert series and continued fractions

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Abstract: In this paper, we have established certain results involving Lambert series and continued fractions.

Keywords and Phrases: Lambert series, continued fractions, q-shifted factorial, basic hypergeometric series.
Mathematics Subject Classification: 33D15, 11B65.

1. Introduction, Notations and Definitions

The q-shifted factorial is defined by,

$$(a,q)_n = \begin{cases} 0 & \text{if } n=0; \\ (1-a)(1-aq)(1-aq^2)\ldots,(1-aq^{n-1}) & \text{if } n \geq 1. \end{cases}$$

Also,

$$(a;q)_{-n} = \frac{q^{n(n+1)/2}}{(-a)^n (q/a;q)_n}.$$

The generalized basic hypergeometric series is given by

$${}_{r+1}\Phi_r \left[\begin{matrix} a_1, a_2, ..., a_{r+1}; q; z \\ b_1, b_2, ..., b_r \end{matrix} \right] = \sum_{n=0}^{\infty} \frac{(a_1, a_2, ..., a_{r+1}; q)_n z^n}{(q, b_1, b_2, ..., b_r; q)_n},$$

where $(a_1, a_2, ..., a_{r+1}; q)_n = (a_1;q)_n (a_2;q)_n ... (a_{r+1};q)_n$ and $\max.(|z|, |q|) < 1$ for the convergence of the series.

The generalised bilateral basic hypergeometric series is defined as,

$${}_{r}\Psi_r \left[\begin{matrix} a_1, a_2, ..., a_r; q; z \\ b_1, b_2, ..., b_r \end{matrix} \right] = \sum_{n=-\infty}^{\infty} \frac{(a_1, a_2, ..., a_r; q)_n z^n}{(b_1, b_2, ..., b_r; q)_n},$$

where $\left| \frac{b_1, b_2, ..., b_r}{a_1, a_2, ..., a_r} \right| < |z| < 1$ for the convergence of the series.

An expression of the form,

$$b_0 + \frac{a_1}{b_1 +} \frac{a_2}{b_2 +} \frac{a_3}{b_3 + ...}$$

J. of Ramanujan Society of Math. and Math. Sc. **ISSN : 2319-1023**
Vol.6, No.1 (2017), pp. 71-78

ON CERTAIN TRANSFORMATION FORMULAS INVOLVING q-HYPERGEOMETRIC SERIES

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Dedicated to Prof. K. Srinivasa Rao on his 75th Birth Anniversary

Abstract: In this paper transformations formulas involving q-hypergeometric series have been established. Certain identities have been deduced as special cases.

Keywords and Phrases: q-hypergeometric series, transformation formula, summation formula, identity.

2010 Mathematics Subject Classification: 33D15, 11B65.

1. Introduction, Notations and Definitions

Throughout the paper, we use the customary notation,

$(a;q)_0 = 1$

$(a;q)_n = \prod_{r=0}^{n-1}(1-aq^r), \quad n \geq 1,$

$(a;q)_\infty = \lim_{n\to\infty}(a;q)_n, \quad |q|<1$

and

$(a_1, a_2, a_3, ..., a_r; q)_n = (a_1;q)_n(a_2;q)_n(a_3;q)_n...(a_r;q)_n,$

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J. of Ramanujan Society of Math. and Math. Sc.
Vol.5, No.2 (2016), pp. 99-112
ISSN : 2319-1023

TRANSFORMATION FORMULAE INVOLVING PARTIAL MOCK THETA FUNCTIONS

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Abstract: In this paper certain transformation formulae involving partial mock theta functions have been established.

Keywords and Phrases: Mock theta function, partial mock theta function, transformation formula.

2000 AMS Subject Classification: 33A30, 33D15.

1. Introduction Notations and Definitions

Early in 1920, three months before his death, Ramanujan wrote his last letter to Professor G.H. Hardy. In the course of it he said: "I discovered very interesting functions recently which I call 'Mock' theta functions. Unlike the 'False' theta functions they enter into mathematics as beautifully as the ordinary theta functions. I am sending you with this letter some examples."

The first three pages in which Ramanujan explained what he meant by a "Mock-theta function" are very obscure. They will be made clearer by Hardy's comment that a Mock theta-function is a function defined by a q-series, convergent when $|q| < 1$, for which we can calculate asymptotic formula when q-tends to a rational point $e^{2\pi ir/s}$ of the unit circle, of the same degree of precision as these furnished for the ordinary theta functions by the theory of linear transformation. The last pages of Ramanujan's notes consist of lists of definitions of four sets of Mock functions with statements of relations connecting members of each of the first s; for fairly obvious reasons the functions in the various sets.

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J. of Ramanujan Society of Math. and Math. Sc.
Vol.5, No.2 (2016), pp. 47-56
ISSN : 2319-1023

ON CERTAIN DOUBLE SERIES IDENTITIES

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Abstract: In this paper, making use of Bailey transform and WP-Bailey transform, certain double series identities of Rogers-Ramanujan type have been established.

Keywords and Phrases: Bailey pair, WP-Bailey pair, identities, double series identities.

Mathematics Subject Classification: Primary 33D15, 33D90, 11A55, Secondary 11F20, 33F05.

1. Introduction, Notations and Definitions

In the present paper, we adopt the following notations and definitions. The q-rising factorial is defined by, for $|q| < 1$.

$$(a;q)_n = (1-a)(1-aq)...(1-aq^{n-1}), \quad n = 1, 2, 3, ...$$

$$(a;q)_0 = 1$$

$$(a;q)_\infty = \prod_{r=0}^{\infty}(1-aq^r)$$

and

$$(a_1, a_2, ..., a_r; q)_n = (a_1;q)_n(a_2;q)_n...(a_r;q)_n.$$

With theses notations, a basic hypergeometric series (q-series) is defined by,

$${}_r\Phi_s\left[\begin{matrix} a_1, a_2, ..., a_r; q; z \\ b_1, b_2, ..., b_s \end{matrix}\right] = \sum_{n=0}^{\infty} \frac{(a_1, a_2, ..., a_r; q)_n z^n}{(q, b_1, b_2, ..., b_s; q)_n} \left\{(-1)^n q^{n(n-1)/2}\right\}.$$

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Ramanujan Society of Math. and Math. Sc.
No.2 (2017), pp. 45-60
ISSN : 2319-1023

A NOTE ON THETA HYPERGEOMETRIC SERIES

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ıct: In this article, making use of Bailey transform and certain known es, we have established certain transformation formulas for elliptic hyper-ric series

ırds: Bailey transform, elliptic hypergeometric series, identities, transformula.

Iathematics Subject Classification: 33D15, 33E05.

oduction, Notations and Definitions

path-breaking paper, Frankel and Turaev [1] introduced elliptic analogues well-poised basic hypergeometric series. Elliptic hypergeometric series and tensions to theta hypergeometric series has become an increasingly active research now these days. So for, many formulae for very well-poised ba-rgeometric series have already been extended to the elliptic setting. Some for multi-basic elliptic hypergeometric series appeared in the work of War-In this paper, using certain identities we have established transformation

South East Asian J. of Math. & Math. Sci.
Vol.11, No.2 2015, pp. 47-58
ISSN : 0972-7752

On certain transformation formulae for terminating hypergeometric series

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Abstract: In this paper, making use of Bailey's Lemma and certain known summation formulae an attempt will be made to establish transformations involving terminating basic hypergeometric series. We shall deduce the transformations involving terminating and truncated series from our results

Keywords and phrases: Terminating basic hypergeometric function/series, Bailey's Lemma, truncated series and summation formula.

2000 AMS subject classification: 33A30, 33D15, 11B65, 05A30.

1. Introduction, Notation and Definition

Throughout this paper we shall adopt the following notation and definition; For any numbers a and q, real or complex and $|q| < 1$, let

$$[\alpha;q]_n \equiv [\alpha]_n = \begin{cases} (1-\alpha)(1-\alpha q)(1-\alpha q^2)...(1-\alpha q^{n-1}); & n>0 \\ 1 \qquad\qquad\qquad\qquad\qquad\qquad\quad ; & n=0 \end{cases} \tag{1.1}$$

Accordingly, we have

$$[\alpha;q]_\infty = \prod_{n=0}^{\infty}(1-\alpha q^n)$$

REDUCTION OF DOUBLE HYPERGEOMETRIC SERIES

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Abstract: In this paperwork, we have taken certain transformation formulae due to Slater [2]; App. (III) Verma & Jain [1] and making use of known identities, to establish some double hyper geometric series into single series.

Key words: Generalized hyper - geometric function / Gauss hyper - geometric function and Ordinary hyper-geometric series; identities, known transformation formulae.

2010AMS Subject Classification: 33C20.

1. Introduction, Notation and Definitions

We shall make use of the following well known identities:

$$\sum_{n=0}^{n=\infty} \sum_{k=0}^{n} B(n,k) = \sum_{n=0}^{n=\infty} \sum_{k=0}^{\infty} B(k, n+k), \qquad (1.1)$$

An explicit representation of generalized hyper geometric functions

$$r^{F_S}\left[\begin{matrix} a_1, & a_2, & \dots, & a_r; \\ b_1, & b_2, & \dots, & b_s \end{matrix} \; z\right] = r^{F_S}\left[\begin{matrix} (a)_r; \\ (b)_s \end{matrix} \; z\right] = \sum_{n=0}^{\infty} \frac{[(a_r)]_n \; z^n}{[1]_n \; [(b_s)]_n}, \qquad (1.2)$$

Valid for $|z| < 1$, provided no zeros appear in denominator. Here $a_1, a_2, a_3, \cdots, a_r$ and $b_1, b_2, b_3, \cdots, b_s$ and z are assumed to be complex number.

The shifted factorial is defined by

$$(a)_n = \begin{Bmatrix} 1, & n = 0 \\ a(a+1) \dots\dots\dots\dots\dots\dots (a+n+1); & n > 0 \end{Bmatrix} \qquad (1.3)$$

In order to establish the reducibility of double hyper-geometric series into single series, we shall be need of the following known summation formulae due to (Slater [2], App.III) and Verma & Jain [1] in our analysis:

$$3^{F_2}\left[\begin{matrix} -n, & -n-x, & y; \\ 1+x, & -n-y & \end{matrix} \; 1\right] = \frac{(1)_n \, (1+x-y)_m (1+y)_m}{(1+x)_m \, (1+y)_n (1)_m}, \qquad (1.4)$$

where m is greatest integer $\leq \frac{n}{2}$.

[Verma & Jain [1]; (2.7) P. 1024]

J. of Ramanujan Society of Math. and Math. Sc. **ISSN : 2319-1023**
Vol.6, No.2 (2017), pp. 45-60

A NOTE ON THETA HYPERGEOMETRIC SERIES

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Abstract: In this article, making use of Bailey transform and certain known identities, we have established certain transformation formulas for elliptic hypergeometric series

Keywords: Bailey transform, elliptic hypergeometric series, identities, transformation formula.

2010 Mathematics Subject Classification: 33D15, 33E05.

1. Introduction, Notations and Definitions

In a path-breaking paper, Frankel and Turaev [1] introduced elliptic analogues of very well-poised basic hypergeometric series. Elliptic hypergeometric series and their extensions to theta hypergeometric series has become an increasingly active area of research now these days. So for, many formulae for very well-poised basic hypergeometric series have already been extended to the elliptic setting. Some formulae for multi-basic elliptic hypergeometric series appeared in the work of Warnaar [7]. In this paper, using certain identities we have established transformation

South East Asian J. of Mathematics and Mathematical Sciences
Vol. 16, No. 1 (2020), pp. 65-78

ISSN (Online): 2582-0850

ISSN (Print): 0972-7752

APPLICATION OF CONJUGATE BAILEY PAIR AND CONJUGATE WP-BAILEY PAIR TO ESTABLISH SUMMATIONS AND q- SERIES IDENTITIES

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(**Received:** *Jun. 10, 2019* **Accepted:** *Dec. 05, 2019* **Published:** *Apr. 30, 2020)*

Abstract: In this paper, making use of Bailey pair, conjugate Bailey pair, WP-Bailey pair and conjugate WP-Bailey pair, four theorems have been established which yield certain double series identities as special cases.

Keywords and Phrases: Bailey pair, WP-Bailey pair, conjugate Bailey pair, conjugate WP-Bailey pair, summation formula and identities.

2010 Mathematics Subject Classification: Primary 11A55, 33D15, 33D90; Secondary 11F20, 33F05.

South East Asian J. of Mathematics and Mathematical Sciences
Vol. 17, No. 2 (2021), pp. 93-96

ISSN (Online): 2582-0850

ISSN (Print): 0972-7752

BASIC ANALOGUE OF STIELTJES TRANSFORM AND ITS PROPERTIES

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(**Received:** *Jun. 12, 2020* **Accepted:** *Jun. 08, 2021* **Published:** *Aug. 30, 2021)*

Abstract: In this paper, basic analogue of Stieltjes transform has been established. Properties of basic Stieltjes transform have been also discussed.

Keywords and Phrases: Stieltjes transform, Gauss's hypergeometric series, basic hypergeometric series, ordinary binomial theorem, basic binomial theorem.

2020 Mathematics Subject Classification: 44A10, 47D03.

1. Introduction, Notations and Definitions

Gaussian hypergeometric series is defined as,

$$ {}_2F_1\left[a,b;c;z\right] = \sum_{n=0}^{\infty} \frac{(a)_n (b)_n z^n}{(c)_n n!}, \tag{1.1} $$

where $(a)_n = a(a+1)...(a+n-1) = \dfrac{\Gamma(a+n)}{\Gamma(a)}$, and $(a)_0 = 1$.
For the convergence of the series (1.1), $|z| < 1$ is needed.

International Journal of All Research Education and Scientific Methods (IJARESM), ISSN: 2455-6211
Volume 9, Issue 12, December-2021, Impact Factor: 7.429, Available online at: www.ijaresm.com

On Certain Transformation Formulae for Hypergeometric Series

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ABSTRACT

In this paper, making use of Bailey's Lemma and certain known summation formulae due to Slater [2], Verma & Jain an attempt will be made to establish new interesting transformation formulae for hyper-geometric series.

Key words: Ordinary and basic hyper-geometric function / series, Bailey's Lemma, summation formulae.

2010AMS Subject Classification: 33C20.

1. Introduction, Notations and Definitions:

The transform which was discovered by Bailey [1] in 1947.

If

$$\beta_n = \sum_{r=0}^{n} u_{n-r}\, v_{n-r}\, \alpha_r \qquad (1.1)$$

And

$$\gamma_n = \sum_{r=n}^{\infty} u_{n+r}\, v_{n-r}\delta_n = \sum_{r=0}^{\infty} u_r\, v_{r+2n}\delta_{r+n} \qquad (1.2)$$

then, under suitable convergence conditions ,

$$\sum_{r=0}^{\infty} \alpha_n\gamma_n = \sum_{n=0}^{\infty} \beta_n\, \delta_n \qquad (1.3)$$

where α_n, δ_n, u_r ***and*** v_r ***are any functions*** r ***only*** **,such that the series γ_n exists, making use of (1.3), Bailey was developed a technique to obtain various transformation formulae for ordinary and q- series , which play an important role in number theory and hyper geometric series. Singh [2] be obtained many transformation formulae for q- series by using Bailey's transformation and certain known result due to Slater [2] and Verma & Jain [1]. In this paper, an attempt we have been made to establish certain transformation formulae for hyper geometric series by using Bailey transformation and some known formulae from Verma & Jain [1].**

An explicit representation of generalized hyper geometric functions

$$r^{F_S}\left[\begin{matrix} a_1, & a_2, \ldots, & a_r; & z \\ b_1, & b_2, \ldots, & b_s & \end{matrix}\right] = r^{F_S}\left[\begin{matrix} (a)_r; & z \\ (b)_s & \end{matrix}\right] = \sum_{n=0}^{\infty} \frac{[(a_r)]_n\, z^n}{[1]_n\, [(b_s)]_n}. \qquad (1.4)$$

$$valid\ for\ |z| < 1, provided\ no\ zeros\ appear\ in\ denominator.$$

Here $a_1, a_2, a_3, \cdots, a_r$ and $b_1, b_2, b_3, \cdots, b_s$ and z are assumed to be complex number.

The shifted factorial is defined by

$$(a)_n = \begin{cases} 1, & n = 0 \\ a(a+1)\ldots\ldots\ldots\ldots\ldots (a+n+1); & n > 0 \end{cases} \qquad (1.5)$$

South East Asian J. of Mathematics and Mathematical Sciences
Vol. 19, No. 3 (2023), pp. 81-86

DOI: 10.56827/SEAJMMS.2023.1903.8 **ISSN (Online): 2582-0850**

ISSN (Print): 0972-7752

CERTAIN RESULTS INVOLVING q-HYPERGEOMETRIC SERIES AND RAMANUJAN'S MOCK THETA FUNCTIONS

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(**Received:** *Dec. 17, 2021* **Accepted:** *Oct. 08, 2023* **Published:** *Dec. 30, 2023)*

Abstract: In this paper certain transformation formulas for q-hypergeometric series have been established. In another section of this paper, results involving mock theta functions have also been established.

Keywords and Phrases: q-hypergeometric series, transformation formula, mock theta functions, truncated hypergeometric series, summation formula.

2020 Mathematics Subject Classification: 30G35, 32A30, 30C15.

1. Introduction, Notations and Definitions

The $q-$shifted factorial for $|q| < 1$ is defined as,

$$(a;q)_0 = 1$$

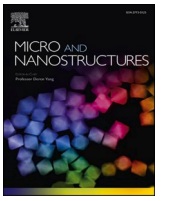
Micro and Nanostructures 191 (2024) 207868



Contents lists available at ScienceDirect

Micro and Nanostructures

journal homepage: www.journals.elsevier.com/micro-and-nanostructures





An analytical model of P^+ SiC core-shell JLFETs to analyze the performance for higher breakdown voltages applications

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ARTICLE INFO

Index Terms:
Higher breakdown voltages
Silicon carbide devices
Wide band gap (WBG)
NW JLFET
P^+ SiC CS JLFET

ABSTRACT

In this article, we proposed a core-shell (CS) architecture that uses the silicon carbide (SiC) as a nanowire for higher breakdown voltages in a Junctionless field effect transistor (JLFET). The P^+ core-shell improves the electrostatic integrity and reduces lateral band-to-band tunneling in SiC JLFET. Furthermore, the SiC is wide band gap material which helps to achieve the full volume depletion in JLFET at such short channel lengths. Thus, the OFF-state current in P^+ SiC CS JLFET has reduced to 10^{-16} μA even at temperature 600 K and $V_{DS} = 2.0$ V. The P^+ SiC CS JLFET shows significant performance even at higher drain voltages. Hence, we investigate the P^+ SiC CS JLFET for higher breakdown voltages with the impact of higher temperatures. In addition, the impact of higher drain voltages with higher temperatures is also examined. This paper presents an analytical model for P^+ SiC CS JLFETs which considers Poisson's equation for nanowires as well as the surface potential at the threshold voltage (V_{th}) and electric field at the zero point (E_z). The model shows that the surface potential and the electric fields in nanowires are essential for an accurate estimation of the drain current. In addition to the numerical modeling results provided by SILVACO TCAD, the performance of the proposed analytical model was compared with simulation results. The results showed good agreement between the simulations and the proposed compact model. This indicates that the proposed model can be used to provide accurate drain current predictions in nanoscale transistors.

1. Introduction

Technology that is compatible with conventional CMOS technology is being developed for circuits and systems that can operate at high temperatures. This is because higher temperatures can help reduce power consumption, increase the speed of operation, and reduce the size of the components. In addition, at high temperatures, more electrons can be injected into the device, resulting in higher transistor performance. VLSI chips are also becoming smaller and more efficient, allowing for even greater reductions in energy consumption. Moreover, advances in semiconductor technology are enabling the development of VLSI chips with even lower energy consumption. Performance and reliability are provided by several devices at different technology nodes [1–3]. Despite this, traditional MOSFETs have reached their physical limits, and if they are scaled down further, their reliability and performance will be compromised. As part of extensive research, different non-planar architectures for sub-20 nm regimes have been proposed, including

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https://doi.org/10.1016/j.micrna.2024.207868
Received 21 March 2024; Received in revised form 7 May 2024; Accepted 8 May 2024
Available online 8 May 2024
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Analog Integrated Circuits and Signal Processing (2025) 125:35
https://doi.org/10.1007/s10470-025-02508-8

An efficient hilbert envelope and factor analysis based Estimation of R-peaks in ECG signal

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Received: 14 September 2023 / Revised: 21 March 2025 / Accepted: 2 September 2025 / Published online: 30 September 2025
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Abstract

In the present situation of health informatics, appropriate pre-processing tools are necessary to judge actual condition. In this direction, Electrocardiogram (ECG) is the right tool which shows electrical activity of the heart. This tool gives its output in the form of electrical signal having three different wave components namely; P-wave, QRS wave (complex), and T-wave. In this paper combination of three efficient techniques viz. Digital bandpass filtering (DBPF), Hilbert envelope, and Factor analysis is used for ECG signal analysis. The analysis of ECG signal is done by estimating position of R-peaks in MIT-BIH Arrhythmia (MIT-BIH Arr) database. The proposed technique has proved its utility in cardiology by establishing Sensitivity (Se) of 99.95%, Positive Predictivity (Pp) of 99.97%, Accuracy (Acc) of 99.92% and Signal-to-Noise Ratio (SNR) of 37.71dB in considered 18 datasets of MIT-BIH Arr database. In the common datasets used by different researchers, the proposed methodology secured Se of 99.98%, Pp of 99.98%, Acc of 99.96%, and SNR of 39.78dB. The proposed methodology is also compared with well established research works and showing significant improvements in their parameters viz. Se, Pp and Acc. Different work proposed by various authors on ECG signal analysis have been compared. The proposed technique is definitely important for medical engineering applications in estimating correct health condition (by R-peaks detection).

Keywords Health informatics · Electrocardiogram · Digital bandpass filter · Hilbert envelope · Pre-processing · Factor analysis · Cardiology · SNR

1 Introduction

With the significant changes in the life styles of people all over the world, cardiovascular diseases (CVDs) are considering as a main challenge for health informatics, both in terms of computational cost and accuracy of health medicine [1]. Figure 1 shows heart schematic in which dead muscle tissue is shown leading to blockage in the heart.

According to the world health organization (WHO) report, 7.4 million people passed out due to heart attack in 2015 and about 272 per 100 000 people due to CVDs [2]. Cardiovascular system is the combination of Heart, blood vessels, and circulatory system. Among these three systems, heart is most important muscular organ which collects less oxygen blood through veins and pumps it to lungs, where it observes oxygen and passes out carbon dioxide. The lungs circulates oxygen rich blood to the left side of the heart and heart pumps this blood to the rest of the body through the arteries.

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Physica Scripta

Check for updates

RECEIVED
26 January 2026

REVISED
6 March 2026

ACCEPTED FOR PUBLICATION
11 March 2026

PUBLISHED
23 March 2026

PAPER

Impedance-guided numerical optimization of lead-free dual-absorber perovskite solar cells using SCAPS-1D simulations

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Keywords: perovskite, lead free, impedence analysis, dual layer, SCAPS-ID

Abstract

This paper focuses on a numerical study of a high-efficiency, lead-free bilayer perovskite solar cell (PSC) with $Cs_2TiBr_6/CsSnBr_3$ heterojunction conducted in SCAPS-1D using drift-diffusion simulations. Through careful optimization of various critical physical and electrical design parameters, such as absorber layer thicknesses, bandgaps, electron affinities, doping concentrations, bulk and interfacial defect densities, temperature stability, and contact interface energetics the bilayer device structure is proved to have apparent performance increases over the related single-junction devices. The optimized structure provides a power conversion efficiency of 24.03%, open-circuit voltage (Voc) of 1.2774 V, short-circuit current density (Jsc) of 21.48 mA cm^{-2}, and fill factor (FF) of 87.59% which is higher than single-layer $CsSnBr_3$ (17.27%) and Cs_2TiBr_6 (10.25%) solar cells. It is believed to improve the performance due to its favorable conduction band offsets and valence band offsets which facilitate charge separation, complementary visible spectrum absorption and effective inhibition of nonradiative recombination by interface engineering and defect passivation. Quantum efficiency (QE) measurement verifies a near-unit carrier collection at the wavelength of 400–700 nm, which implies an efficient absorption of photons and carrier transportation. The thermal stability is also observed to be large when temperature-dependent simulations are conducted, and this indicates that the device can work under realistic operating conditions. Impedance analysis confirms efficient charge extraction, characterized by a charge transfer resistance of $R_{ct} = 2.66 \times 10^4\ \Omega{\cdot}cm^2$, a chemical capacitance of $C_\mu = 23.8\ nF \cdot cm^{-2}$, and a corresponding time constant of $\tau = R_{ct} C_\mu = 0.63$ ms. Further, the C-V and Mott–Schottky analyses confirm proper junction formation, with a linear $1/C^2$–V response yielding a built-in potential (V_{bi}) of 1.41V. This high value of V_{bi} indicates strong band bending and efficient charge separation. In general, the alignment of energy levels, defect control, and interface engineering are identified as the key factors in attaining high-efficiency, thermally stable, and environmentally benign lead-free perovskite photovoltaics, and the bilayer architecture of $Cs_2TiBr_6/CsSnBr_3$ is a technologically viable option for next-generation non-toxic PSCs.

1. Introduction

The perovskite solar cells (PSCs) have proven to be a very competitive photovoltaic technology, and the certified power conversion efficiencies (PCEs) have recently reached over 26%. This is mainly due to their good optoelectronic properties e.g., adjustable bandgap energies, good optical absorption, low exciton binding energies, and efficient transport of charge-carriers [1–3]. The above features make PSCs a very promising option in terms of their use as a sustainable energy source. Nevertheless, large-scale commercialization is

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اردو کے ذریعے تکنیکی تعلیم میں اضافہ: تصور کو بہتر طور پر سمجھنے کا ایک راستہ

زاہد اعظم اور اجمل صادق محمد

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خلاصہ: تکنیکی تعلیم میں ذریعہ تعلیم طلباء کے سیکھنے کے نتائج کو تشکیل دینے میں ایک اہم کردار ادا کرتا ہے . ان علاقوں میں جہاں اردو ایک غالب زبان ہے، اسے تکنیکی تعلیم میں ذریعہ تعلیم کے طور پر ضم کرنے سے تفہیم کو بہتر بنانے، بہتر مواصلات کی سہولت اور جدت طرازی کو فروغ دینے کی صلاحیت موجود ہے۔ اس مضمون میں تکنیکی تعلیم میں اردو کے استعمال کی اہمیت کا جائزہ لیا گیا ہے، جس میں طالب علموں کی تفہیم، مشغولیت اور برقرار رکھنے پر اس کے اثرات پر توجہ مرکوز کی گئی ہے۔ طلباء کو درپیش لسانی چیلنجوں کا جائزہ لیتے ہوئے، مضمون تکنیکی تعلیم کے لئے دوزبانی نقطہ نظر کی وکالت کرتا ہے اور تکنیکی نصاب میں اردو کو بنیادی زبان کے طور پر اپنانے کے ممکنہ فوائد پر روشنی ڈالتا ہے۔ مزید برآں، تحقیق تکنیکی کورسز میں اردو کے نفاذ کے لئے ایک فریم ورک پیش کرتی ہے اور اس طرح کے اقدام کے معاشرتی اور تعلیمی فوائد کی تلاش کرتی ہے.

تعارف: تکنیکی تعلیم کسی بھی قوم کی سماجی و اقتصادی ترقی کے لئے ضروری ہے . بھارت، پاکستان اور مشرق وسطیٰ کے کچھ حصوں میں، جہاں اردو بڑے پیمانے پر بولی اور سمجھی جاتی ہے، تعلیمی ماحول میں علاقائی زبانوں کا استعمال مواصلات کے اہم خلا کو پر کر سکتا ہے۔ انجینئرنگ، انفارمیشن ٹیکنالوجی، اور سائنس جیسے پیچیدہ تکنیکی مضامین سیکھنے والے طلباء کے لئے، ان کی مادری زبان میں اصطلاحات اور تصورات کو سمجھنے سے ان کے سیکھنے کے تجربے کو بہت بہتر بنایا جا سکتا ہے۔ اگرچہ انگریزی کو اکثر سائنس اور ٹیکنالوجی کی عالمی زبان سمجھا جاتا ہے، لیکن تکنیکی تعلیم میں اردو کا انضمام بہت سے فوائد پیش کر سکتا ہے، بہتر تفہیم سے لے کر طلباء کی مصروفیت اور کامیابی میں اضافہ تک۔

جدید دنیا میں تکنیکی تعلیم کی ضرورت پہلے کبھی زیادہ نہیں رہی، جہاں سائنس، ٹکنالوجی، انجینئرنگ اور ریاضی (ایس ٹی ای ایم) معاشی ترقی اور قومی ترقی میں مرکزی کردار ادا کرتے ہیں۔ تاہم، تعلیم کا ذریعہ دنیا بھر میں بہت سے طالب علموں کے لئے ایک اہم رکاوٹ بنا ہوا ہے . پاکستان اور ہندوستان کے کچھ حصوں جیسے ممالک میں جہاں اردو غالب زبان ہے، طلباء کو اکثر چیلنجوں کا سامنا کرنا پڑتا ہے جب تکنیکی تعلیم بنیادی طور پر انگریزی میں فراہم کی جاتی ہے۔ تعلیمی اداروں کی عالمی زبان کے طور پر انگریزی کے بڑھتے ہوئے کردار کے باوجود، تکنیکی تعلیم میں اردو جیسی علاقائی زبانوں کا استعمال بے شمار فوائد پیش کر سکتا ہے۔ تکنیکی تعلیم میں اردو کے انضمام سے طالب علموں کی تفہیم میں نمایاں اضافہ، زیادہ سے زیادہ مصروفیت کو فروغ دینے اور اردو بولنے والے علاقوں میں انتہائی ہنر مند افرادی قوت کی ترقی میں کردار ادا کرنے کی صلاحیت موجود ہے۔

اس مضمون کا مقصد یہ جاننا ہے کہ تکنیکی تعلیم میں اردو کا استعمال کس طرح طالب علموں، اساتذہ اور صنعتوں کے لئے ایک ٹرانس فارمیٹو طاقت بن سکتا ہے۔ مختلف کیس اسٹڈیز کو دیکھ کر، طلباء کو درپیش چیلنجوں کا جائزہ لے کر اور ممکنہ حل پر تبادلہ خیال کرتے ہوئے، ہم تکنیکی شعبوں میں اردو کو ذریعہ تعلیم کے طور پر استعمال کرنے کی اہمیت کو اجاگر کرنا چاہتے ہیں۔

تکنیکی تعلیم کا موجودہ منظر نامہ

1.1 تکنیکی تعلیم میں عالمی تبدیلی:

جدید دنیا میں، تکنیکی تعلیم نے بہت اہمیت حاصل کر لی ہے کیونکہ دنیا بھر کی صنعتیں جدت طرازی، تکنیکی ترقی اور ہنر مند افرادی قوت پر انحصار جاری رکھے ہوئے ہیں۔ ٹیکنالوجی کی تیزی سے ترقی کے ساتھ، تکنیکی تعلیم اب بنیادی مہارتوں تک محدود نہیں ہے بلکہ اب مصنوعی ذہانت، روبوٹکس، بائیومیڈیکل انجینئرنگ، اور پائیدار توانائی کی ٹیکنالوجیز سمیت وسیع پیمانے پر شعبوں کا احاطہ کرتی ہے۔

تاہم، زیادہ تر نصاب، وسائل، اور تدریس کے طریقوں کو انگریزی کے ارد گرد ڈیزائن کیا گیا ہے، خاص طور پر تعلیمی اور تکنیکی اداروں میں۔ اگرچہ یہ بین الاقوامی تعاون کے مواقع پیدا کرتا ہے، لیکن یہ غیر انگریزی بولنے والے علاقوں میں طلباء کے لئے بھی چیلنج پیش کرتا ہے جو زبان کی رکاوٹوں کے ساتھ جدوجہد کرتے ہیں۔ ان علاقوں میں طالب علموں کے پاس اکثر

Journal of Optics
https://doi.org/10.1007/s12596-026-03309-6

RESEARCH ARTICLE

Numerical investigation of current matching and bandgap engineering in two-terminal Cu(In,Y)Se_2 chalcopyrite tandem solar cells

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Received: 22 May 2026 / Accepted: 27 August 2026
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Abstract

A numerical investigation of bandgap engineering and current matching in a monolithic two-terminal Cu(In,Y)Se_2 chalcopyrite tandem solar cell is presented. Yttrium alloying is employed as an effective strategy to tune the absorber bandgap within a single materials system, enabling the design of a wide-bandgap top subcell and a narrow-bandgap bottom subcell. Based on bandgap-composition analysis, Cu($In_{0.625}Y_{0.375}$)Se_2 (1.753 eV) and $CuInSe_2$ (1.04 eV) are identified as the optimal top and bottom absorbers, respectively. Transport-layer optimization yields STO/PTAA and STO/CBTS as the most favourable ETL/HTL combinations for the top and bottom subcells. Standalone optimization results in efficiencies of 18.19% for the top cell and 21.23% for the bottom cell. Spectral current matching is achieved by thickness optimization, with the maximum matched current density of 17.25 mA/cm^2 occurring at top- and bottom-cell thicknesses of 878 nm and 600 nm, respectively. The resulting tandem device delivers an open-circuit voltage of 2.08 V, a fill factor of 82.29%, and a power conversion efficiency of 29.51% under AM1.5G illumination. Small-signal and impedance analyses further reveal complementary charge-transport and carrier-storage characteristics between the two subcells, validating their efficient tandem operation. These results demonstrate the strong potential of yttrium-alloyed chalcopyrites for high-efficiency monolithic tandem photovoltaics.

Keywords SCAPS-1D · Tandem solar cell · Spectral matching · Parasitic resistances · Transport layers

Silicon
https://doi.org/10.1007/s12633-026-03858-2

RESEARCH

Unified Compact Modeling of Carrier Transport in SiC Gate-All-Around Nanowire FETs

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Received: 14 February 2026 / Accepted: 6 October 2026
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Abstract

In this study, we proposed a quasi-analytical compact model for cylindrical gate-all-around (GAA) SiC nanowire field-effect transistors (NWFETs). The proposed approach incorporates multiple carrier transport regimes (i) fully ballistic transport based on Landauer formalism, (ii) a partially ballistic approach using the Lundstrom backscattering model, and (iii) a classical drift–diffusion (DD) formulation including velocity saturation and channel-length modulation. Simulation results suggest when the device has an aggressively scaled channel, the Lundstrom model provides close agreement in the quasi-ballistic regime. The electrostatic behavior of the device is captured using a self-consistent surface-potential formulation that includes quantum capacitance due to strong charge carrier confinement, enabling accurate estimation of charge carrier modulation in the inversion region. Also, the electrostatic metric consists of surface potential, drain induced barrier lowering (DIBL), quantum, and total gate capacitance, which are estimated across geometry variations and bias conditions. Particularly, the effect of nanowire radius scaling on current drive and capacitance behavior is analyzed. The proposed model is also validated against published TCAD data, and quantitative error analysis was performed with RMSE value of 1.11 μA, MAE value of 0.88 μA, and R^2 score of 0.498. Unlike purely numerical approaches, Technology Computer-Aided Design (TCAD) simulations, the proposed unified modeling framework offers analytical scalability, circuit-level compatibility, and computational efficiency, making it a valuable tool for exploring design variations in next-generation SiC nanowire transistors and performance benchmarking of next-generation wide-bandgap nanoscale transistors.

Keywords Gate-all-around · Nanowire field-effect transistors · Ballistic transport · Drift–diffusion · Lundstrom model · Drain-induced barrier lowering

FAKE NEWS DETECTION USING LINGUISTIC INQUIRY WITH SYLLABLE PATTERN OF WORDS BASED ON CNN APPROACH

Zahir Abbas Khan[1*], Rekha V[2], Ajit Danti[2], Naveen J[2]

Abstract:
The usage of social media for news consumption is progressively growing due to its accessibility, low cost, increased attractiveness, and capacity to disseminate "false news."Fake information deliberately created is purposefully or unintentionally created over the internet. Some people spread wrong information on social media to get the attention or financial and political gain. This is affecting a larger group of society who are blind by technology. We need to be smarter at the recognition of fake or real news. In this research we have implemented Linguistic Inquiry with Syllable Pattern of Word (LISPW) feature set for detection of fake news based onConvolutional neural network (CNN). The Linguistic features involved certain textual characteristics converted into a numerical form such that they can be used as an input for the training models. Tensorflow is used for implementation of the proposed framework and provides visualizations for the CNN. Confusion matrix and classification reports are validated and achieved accuracy score of 98% by using Linguistic Inquiry with Syllable Pattern of Word. Also, to check the headline or fact of the news, a module is developed to check for contradiction between inputted news and web scraped news related to it.

Keywords: Fake news, Feature Extraction, Deep Learning, Convolutional Neural Network, LISPW.

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DOI: 10.48047/ecb/2023.12.si10.0024

International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Fake News Detection Using TF-IDF Weighted with Word2Vec: An Ensemble Approach

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Submitted: 25/04/2023 **Revised**: 26/06/2023 **Accepted**: 06/07/2023

Abstract: Social media platforms' utilization for news consumption is steadily growing due to their accessibility, affordability, appeal, and ability to propagate misinformation. False information, whether intentionally or unintentionally created, is being disseminated across the internet. Certain individuals spread inaccurate information on social media to gain attention, financial benefits, or political advantage. This has a detrimental impact on a substantial portion of society that is heavily influenced by technology. It is imperative for us to develop better discernment in distinguishing between fake and genuine news. In this research paper, we present an ensemble approach for detecting fake news by using TF-IDF Weighted Vector with Word2Vec. The extracted features capture specific textual characteristics, which are converted into numerical representations for training the models and balanced dataset with the Random over Sampling technique. The implementation of our proposed framework utilized the ensemble approach with majority voting which combines 2 machine learning models like Random Forest and Decision Tree. The proposed strategy was adopted empirically evaluated against contemporary techniques and basic classifiers, including Gaussian Naïve Bayes, Logistic Regression, Multilayer Perceptron, and XGBoost Classifier. The effectiveness of our approach is validated through the evaluation of the accuracy, F1-Score, Precision, Recall, and Auc curve, yielding an impressive accuracy score of 94.24% on the FakeNewsNet dataset.

Keywords: *Convolutional Neural Networks, Machine learning, TF-IDF Weighted Vector; Word2Vec*

1. Introduction

In the current online environment, the spread of fake news has emerged as a pressing concern that threatens the integrity of information dissemination and public discourse. It is often crafted to sway opinions among people, create confusion, or serve specific agendas. The propagation of fake news has gotten easier since the introduction of social networking sites as well as the accessibility for exchanging data online faster and more widespread than ever before. The consequences of fake news are far-reaching and impactful. It can sway elections, incite social unrest, damage reputations, and erode trust in traditional news sources. Moreover, the sheer volume and rapid dissemination of fake news make it increasingly challenging for individuals to distinguish between reliable information and fabricated content. This phenomenon of creation and dissemination of false information poses a significant threat to democratic societies that rely on an informed citizenry for decision-making and governance. Developing effective detection algorithms and tools, promoting media literacy and critical thinking skills, and fostering a culture of responsible information sharing is necessary. Research in the field of fake news encompasses various disciplines, including computer science, journalism, psychology, and communication studies. Scholars and experts are continuously exploring methods to detect, analyze, and counteract the spread of fake news. This research aims to equip individuals, organizations, and platforms with the necessary tools and strategies to identify and combat misinformation effectively. By shedding light on the mechanisms, implications, and challenges surrounding fake news, researchers strive to promote media literacy, strengthen information integrity, and safeguard the democratic principles of transparency, accountability, and truth. Through interdisciplinary collaboration and innovative approaches, the battle against fake news is being fought on multiple fronts, with the ultimate goal of fostering a more informed and resilient society. The given text discusses the problem of fake news and presents a paper that focuses on principles and fundamental ideas behind spotting fake news. The paper investigates various kinds of linguistic and machine learning-based detection techniques. It additionally offers a qualitative evaluation of these methods for spotting fake news. The article points out the use of machine learning and ensemble learning techniques, particular taking advantage of the technique of counting and TF-IDF vectorization methods, and discusses the difficulties of fake news detection. [1]. In our research paper, we incorporate the TF-IDF (Term Frequency-Inverse Document Frequency) technique, a widely used approach in natural language processing and information retrieval, to assess the significance of words within a document relative to a larger collection of documents. TF-IDF combines term

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Journal of Theoretical and Applied Information Technology
15th January 2024. Vol.102. No 1
© 2023 Little Lion Scientific
ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

ENHANCING FAKE NEWS DETECTION ON SOCIAL MEDIA THROUGH ADVANCED MACHINE LEARNING AND USER PROFILE ANALYSIS

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ABSTRACT

Social media news consumption is growing in popularity. Users find social media appealing because it's inexpensive, easy to use, and information spreads quickly. Social media does, however, also contribute to the spread of false information. The detection of fake news has gained more attention due to the negative effects it has on society. However, since fake news is created to seem like real news, the detection performance when relying solely on news contents is typically unsatisfactory. Therefore, a thorough understanding of the connection between fake news and social media user profiles is required. In order to detect fake news, this research paper investigates the use of machine learning techniques, covering important topics like feature integration, user profiles, and dataset analysis. To generate extensive feature sets, the study integrates User Profile Features (UPF), Linguistic Inquiry and Word Count (LIWC) features, and Rhetorical Structure Theory (RST) features. Principal Component Analysis (PCA) is used to reduce dimensionality and lessen the difficulties presented by high-dimensional datasets. The study entails a comprehensive assessment of multiple machine learning models using datasets from "Politifact" and "Gossipofact," which cover a range of data processing methods. The evaluation of the XGBoost classification model is further enhanced by the analysis of Receiver Operating Characteristic (ROC) curves. The results demonstrate the effectiveness of particular combinations of features and models, with XGBoost outperforming other models on the suggested unified feature set (ALL).

Keywords: *Linguistic Inquiry and Word Count features, Machine learning techniques, Principal Component Analysis (PCA), Rhetorical Structure Theory (RST) features, Unified feature set (ALL), User profile features (UPF)*

1. INTRODUCTION

Disinformation, often colloquially referred to as "fake news," is a phenomenon that has been present throughout human history, although the term and its current manifestations are relatively new. While the term "fake news" gained widespread recognition in the 21st century, the concept of spreading false or misleading information predates the internet and modern media by centuries. Here, we'll explore the historical roots of disinformation, its evolution, and its contemporary impact[1]. As evidenced by the 2016 U.S. presidential election, where Macedonian youths operated over 100 websites disseminating false information, fake news, which is frequently misinformation, is frequently intentionally created for political, personal, or financial gain. Fact-checking is done by the media and experts to thwart false information. Manual fact-checking, however, is a labor and expertise-intensive task that cannot be scaled to the volume of fake news generated. As a result, researchers have developed data mining and machine learning techniques for automatically spotting fake news [2]. Some examples of fake news which affect the environment, in 2017, reports surfaced that Barack Obama had suffered injuries from an explosion [3]. On occasion, the dissemination of false information has as its goal escalating the anxiety and causing confusion, as was the case with the "Pizzagate," which prompted a man to

Nanotechnology Perceptions
ISSN 1660-6795
www.nano-ntp.com

AHCS: Advanced Health Care System for Critical Care Integrated with AI and Fog Computing in IoT Environments

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This paper employs the Pure Edge simulator to analyze the effectiveness of the edge and cloud computing structures addressing task completion time and resource consumption. In the simulation, 'TRADE OFF' and 'ROUND ROBIN' algorithms are used to compare the 'EDGE AND CLOUD' and 'CLOUD ONLY' orchestration architectures with respect to a number of edge devices. The proposed 'EDGE AND CLOUD' architecture achieves a balance of the computational load and has a relatively healthy average execution delay and an improved task success rate. In contrast, the 'CLOUD ONLY', where all task processing resides in the cloud, has more task failures because of latency, even if it provides total immediacy of processing and storage. A comprehensive analysis and comparison have been done, which suggests that hybrid architectures have significant potential to enhance feasibility and efficiency in distributed computing systems.

Keywords: Smart Healthcare, IoT, Machine Learning, Intelligent System.

1. Introduction

Using a cross-disciplinary approach with the help of modern technologies that can improve patient outcomes as the centerpiece, an advanced healthcare system for patients in critical care can be asserted. Such an advanced healthcare system for patients in critical care is defined by applying the latest medical technologies, AI and IoT, for effective patient care and data collection and analysis. In such systems, passive patient monitoring is made possible through IoT-based medical devices that acquire and send significant patient health parameters to AI

Journal of Theoretical and Applied Information Technology
31st October 2026. Vol.104. No.20
© Little Lion Scientific
ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

HYBRID TF-IDF - WORD2VEC FEATURE FUSION WITH STACKING ENSEMBLE LEARNING FOR URDU FAKE NEWS DETECTION

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ABSTRACT

The rapid dissemination of misleading information online has become a major social issue, particularly in low-resource languages like Urdu. The ability of existing false news detection techniques to recognize semantic connections in textual data is limited because they often solely employ lexical representations. This study proposes a hybrid fake news detection method that combines Word2Vec embeddings with Term Frequency–Inverse Document Frequency (TF-IDF) to leverage lexical and semantic information present in Urdu news articles. The gathered features are fused and classified using a stacking ensemble that includes Support Vector Machine (SVM), Logistic Regression (LR), and Extreme Gradient Boosting (XGBoost) as foundation learners. For the studies, a combined Hook-and-Bait Urdu fake news dataset including 78,406 news articles 42,179 real and 36,230 fake news samples—was utilized. The proposed framework had an accuracy of 95.17%. Comparative studies show that the hybrid representation and ensemble learning approach works better than conventional machine learning techniques based solely on TF-IDF features. The findings demonstrate that integrating lexical and semantic representations can greatly improve Urdu false news detection ability.

Keywords: *Fake News Detection, Machine Learning, Natural Language Processing, Stacking Ensemble, TF-IDF, Word2Vec*

1. INTRODUCTION

The growth of digital media and online news outlets has accelerated the flow of information, but it has also increased the dissemination of fake news and misinformation, affecting public opinion and trust in digital sources. Hence, automated fake-news detection is an important research problem for NLP and machine learning (ML) especially for low-resource languages such as Urdu where linguistic variation and lack of annotated datasets and computational resources pose additional challenges.

Traditional approaches often use the TF-IDF (Term Frequency–Inverse Document Frequency) which captures discriminative words and phrases but does not explicitly represent semantic relationships. Word2Vec learns distributional semantic associations, but averaging word embeddings to document vectors may lose important lexical distinctions. This combination of complementary representations may improve the news classification. Also, stacking ensemble learning combines the predictions of several classifiers and improves the performance by utilizing their complementary strengths.

The present study addresses the problem of representing and categorizing Urdu news articles by combining lexical and semantic features with ensemble learning. There have been a few studies on machine-learning classifiers and word representations for fake-news detection. However, the effectiveness of TF-IDF and Word2Vec fusion with stacking needs to be systematically evaluated on the Hook-and-Bait Urdu dataset.

To address this gap, this paper proposes a feature-fusion framework by combining TF-IDF features and document-level Word2Vec embeddings for binary Urdu fake-news classification. The base classifiers are Support Vector Machine (SVM), Logistic Regression (LR) and Extreme Gradient Boosting (XGBoost), and the meta-classifier is Logistic Regression to combine their predictions.

The specific aims are to:

1. Clean and normalize Urdu news articles for classification.

Silicon
https://doi.org/10.1007/s12633-025-03332-5

RESEARCH

An Optimized Hetero-gate Bandgap-Engineered SOI PNPN TFET with Hetero-dielectric BOX for Near-Complete Suppression of Ambipolar Current

Mahboob ul Haque[1,3] · **P. Vimala**[2,3]

Received: 22 December 2024 / Accepted: 29 April 2025
© The Author(s), under exclusive licence to Springer Nature B.V. 2025, corrected publication 2025

Abstract
This paper presents a planar SOI Tunnel FET that integrates a source-side pocket, hetero-gate, hetero-dielectric BOX along with bandgap engineering. These design enhancements, implemented through 2D simulations, result in a significantly high ON current, an improved ON-to-OFF current ratio, and nearly complete suppression of ambipolar current. An optimum pocket is introduced near the source leading to full depletion of the pocket. A comprehensive analysis of partial depletion and full depletion conditions along with a detailed step by step flow for fabrication of the proposed device is presented. As part of bandgap engineering, SiGe is utilized as the source material. Additionally, the hetero-gate structure enhances the tunneling generation rate between the source and the channel, achieving an ON-current of 2×10^{-4} A/μm and an OFF current of 3.37×10^{-15} A/μm. The incorporation of a hetero-dielectric buried oxide (HDB) effectively suppresses ambipolar conduction up to a gate voltage of -1.1V. These design optimizations collectively yield a better ON-to-OFF current ratio of 6×10^{10} and nearly eliminate OFF current. Furthermore, the device achieves a point subthreshold swing of approximately 20 mV/dec, making it a strong candidate for low-power and energy-efficient applications.

Keywords Tunneling · BTBT · Hetero gate · Hetero dielectric BOX · Subthreshold swing · Ambipolar current · ON–OFF current ratio

1 Introduction

With the advent of artificial intelligence in almost every walk of life, the next-generation electron devices in general and mobile and portable devices in particular, owing to the need for high performance and low operating power, are being designed to work at reduced supply voltages. In conventional MOSFETs, when the supply voltage is scaled down, it is required to reduce the threshold voltage as well. But scaling down of the threshold voltage leads to rise in the short channel effects namely drain induced barrier lowering (DIBL), channel length modulation, velocity saturation etc.; [1]. MOSFETs operate on the principle of thermionic emission that poses a limitation on the subthreshold swing of the device to 60 mV/dec. The scaling down of the threshold voltage necessitates lowering down the subthreshold swing which is not possible in MOSFETs.

Tunnel Field Effect Transistors (TFETs) which work on the principle of Band to Band Tunnelling (BTBT) that takes place between the source valence band and the channel conduction band has led to the possibility of reducing the subthreshold swing. Thus TFET is a good choice for low power electronic applications [2, 3].

But a TFET suffers from low ON current and high ambipolar current. The low ON current leads to limited drive capability. A transistor inside a modern day IC needs to have higher drive current to address the high fanout requirements [4]. On the other hand ambiploarity is undesirable as it adds to OFF state current. The ambipolar current arises from band-to-band tunneling (BTBT) at the channel-drain junction, occurring under negative gate voltage for n-type TFETs

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Published online: 14 May 2025

Silicon
https://doi.org/10.1007/s12633-022-01778-5

ORIGINAL PAPER

Modeling of Source Pocket Engineered PNPN Tunnel FET on High-K Buried Oxide (H-BOX) Substrate for Improved ON Current

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Received: 23 November 2021 / Accepted: 15 February 2022
© The Author(s), under exclusive licence to Springer Nature B.V. 2022

Abstract
In this paper, an analytical model has been developed for a single gate tunnel FET, introduced with a highly doped pocket in the vicinity of the source-channel junction and the bottom oxide layer being distributed between SiO_2 and a high-k material such as HfO_2. Introduction of the pocket region modifies the energy band diagram of the device thereby augmenting the electron tunneling from the source valence band to the channel conduction band in the band to band tunneling (BTBT) process of conduction. The proposed model results into an improvement in the surface potential, electric field profile and finally in the on state current I_{on}. Comparison of surface potential, electric fields for various V_{gs} has been made. Comparisons of the surface potential for various pocket widths, with and without the pocket & with & without the high-k dielectric material have also been made to show improvements in the proposed structure. Finally, drain current is computed and a comparison is made with & without the high-k dielectric material used in buried oxide.

Keywords Tunneling · BTBT · Analytical modeling · Source- pocket · High-k dielectric · Sub-threshold swing · On-state & off-state currents

1 Introduction

The CMOS technology has been the technology of choice since a long time. But after the demand for low power devices arose as a result of an unprecedented rise in the usage of portable mobile devices in the last decade, search for a device which works at lower supply voltage took off its journey.

The reduction of the supply voltage in a standard MOSFET is hindered by the sub-threshold slope which cannot be lowered below 60 mV/dec [1]. The threshold voltage in MOSFET could not be reduced without increasing the off state current which again increased the overall power consumption of the device. This bottleneck in the MOSFET lead to the search for a device which could work at sub-threshold slopes lower than 60 mV/dec. A device working on the principle of Band-to-Band tunneling (BTBT) came into being called Tunnel field effect transistor (TFET).

TFET is essentially a gated P^+-I-N^+ diode operated in reverse bias [2]. Based on the applied voltage at the gate terminal (V_G), the channel conduction band is modulated. Whenever the source valence band and channel conduction band are energetically aligned, tunneling of electrons occurs through the source-channel junction using phenomena called band to band tunneling (BTBT). The electrons thus generated are eventually swept away by the drain voltage (V_{DS}).

TFET, though it offers lower SS but suffers from lower on state current which prevents it from being used in applications requiring high drive currents. Several modifications were proposed to enhance the on current such as use of high-k dielectric gate material [3], use of alternative material leading to hetero-junction TFETs [4–7], use of alternative geometries [8], use of a highly doped pocket in the source region [9] and so on. Various research groups have proposed a variety of TFET structures.

It was found that there is no analytical model available for a source pocket engineered PNPN TFET on High-k buried oxide (H-BOX) substrate in the current literature. Though, there are a few conference papers available which validate the

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Published online: 03 March 2022

Next Materials 13 (2026) 102747

Contents lists available at ScienceDirect

Next Materials

journal homepage: www.sciencedirect.com/journal/next-materials

Research article

Impact of strain and raised hetero-BOX on the current characteristics of Si-based hetero-PNPN tunnel FET: A simulation based analysis and optimization

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ARTICLE INFO

Keywords:
Tensile strain
Band to Band Tunneling
BTBT
Hetero gate
Raised hetero dielectric BOX
Subthreshold swing
Ambipolar conduction
Tunneling generation rate
ON-to-OFF current ratio

ABSTRACT

This work presents a simulation based analysis of the impact of strain and raised hetero dielectric buried oxide (BOX) effects on a planar SOI Tunnel FET featuring a source pocket, hetero-gate and hetero-dielectric BOX configuration. A uniform tensile strain is applied to the source, channel and drain regions. The results show that tensile strain improves the tunnelling characteristics and subthreshold behavior, while the raised hetero-dielectric BOX effectively suppresses ambipolar conduction up to a gate voltage of −1.1 V and reduces the OFF current to 2.19×10^{-14} A/μm. The device exhibits a subthreshold swing of 22 mV/dec and an ON current of 62.7 μA/μm. A detailed analysis of the influence of incremental tensile strain and raised BOX structure is provided through quantitative and qualitative comparisons of electrostatic potential, electric field, energy bandgaps, tunneling generation rates, gate capacitance, drain currents and ambipolar conduction at source-channel and channel-drain junctions. The study shows that an appropriate combination of strain and raised BOX dimensions provides an effective trade-off between ON-state performance, OFF-state leakage, and ambipolar suppression, resulting in an ON/OFF current ratio of 0.3×10^{10} and near-complete suppression of ambipolar conduction. These characteristics make the proposed device suitable for low-power and complementary circuit applications.

1. Introduction

With the rapid integration of artificial intelligence (AI) across various domains, there is a growing demand for next-generation electronic devices especially mobile and portable systems that offer high performance while operating at lower power levels. To meet this need, modern devices are being designed to operate at lower supply voltages. However, in traditional MOSFET, which has been in use since more than half a decade, lowering the supply voltage also requires a corresponding reduction in threshold voltage to maintain a sufficient amount of drive current required for driving high fan-out and high speed circuits. Reduction in the threshold voltage, in turn, exacerbates short-channel effects such as drain-induced barrier lowering (DIBL), channel length modulation, and velocity saturation [1]. Furthermore, MOSFETs rely on thermionic emission for carrier transport, which inherently limits their subthreshold swing to 60 mV/dec, limiting their capability to switch at lower power supply voltages. Thus with MOSFETs, achieving lower threshold voltages without degrading device performance and enabling the device to switch at lower voltages becomes challenging. This paved the way towards sharp switching devices such as Tunnel Field Effect Transistors (TFET).

TFETs operate on the principle of band-to-band tunneling (BTBT), where carriers tunnel from the valence band of the source to the conduction band of the channel. This operating principle enables the potential to achieve subthreshold swings lower than the thermal limit of conventional MOSFETs, making TFETs a promising candidate for low-power electronic applications [2,3].

However, TFETs suffer from low ON current and significant ambipolar conduction. The limited ON current restricts the drive strength of the device, which is critical for meeting the high fan-out demands of modern integrated circuits [4]. Additionally, ambipolar behavior is undesirable as it increases the OFF-state current. This ambipolar current emerges from band-to-band tunnelling at the channel–drain junction, under positive gate voltages in p-type TFETs and negative gate voltages

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https://doi.org/10.1016/j.nxmate.2026.102747
Received 27 January 2026; Received in revised form 9 June 2026; Accepted 8 July 2026
Available online 14 July 2026
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Indonesian Journal of Electrical Engineering and Computer Science
Vol. 29, No. 2, February 2023, pp. 1047~1054
ISSN: 2502-4752, DOI: 10.11591/ijeecs.v29.i2.pp1047-1054

Research on secure workload execution scheme in heterogeneous cloud environment

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Article Info

Article history:

Received Aug 1, 2022
Revised Sep 29, 2022
Accepted Oct 21, 2022

Keywords:

Cloud computing
Scientific workflow
Task-scheduling
Virtualization
Workflow scheduling

ABSTRACT

The increasing demand for the hardware, software and infrastructure is playing a big role in the information technology domain towards the need of customer's specific requirements. Cloud computing is a major backbone for providing such services over the internet. It includes the services such as applications, storage, network, scalability, sharing, virtualization, confidentiality, security, authentication, and integrity. A large number of data intensive workflow applications uses heterogeneous cloud environment for communication and computation operation. An intruder/attacker will utilize these environments for their benefit by flooding malicious links, unwanted information and others. In cloud environment, detecting a malicious device/packet during workflow execution is a critical and challenging task. The various workflow method with security, service level agreement (SLA) and quality of service (QoS) have been modelled in recent time; However, these models are not efficient in detecting malicious users and maintaining high level of QoS or workflow applications. This article focus is on addressing research future direction, issues and challenges of work in meeting secure and efficient workflow execution model for heterogeneous cloud environment.

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1. INTRODUCTION

To run the organizations smoothly and efficiently the information systems are used for the business operations. A type of information system is workflow system which is current being used because of the cloud computing architecture. The workflow systems have grown due to the high development of the distributed computing. This workflow system has been shifted to the cloud computing-based workflow systems as it is currently being used to support the services of the cloud [1]. In the current situation of the COVID-19, many employees are currently working in their homes and due to this there is a huge demand of cloud services to store the data. The workflow system is an important element in the cloud services which helps in many fields such as the projects of the smart city, different kind of e-commerce applications and even helps in the educational field. The cloud services are used to transfer the information between the sender device and the receiver device, or to do some sensitive operations on the data. There is a chance that the cloud services can be hacked or the data may get leaked. To protect the data from getting leaked or hacked there are several security measures which can be used. Hence for the workflow system to work in the correct manner, it must be ensured that only the approved users have the access to the current task of the workflow and all the operations performed

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Knowledge and Information Systems
https://doi.org/10.1007/s10115-025-02416-3

RESEARCH

An intelligent secure and efficient workflow scheduling (SEWS) model for heterogeneous cloud computing environment

Fairoz Pasha[1] · Jayapandian Natarajan[1]

Received: 2 February 2023 / Revised: 21 September 2024 / Accepted: 22 March 2025
© The Author(s), under exclusive licence to Springer-Verlag London Ltd., part of Springer Nature 2025

Abstract

This study recognizes the critical role of the cloud computing platform in scientific workflow applications yet identifies vulnerabilities in existing cloud workflow systems, such as information leaks, unauthorized access, and compromised data integrity during task scheduling. Mainly, attackers exploit the lack of security for intermediate-level task information. To address these security threats, this work introduces the secure and efficient workflow scheduling (SEWS) model for heterogeneous cloud computing environments. The SEWS model identifies malicious attacks on all workflow tasks and focuses explicitly on safeguarding intermediary data. The SEWS model employs intelligent techniques to enhance security and introduces a comprehensive metric to measure the security of workflow tasks, considering factors like integrity, confidentiality, and availability. Beyond security improvements, the SEWS model aims to elevate the overall quality of service (QoS) in workflow scheduling applications. This includes reducing simulation time, enhancing overall power efficiency, and minimizing average energy consumption. Results: Results from the SEWS model demonstrate substantial improvements over the energy-minimized scheduling (EMS) model, with a reduction of 79.41% in average simulation time, 87.92% in average power sum, 41.35% in average power average, and 89.62% in average energy consumption. These findings underscore the SEWS model's effectiveness in providing enhanced security and improved QoS in cloud workflow scheduling. The overarching goal of this work is to contribute to developing a more secure and efficient cloud workflow scheduling system, aligning with the increasing demands for robust security measures and optimized performance in heterogeneous cloud environments. Findings: Compared to the energy-minimized scheduling (EMS) model, the findings of this study demonstrate that the secure and efficient workflow scheduling (SEWS) model yields superior outcomes across key performance metrics. Specifically, the SEWS model excels in average simulation time, power sum, power average, and energy consumption. These results underscore the effectiveness of the SEWS model in enhancing the efficiency and resource utilization of cloud workflow scheduling. Importantly, the study identifies a notable gap in the existing work related to workflow task scheduling. Many prior studies still need to address the critical aspects of security and QoS in this context. While some jobs have attempted to enhance security, a significant limitation is the failure to extend these security measures to intermediary data. This gap in the literature highlights the unique contribution of the SEWS model, which addresses security concerns comprehensively and

Extended author information available on the last page of the article

Published online: 18 April 2025

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Bulletin of Electrical Engineering and Informatics
Vol. 15, No. 2, April 2026, pp. 1313~1323
ISSN: 2302-9285, DOI: 10.11591/eei.v15i2.9885

Multi objective energy aware integrated cloud scheduling with a consensus-based security

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Article Info

Article history:

Received Jan 13, 2025
Revised Jan 21, 2026
Accepted Feb 22, 2026

Keywords:

Cloud computing
Consensus-based security
Dynamic scheduling
Multi-objective
Workflow

ABSTRACT

This research presents a multi-objective, energy-aware workflow scheduling framework for heterogeneous cloud–edge environments that addresses both efficiency and data integrity challenges. Conventional encryption-based security mechanisms, although effective in protecting data during task offloading, often introduce significant computational and communication overhead, leading to degraded system performance. To overcome this limitation, this work proposes the consensus security-integrity and quality-aware workflow scheduler (CSIQA-WS), which integrates energy-aware scheduling with a lightweight, consensus-driven security mechanism. The model incorporates automatic service management and an attack prevention module to detect and mitigate malicious behavior during inter-node data transmission while maintaining quality of service (QoS) constraints. A dynamic coordination between edge and cloud resources enables efficient workload distribution and robust resource utilization. Experimental evaluation using scientific workflow benchmarks demonstrates that CSIQA-WS significantly reduces processing time and energy consumption compared to existing approaches. The proposed model achieves up to 92.29% reduction in processing time and consistently improves overall QoS while preserving data integrity in dynamic execution environments. These results indicate that CSIQA-WS provides an effective and scalable solution for secure and energy-efficient workflow scheduling in modern cloud–edge systems.

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1. INTRODUCTION

The paradigm of computation as a service has evolved rapidly, with cloud computing emerging as a dominant model that enables users to store data remotely and access on-demand applications and services through the internet [1], [2]. By offering a shared pool of programmable computational resources [3], cloud computing delivers scalability, flexibility, and cost efficiency, allowing users to perform data storage, processing, and analytics without maintaining physical infrastructure [4], [5]. Virtualization plays a central role in this ecosystem by enabling multiple virtual machines (VMs) to share physical resources while maintaining isolation and service reliability [6].

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A Study on the Existential Psychology in Arun Joshi's "A Trip for Mr Lele"



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Abstract:

The research paper depicts the reality of a materialistic society that finds happiness in earning money and leading a comfortable life. The story "A Trip for Mr. Lele" represents that the happiness of a person is not only found in material comforts but also in the mental peace of a person. The research attempts to highlight Arun Joshi's portayal of psychological existentialism over physical existentialism. The paper further analyses a father's love for his disabled daughter. He prefers his daughter's happiness over his professional career.

Key Words: trauma, materialistic, prioritize, psychological, humiliate, consolation, inseparable.

Arun Joshi is a popular novelist as well as a renowned short story writer. He is well known for his five novels and a few collection of short stories. His short story collections make him as one of the important short story writers of the modern period. Under the able contribution of Arun Joshi Indian English Fiction underwent a remarkable transformation. His short stories give much scope for psychological realism instead of Social realism. The story revolves around the psychological trauma of an ordinary employee who is in doldrums between his inner conscience and materialistic demands of the society. Arun Joshi takes a remarkable step to portray the psychological trauma of many middle class people who are not able to choose the correct option to lead a meaningful life. Shivani Vatsa and Rashmi Gaur aptly remarks in the following way:

> Arun Joshi was pained to see the chaotic conditions of the society. He therefore took into his hands the task of providing a solution to the society, to escape from the vicious-circle of rapid industrialization. Thus, through the struggles of his protagonists he aims to achieve a good society and happy and joyful individuals. (Shivani Vatsa and Rashmi Gaur 29)

The story writer perfectly pictures the final decision of the protagonist who chooses an option of his own choice. He avoids a

RECLAIMING IDENTITY: WOMEN'S JOURNEY THROUGH PARTRIARCHY IN DATTANI'S PLAYS

Prof.P.Padma,
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Shaik Shakeela,
Research Scholar,
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ABSTRACT

Contemporary Indian English plays portray women as individuals caught in the web of patriarchal traditions, social expectations, and domestic hierarchies. Playwrights such as Vijay Tendulkar, Girish Karnad, and Mahesh Elkunchwar depict women characters who are often marginalized within their families and communities, expected to conform to roles as dutiful wives, submissive daughters-in-law, and silent sufferers. In plays like Tendulkar's *Kamala*, the female protagonist is treated as a commodity, highlighting the gendered power dynamics within a male-dominated society. Similarly, Karnad's *Nagamandala* presents the struggle of a woman trapped in an emotionally barren marriage, using myth and folklore to underscore the suppression of female desire and agency.

KEY WORDS: Patriarchal traditions, social expectations, power dynamics and domestic hierarchies.

Contemporary Indian English plays portray women as individuals caught in the web of patriarchal traditions, social expectations, and domestic hierarchies. Playwrights such as Vijay Tendulkar, Girish Karnad, and Mahesh Elkunchwar depict women characters who are often marginalized within their families and communities, expected to conform to roles as dutiful wives, submissive daughters-in-law, and silent sufferers. In plays like Tendulkar's *Kamala*, the female protagonist is treated as a commodity, highlighting the gendered power dynamics within a male-dominated society. Similarly, Karnad's *Nagamandala* presents the struggle of a woman trapped in an emotionally barren marriage, using myth and folklore to underscore the suppression of female desire and agency.

Many of these plays also explore the gradual awakening of female consciousness and

Transgender as an excluded entity: A Study of Mahesh Dattani's *Seven Stepsaround the Fire*

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Mahesh Dattani, being a renowned Indian English playwright exposed many social atrocities done on less privileged communities. Women, homosexuals, transgender and AIDS victims are the thrust areas of his focus. He majorly exhibited the sufferings of these oppressed human communities in Indian society by major part of the society. He raised his voice and protested against the discrimination and injustice done to this group and highlights the need for equal rights.Transgender are born with male sex but becomes female by gender. They differ in their behavior from their biological sex and get dominated by feminine features resulting to face rejection by their families and society. They suffer both psychologically and physically through the harsh treatment shown by the people of patriarchal society.In contemporary society Transgender community does not have any recognizable identity and instead it is facing humiliation, discrimination, rejection and violence in society under the clutches of power structure built in patriarchal society. Power politics play a major role in dominating hijra communityand marginalizing it from mainstream of human community.in the words of Bijay Kumar Das,

> … the plight of hijras in our society is deplorable. It is an irony of life that the hijras who are welcome on two occasions—one, at the time of marriage, and two at the time of childbirth—to sing and dance, are themselves deprived of marriage and child birth. Nothing can be more ironical and pathetic than this. (85)

In *Seven Steps Around the Fire* Mahesh Dattanirealistically represents the sufferings of Transgender and their tragic lives. They are known with different names in different regions in India. They had rich cultural epoch which is evidenced in ancient history. They were patronized by great rulers and administrators by giving high positions in their royal courts as civil servants and officers. They were admired and respected by the society with high respect and given next to godly position. But the position of transgender in contemporary society is

Women as subalterns in Mahesh Dattani's *Bravely Fought the Queen*

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ABSTRACT:

Mahesh Dattani's plays are special in its portrayal of contemporary social issues by representing the themes of gender discrimination, homosexuality, child abuse etc. He does not follow the trend, but he is a trend setter in the field of modern Indian drama. Indian culture gives utmost respect for women, but in reality, society looks at women as domestic servants. The violence, domination and harassment on women is not confined to any class, community and region, it is present all over the world from the last several centuries. Women are restricted from the expression of rights, desires and enjoy the freedom. The Play *Bravely fought the Queen* throws light on the sufferings of Indian high class women in silence and their fight against the domination of their family under patriarchal hegemony in climax. The play examines the miserable conditions of women, who are made puppets in the hands of men under male chauvinistic psychology.

Key Words: gender discrimination, homosexuality, violence, domination, patriarchal hegemony.

Mahesh Dattani, the contemporary Indian playwright, known for the depiction of many social issues, which were unspoken earlier. He projects the issues like discrimination of women in society, homosexuality, transgender problems, child abuse and the problems of AIDS patients through his plays. He shows all aspects of society through the medium of theatre. He believes to represent the social issues in his plays effectively on stage to emancipate the social conditions in society. For him society and theatre are interdependent on each other. He not

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Portrayal of Transgenders' pathos by Mahesh Dattani in Seven Steps Around the Fire

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ABSTRACT

Transgenders are not unfamiliar community in our society. Their presence in the events like marriages and child birth functions is considered auspicious; people feel their graces are signs for good omen. But it is very pathetic to know that though their presence is considered good in marriages and birth functions but they are exempted from marrying and giving birth to children. They are treated as separate entities by major part of the world. Writings on Transgenders' problems are very rarely seen in Indian writings. Mahesh Dattani is one of the powerful Indian writers in portraying the issues which are serious but neglected, prominently about gender discrimination. Even though many of his plays focus on contemporary issues like corruption, communal rivalries, male superiority but his main attention is on the problems of Transgenders. They are shown as the victims of our own human society. *Seven Steps Around the Fire,* a significant play of Dattani that deals with the sufferings of these transgenders through the help of the character Kamla. It is a tragic play of Kamla, a beautiful eunuch who loves Subbu, a minister's son and marries him but gets killed just because she is a transgender. Uma is another major character who brings into limelight the sufferings of these transgenders and reveals the murder mystery of Kamla with the help of Anarkali. Two tragic incidents are shown in this play the first is the murder of Kamla and another is

www.ijcrt.org © 2020 IJCRT | Volume 8, Issue 8 August 2020 | ISSN: 2320-2882

the death of Subbu. This play deals with the emotions of transgenders as all human beings feel and advices for the

Marginalization Through Servitude: An Analysis of Bandhumadhav's *Poisoned Bread*

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***P**oisoned Bread,* is a short story authored by Bandhumadhav, a Marathi writer, who contributed his works for the marginalized and elevated their sufferings in an effective manner. It was translated into English by Ramesh Dnyate. The story presents the class marginality of Mahar clan (Mangs) by Upper caste land lords in an auto biographical tone. It also highlights the divergent opinions of two generations against marginality. The Indian age old slave system and the atrocities done by land lords in the name of servitude on marginalised are portrayed in this story. It shows the picture of the sufferings of the marginalised people through the characters of Yetalya and his grandson Madhav. Yetalya, an old man of Mahar's clan is one of the important characters of this short story. He is shown as a slave who works in the field of Bapu Patil, lost his land and becomes a hereditary slave to land lord's family.

Yetalya works under a land lord named Bapu Patil, does full hard work to get some food for the family. He is very obedient, mutely bears the atrocities done by upper class people. He considers himself as a beggar before high-caste people. He was intolerated by the land lord and was very often humiliated even treated lesser than an animal just because he belongs to marginalised sections of people. They have no right to lead their independent lives and to go for self-employment. They were panic even to speak before upper caste communities. The story reflects how land lords trouble oppressed community people. The story begins with the struggle for the meagre need of Yetalya's family that is the food for the family to feed. With the hope of getting a share of Jowar from Bapu Patil the old man takes his grandson to Patil where he gets insulted. Even to get the work for that day he pleads Patil, "My lord is our bread – giver and we find it a privilege to beg for our share of corn, master. I am your begging Mahar and feel proud to be so."(167)

Mahars, the marginalised caste people have no bread to eat of their own. They were made

IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

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Physical Deformity as a Source of Gender Discrimination in Mahesh Dattani's *Tara*

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Tara, a play in three acts, is perhaps the most famous play of Mahesh Dattani. Just as his other plays portray many of the prevalent issues of modern society, *Tara* also stands as a replica in reflecting a contemporary social issue, gender discrimination. Discrimination through gender is a common phenomenon in Indian society even after independence and social reforms. *Tara* throws light on marginalising a girl child emotionally by her family just because of her gender. The play is completely woven around an urban, educated high middle class family. It was enacted for the first time with the title "Twinkle Tara" on 23 October 1990 by Playpen theatre group in Bangalore.

The play has many sentimental incidents leading to a tragic end. Tara, a young girl, is the central character in this play who gets discriminated by her own family and witnesses many painful experiences till the end of her life. Chandan, Tara's brother, is one of the major characters in this play, who changes his name as Dan and writes the story of his sister after her death. Dan is full of guilt for Tara's death and regrets it by writing her story. The characterisation of Tara reflects the conditions of many Indian girls who lead a life of compromise at every stage for having been born a girl. Tara is a peace loving and calm going defender of her family and never raises her voice for her comforts but mildly bears injustice. In the words of Sushma Seth, "Tara is the story of conjoined twins separated at birth, by a surgical procedure intended to favour the boy over the girl. Told through boy's reflections on his childhood memories, Tara's story is also a reflection of the feminine struggle for expression both physically and emotionally in a patriarchal Indian society" (43)

Homosexuality under Social Constraints: A Study on Dattani's *Do the Needful*

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Abstract:

Society is beingrun by a system of social inclinations and people are strictly prohibited to violate such social norms.The social institutions of Marriage and familyare the most important parts of our life. Post-Independent India attains progress in almost all the fields, butthe progress in society is leading to societal transformation from traditional to modern. Change is a common in every aspectand it is an essential phenomenon to meet the needs of advanced ideologies. Western culture and life styles are welcomed into our society with utmost curiosity. With the welcome of western thoughts into our society, modern ideologies have emancipated our society by eliminating many social evils from society but at the same time extreme levels of violating social norms seem to indicate an alarm towards deteriorating social values in present generation. The play *Do the Needful*examines the results of violating social restrictions in different ways;development of negative attitude towards marriage institution among young generation and sufferings of homosexuals under heteronormative society. However, the thorough examination of the play enables to ascertain that the major theme of the play is to portray the sufferings of homosexuals.

Key words: social inclinations, post-independent, transformation, ideologies, social evils, casteism, homosexuals, heteronormative.

Homosexuality is widely known but less acceptable even in highly advanced nations. Many people in traditional clutches consider it as sin and unnatural. This community doesn't

A Psychological Trauma: Dattani's *On a Muggy Night in Mumbai*

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Abstract:

Homosexual community is one of the marginalized sections of our society all over the world. Many studies have been made to know the reasons for the "abnormal" sexual orientation among homosexuals. The American Psychiatric Association did a lot of researche on the psychology of homosexuals. Through these scientific studies, the Association earlier considered them mentally abnormal, but later on came out with a different approach and started treating them as other human beings of our social system. Dattani's *On a Muggy Night in Mumbai* depicts two types of discrimination: against women and against homosexuals. Patriarchal Indian society does not accept homosexuals as a part of our society. Homosexuals, face many problems that deprive them of a comfortable life that any common human being aspires to lead. These marginalized people experience a psychological trauma as a result of the social discrimination against them. The play deals with homosexual relationships and the fear of gays and lesbians to reveal their gender identity in society. It also deals with the negative aspects of homosexuals, who, behaving like heterosexuals play with the lives of innocent people. The separate world of gays and lesbians, and their isolated life styles show them as victims of a heterosexual world. These homosexuals form into groups to share their sorrows and happiness with one another. The fact that they are illtreated by society makes them more drown to Homosexuality. The paly *On a Muggy Night in Mumbai* throws the light on the fact

Identity crisis through gender bias in Dattani's *Dance Like a Man*

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Abstract:

Gender difference is a common but seriously found phenomenon in Indian society. Inspite of major reformative acts in our country, there is a great demand for the social transformation and reformation in society even today. Our Society is still confined to its rigid, age old thoughts and limitations which have become hurdles in our social progress. In general, discrimination is shown on the part of female community but Mahesh Dattani's play *Dance Like a Man* shows it on the other part in realistic perspective. He shows how a male dancer struggles to get his identity as a dancer in society and dies without tasting much success. He is shown as a victim of gender bias. The play majorly talks about the sufferings of Jairaj, a dancer, born and brought up in a wealthy family but always opposed and suppressed by his father. He is tormented by his own people for selecting Dancing as his profession. Though there is a liberty for him to select dancing as a profession and but he is not allowed to prosper as a great dancer in his career because of the belief that Dancing profession is not meant for men. Change in thought from one generation to another generation is shown in this play by using three generatins of Jairaj's family. He signifies the need for the change in societal thought by throwing light on the sufferings of Jairaj, as a professional dancer.

Key words:

Gender, Transformation, Reformation, Hurdle, success, Identity, victim, liberty, Generation

Dance Like a Man is one of the most popular plays written and directed by Dattani. The play was performed for the first time at Chowdiah Memorial Hall, Bangalore, on 22 September 1989 as a part of Deccan Herald Theatre. Though most of the plays of Dattani deal with the female identity problems and gay culture, *Dance Like a Man* deals with the problems of a male dancer, whose only passion is to to dance. This play focuses on various contemporary issues of society such as the Indian marriage system, caste system, male perception towards dancing women, and a man's passion for dancing. According to Beena Agarwal, "In the play *Dance Like a Man*, Dattani expresses his resentment for closefisted

Kalyan Bharati
ISSN No. 0976-0822
(UGC-CARE List Group I)

CHILD SEXUAL ABUSE AS A SOCIAL REALITY IN MAHESH DATTANI'S *THIRTY DAYS IN SEPTEMBER*

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Abstract:
Child sexual abuse, the most inhumane act of human society is portrayed by Dattani through his three acts play *Thirty Days in September*. The play examines the psychological trauma faced by the victim of child sexual abuse. Mala and Shanta, the two women characters are shown as the victims of incest and forced sexual relations. Through the female characters in the play, Dattani displays women as the pain bearers of sexual assault. Shanta, Mala's mother is the first lady who becomes a prey to the desires of Vinay in her child hood. Vinay, the most vulnerable character in the play makes use of the financial needs of Shanta and her daughter Mala. He makes both the mother and daughters as the victims of his beastly desires. The effect of forced physical relations make Mala to suffer psychologically. Being seduced by her uncle, Mala gets addicted to indulge herself in to sexual relations with other men. Throughout her life she is haunted with the ghostly memories of her uncle Vinay.
Key Words: trauma, incest, sexual assault, prey, victims, indulge, haunt

Mahesh Dattani, one of the greatest playwrights of India and the first playwright, winning Sahitya Akademi Award is known for the representation of many social issues of contemporary society, which were not discussed earlier by any other writer in Indian English literature. He largely discusses gender discrimination, child sexual abuse, homosexuality and transgender's problems in his plays. *Thirty Days in September* is one among his plays, which reflects the child sexual abuse in urban society. Through this play Dattani examines the psychological trauma of a girl child, who becomes the victim of incest, the most heinous act.

The play *Thirty Days in September*, while examining the most vulnerable issue of child sexual abuse, also deals with the conditions of Indian women, who bear the mental torment without any one's notice. Two different women characters are represented in this play by Dattani; the one who bears the pain and the another who reacts against the torment. The play majorly throws light on the influence of sexual atrocity both on the body and soul of a girl child. Mala, a young daughter of Shanta is molested by her own uncle Vinay at the very adolescent age of thirteen years. This affects her very much, since then she addicts herself to sexual longings. By giving Mala as an example character, Mahesh Dattani clearly portrays the adverse effects of child sexual abuse on young minds. As aptly opined by Bijay Kumar Das,

> This is a family play in which incestuous relationship ruins the lives of girls in their puberty and young women at tender age. Mala and Shanta are victims of such outrageous relationship. Morality is thrown into wind. Dattani explores a dark area in our social and family life with insight. His play reminds us of a changing society under the impact of globalization. (28)

Mala feels alone and believes that her own mother is responsible for her pathetic situation. She detaches herself from her mother and questions her for not caring and not responding to her, when she was being seduced by her uncle. She blames Shanta that, if she intended, she would have saved her from the evil intentions of her uncle. But she realizes her mistake, that her mother is also the victim of similar torment by the same person from many long years and regrets.

Shanta is always shown busy in standing in front of the statue of Lord Krishna and worshipping him. She avoids all the complaints given by her daughter against her uncle Vinay and deviates her by feeding with her favorite stuff. She responds to the pain of Mala, when she insists her mother for being responsible of spoiling her life. Shanta out of unbearable agony opens her mouth about the bitterness of her own life. She confesses that she kept silent for the kind of financial support they were provided by Vinay and addition to that she reveals the darker side of her life that she was also

Deprived relations under Patriarchal hegemony: A study on Dattani's *Where there's a will*

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Abstract:

Dattani's *Where There is a will* is one of his best plays portraying typical family relations of contemporary society. He discusses various issues in his plays but the present play *Where There's a Will* deals with a serious issue of a wealthy family in a comical tone. Relations play a vital role to lead a happy and comfortable life but it is quite contrast for the people who cannot find happiness in their family. Dattani colours the same problem of an industrialist who fails to enjoy a happy family life in a wonderful manner. The play is weaved around 'a will' prepared by an old man to get a grip over his family, especially his son. Patriarchal domination of a father over all the other family members is the major subject of the play and how the same hegemony leads to his death is touching. The play throws a light on the traditional settings of the Indian family system along with the focus on materialistic thoughts of modernism.

Key words:

Contemporary society, patriarchal domination, traditional, materialistic thoughts, modernism.

The play *Where There's a Will* can be considered a different work of art among all the plays of Mahesh Dattani. Most of his plays deal with Gender discrimination, Gay culture and Post-partition conditions. But the present play is different in its subject as well in its narrative technique. The plot in this play is about the preparation of a will by the head of the family to teach a lesson to his family members for not obeying him and becomes a victim to the conspiracy woven by his own family member due to his rigid attitude. The play is about a man of forty five years old, Hasmukh Mehta, a wealthy person of his town. He is characterised as a dictator, allowing none of his family members to act according to their wish. His relation with any other family member is not cordial. He is the central character in the play. He is utterly disappointed old man due to his only son Ajit. Throughout the play he

Ek Alag Mausam: A Mirror for the Lives of AIDS Victims

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Mahesh Dattani, a famous Indian Playwright portrayed the plight of AIDS patients in Indian society through his screen play *Ek Alag Mausam*. As he is popularly known for representing the problems of marginalized sections of society, he raised his voice in protest against the discrimination shown against the AIDS patients. The play discusses in detail the predicament faced by HIV positives in Indian society. The AIDS patients are segregated and discriminated from the common stream of public due to ignorant beliefs of many people. There are certain prevailing myths pertaining to this disease that the people of unethical character get infected with HIV virus. Many people in our society are not aware of the possibilities of transmission of this disease. Mahesh Dattani, in his play *Ek Alag Mausam* not only discusses the poor conditions of AIDS patients but also asserts that these invisible and discriminated people too deserve to get love, care and concern in society as other common people get. They are shown in a predicament whether to cope up with their desires and lead a secluded life or to question the society for their survival as they deserve to lead the life like the other living human beings. Bijay Kumar Das opines,

> *Ek Alag Mausam* (*A Different Season*) is really a different kind of play on the latest dreaded disease HIV positive (AIDS). To write a play on AIDS victims and the reactions of the people to them is to bring alive the contemporary society which shows the predicament of human lives against the onslaught of this disease. Reader-Response criticism can be applied to this play to unfold human agony as well as selfishness of other people who avoid such diseased persons as untouchables. In this play a number of people are affected by this disease and Dattani shows how they live in the society knowing that their days are numbered. (88)

K.P. Sasi was the director of the movie *Ek Alag Mausam* which was released on 4 February 2005. An NGO named Action aid India, working for the welfare of AIDS patients helped in