CHRISTIAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.)

3.3.1 SUMMARY REPORT

3.3.1 Number of research papers published per teacher in the Journals notified on UGC care list during the last five years

No. of research papers published per teacher in the Journals notified on UGC care list on UGC website					Total
Year of Publication					
2022	2021	2020	2019	2018	
10	8	10	1	0	**29**

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Proceedings of the 5th International Conference on Inventive Research in Computing Applications (ICIRCA 2023)
IEEE Xplore Part Number: CFP23N67-ART; ISBN: 979-8-3503-2142-5

Advancing Cybersecurity with Explainable Artificial Intelligence: A Review of the Latest Research

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2023 5th International Conference on Inventive Research in Computing Applications (ICIRCA) | 979-8-3503-2142-5/23/$31.00 ©2023 IEEE | DOI: 10.1109/ICIRCA57980.2023.10220797

***Abstract*—The use of artificial intelligence (AI) in cybersecurity has become increasingly common, but a key challenge is the lack of transparency and interpretability of AI models. Explainable Artificial Intelligence (XAI) can address this issue by providing a means of enhancing the transparency and interpretability of AI models, enabling cybersecurity professionals to better understand the decisions made by these models and to identify errors or biases. This review article provides a comprehensive overview of the latest research on the application of Explainable Artificial Intelligence (XAI) in the context of cybersecurity, with a focus on its benefits and challenges. Specifically, it analyses the most recent techniques and tools for implementing XAI in cybersecurity, while also highlighting several successful use cases. Furthermore, it delves into the ethical and regulatory considerations associated with XAI in cybersecurity and provides recommendations for future research in this area. The ultimate objective of this review article is to furnish cybersecurity professionals with a detailed understanding of the potential of XAI to enhance the efficacy of AI-based tools in cybersecurity, underscoring the significance of transparency and interpretability in assuring the security and dependability of AI systems.**

***Index Terms*—Explainable Artificial Intelligence,Intrusion Detection System, Botnet,Cybersecurity**

I. Introduction

Artificial Intelligence (AI) has become an integral part of our lives, revolutionizing the way we work, communicate, and interact with the world around us. In the field of cybersecurity, AI has the potential to transform the way we detect and respond to security threats, allowing us to stay one step ahead of cybercriminals and hackers. However, the adoption of AI in cybersecurity presents unique challenges, particularly in terms of transparency and interpretability.The contribution of AI to cybersecurity are summarised below:

1) Threat detection and analysis:: Large data sets can be analysed by AI-powered systems to find patterns and anomalies that might point to possible cyber risks. Machine learning algorithms can recognise known attack signatures and spot new threats by learning from enormous datasets.

2) Malware detection: : Using indicators such as behaviour, code analysis, and other data, AI systems can be trained to recognize and categories various types of malware. This makes it possible to identify dangerous software more quickly and accurately, which aids in its prompt mitigation.

3) Intrusion detection and prevention:: AI systems are able to monitor network traffic and spot suspicious activity or unusual behaviour that might point to intrusions or unauthorised access. AI algorithms are able to recognise and react to potential security breaches by examining network records, user behaviour, and system activities.

4) User authentication:: By utilising biometric authentication, behavioural analysis, or facial recognition, AI technology can improve user authentication procedures. These methods make it more challenging for unauthorised individuals to access systems and confidential data.

5) Vulnerability management:: AI tools can assist in identifying vulnerabilities in software and systems by automating the scanning and analysis of code, configurations, and infrastructure. This helps organizations prioritize and patch vulnerabilities before they can be exploited.

6) Automated incident response:: AI systems can accelerate incident response by automatically analyzing and correlating security events, providing real-time alerts, and suggesting remediation actions. This improves the efficiency of cybersecurity teams and reduces response times.

7) Threat intelligence:: AI-powered tools can aggregate and analyze large volumes of threat intelligence data from various sources, such as forums, dark web, and security feeds. This enables the identification of emerging threats, trends, and vulnerabilities, enhancing proactive defence measures.

8) Phishing and fraud detection:: AI algorithms can analyze email content, URLs, and user behavior to detect phishing attempts and fraudulent activities. By identifying suspicious patterns and using natural language processing techniques, AI can help prevent social engineering attacks.

Sentiment analysis on newspaper article reviews: contribution towards improved rider optimization-based hybrid classifier

Pandiaraj A., Sundar C., Pavalarajan S.

Kybernetes

ISSN: 0368-492X (International Standard Serial Number.)

Article publication date: 18 March 2021

Issue publication date: 5 January 2022

Abstract

Purpose

Up to date development in sentiment analysis has resulted in a symbolic growth in the volume of study, especially on more subjective text types, namely, product or movie reviews. The key difference between these texts with news articles is that their target is defined and unique across the text. Hence, the reviews on newspaper articles can deal with three subtasks: correctly spotting the target, splitting the good and bad content from the reviews on the concerned target and evaluating different opinions provided in a detailed manner. On defining these tasks, this paper aims to implement a new sentiment analysis model for article reviews from the newspaper.

Design/methodology/approach

Here, tweets from various newspaper articles are taken and the sentiment analysis process is done with pre-processing, semantic word extraction, feature extraction and classification. Initially, the pre-processing phase is performed, in which different steps such as stop word removal, stemming, blank space removal are carried out and it results in producing the keywords that speak about positive, negative or neutral. Further, semantic words (similar) are extracted from the available dictionary by matching the keywords. Next, the feature extraction is done for the extracted keywords and semantic words using holoentropy to attain information statistics, which results in the attainment of maximum related information. Here, two categories of holoentropy features are extracted: joint holoentropy and cross holoentropy. These extracted features of entire keywords are finally subjected to a hybrid classifier, which merges the beneficial concepts of neural network (NN), and deep belief network (DBN). For improving the performance of sentiment classification, modification is done by inducing the idea of a modified rider optimization algorithm (ROA), so-called new steering updated ROA (NSU-ROA) into NN and DBN for weight update. Hence, the average of both improved classifiers will provide the classified sentiment as positive, negative or neutral from the reviews of newspaper articles effectively.

Modified U Net Based Learning Model for Semi Supervised Medical Image Segmentation

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2022 International Conference on Power, Energy, Control and Transmission Systems (ICPECTS) | 978-1-6654-6275-4/22/$31.00 ©2022 IEEE | DOI: 10.1109/ICPECTS56089.2022.10047135

***Abstract*—The applications include scene interpretation, medical image processing, robotic perception, video based scrutiny systems , augmented and virtual reality, among many others the image segmentation is a being a key topic. In the literature, many picture segmentation methods have been created, and there have been a lot of recent efforts aimed at creating image segmentation algorithms using deep learning models due to the success of these models in a broader range of vision based utilities. The adaptability of a learning model to segment medical images like Modified U-net based convolution neural network has shown good results in retinal vessel region extraction and has greater feature learning capability.Therefore, using the DRIVE and STARE datasets, we compare the accuracy, specificity, and sensitivity of modified U-Net deep learning with those of the U-Net model, and we also highlight several promising future research directions.**

***Index Terms*—CNN, Multiple sclerosis, FCN, Modified U-net**

I. Introduction

Huge amounts of labelled data are typically required to train deep neural networks. However, labelled data is sparse in the medical industry since human annotation is laborious and time-consuming. When training the models with a constrained quantity of labelled data, it is unable to give assurance that these models will generalise effectively on unexplored data domain which is distributed differently. Distributed numerous sclerosis scratch segmentation in MR images serves as a noteworthy illustration in this regard. This process is hampered by a lack of ground truth data as well as distribution shifts across pictures taken with various devices.Large volumes of unlabeled data, however, are usually comparable and simple to deliver. For the purpose of deep network training, semi-supervised learning is capable of using together the finite quantity of labelled data and also the arbitrary quantities of unlabeled data. A framework is provided for artificial neural networks, shallow CNNs supported by manifold embedding, and several architecture for semi-supervised deep learning are described in 2012 [3]. They induced the specification of nearby labelled and unlabeled data samples will become more similar using an extra embedded loss function coupled to arbitrary unknown layers and adjacency among sample input, leading to increased generalization. When enhancing a model using guesses on unlabeled data and an entropy regularisation failure, it was also shown in 2013 [4] that the generalisation was enhanced. In 2015, it debuted the ladder standard for semi-supervised deep learning, which was more recent. Recently, a framework for shallow neural networks also allowed graph embeddings, including both transudative and inductive forms. Although all of these techniques produce promising results, they are all designed for use with traditional framework of CNN and are frequently tested on computer vision datasets of smaller size. The Fully Convolutional Networks (FCNs), that are effective and have capacity to understand context, are preferred in difficult situations like biomedical picture segmentation. We are all aware that currently no semi-supervised learning approach for such FCN's. In this study, we extend notion of auxiliary manifold that are embbeded to FCNs using a unique approach dubbed "Random Feature Embedding." The difficult task of segmenting dispersed Multiple Sclerosis (MS) lesions was then accomplished using our suggested embedding approach by semi-supervised learning of FCN's for domain adaption.

II. RELATED WORKS

In [10] and [9], several vascular segmentation techniques were examined using two dimensional retinal pictures obtained from a specialized fundus camera, and the summary of various methods was presented in a far precise manner. In intention to boost-up the segmentation preciseness, the author of [11] created a deep convolutional neural network (CNN) that takes advantage of particular properties of the input data of retinal image is to be apply to deep learing process. According to [1], an evaluation the efficacy in the latest developed spatially adaptive contrast enhancement approach for improving retinal fundus pictures in vascular segmentation is made. A innovative deep learning technique for segmenting and extracting the cen-

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Back

Research Article | Open Access

Content Deduplication with Granularity Tweak Based on Base and Deviation for Large Text Dataset

S. Venkatesh Babu, P. Ramya, Jeffin Gracewell

First published: 2022
https://doi.org/10.1155/2022/9515181

Academic Editor: Zhiri Tang

Abstract

The concept of storage optimization has evolved as one of the hottest research projects in big data which brings out better solutions such as data compression which almost converges towards the deduplication technique. Deduplication is a technique that finds and eliminates duplicate content by storing only the unique copies of data whose efficiency is being qualified based on the amount of duplicate content that they hideout from the data source. The deduplication technique is a well-established storage optimization technique, so in the due course of time, various tweaks have been provided for its betterment, but it quite has some limitations that it cannot determine the tiny changes that occur among similar contents, and the chunks which are generated by segmenting and hashing the data are more sensitive to changes which produce a new chunk for every small change which ruins the concept of storage optimization, so to tackle this, content deduplication with granularity tweak (CDGT) in the Hadoop architecture has been proposed for large text datasets. The CDGT aims to improve the efficiency of deduplication by utilizing the Reed Solomon technique. This pumps out more duplicate content by verifying both intracontent and intercontent as consequence performance enhancements are met, and this system incorporates cluster-based indexing to reduce the time involved in data management activities.

1. Introduction

The cloud is a wonderful option to store data from pervasive entities, which attracts the digital world toward itself, and as a result it becomes the universe for data and services. The flexibility provided by the cloud, like the accessibility of services and data by user from anywhere which attracted huge number of user towards cloud as a result of it. Large amount of digital content of zettabytes in size is being dumped into the cloud environment and to realize the scenario the amount of data stored in the cloud has neared one hundred zettabytes at the end of 2020

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

Experimental Investigation of Bricks Made With Eco Sand and Foundry Sand, With Fly Ash Replacement for Part of the Cement

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Abstract : Eco sand and foundry sand are the definitive types of brick making these must continue to evolve sustainably and create competitive within the industries, while at same time being a long-term construction material, must have high energy efficient and cheap in cost. Eco sand and foundry sand were mixed with cement partial replacement of fly ash and water then cast into shape. Compression and water absorption of bricks were detected. The outcome illustrated that the test bricks had higher compressive strength and higher water absorption when placed after that to the presented masonry blocks. Sand from the environment and foundry sand are combined with cement, fly ash and water then cast into shape. To handle the ecological pollution we are using this variety of sand. Eco sand and foundry sand possess attractive properties and good strength. The results demonstrate that a mix of Eco sand, foundry sand, cement and Fly ash produces superior new bricks at a lower cost.

Keywords: Eco sand, Foundry sand, Fly Ash, Compression and Water Absorption.

1 INTRODUCTION

Bricks are the most often used building material; however tiles, refractory bricks, earthenware, and stoneware are all used for diverse construction purposes. Walls, columns, roofing, paving floors, and coarse aggregates for concrete construction in foundation under-floors are only a few of the applications for bricks.

- Bricks should have a consistent shape and size, and when knocked together, they should make a distinct ringing sound.
- Processes in industry the bricks should have a low thermal conductivity and be soundproof.

Convert industrial wastes into useable building and construction materials is a major challenged for Civil engineers, especially in the recent decade, due to a significant demand placed on the building material sector due to the getting higher population, this creates a constant scarceness of construction materials. Recycling trash into construction materials will be a more environmentally friendly alternative. The growing use of eco friendly, inexpensive, and light-weight construction materials in the manufacture sector demonstrates the necessity for recycling and reusing the resources. Bricks are classified into several types based on the raw materials used to make them. The materials used in bricks, as well as their characteristics and various testing, are detailed here. The index and chemical characteristics of Eco sand, Foundry sand, fly ash and cement vary greatly based on a variety of circumstances, including geographical location.

2 MATERIALS AND METHOD

2.1 Materials used

2.1.1 Cement

Throughout the investigation, locally available cement of the common Portland cement type (53 grade) was utilized, which was in accordance with IS 8112.

2.1.2 Fly ash

Fly ash brick is a type of construction material that includes class F fly ash is used to make masonry units. The specified compositions produce fly ash bricks with a strength of 7.5 to 10 MPa. Fly ash bricks are more durable than clay bricks, although they are heavier.

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
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Experimental Investigation on Reinforcement Corrosion in Bacterial Concrete Using Impressed Current Technique Method

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Abstract : Reinforced concrete structures form a major part of the engineering infrastructure of all developed countries, and their integrity over long periods of service is of vital economic importance. But the major drawback is its low tensile strength which causes cracking in concrete. When micro cracks growth reaches the reinforcement, not only the concrete gets damaged, but also corrosion occurs in the reinforcement due to exposure to water and oxygen, and possibly CO2 and chlorides too. Micro-cracks are therefore the main cause for structural failure. There are a range of crack repair procedures available, but traditional restoration solutions have a number of drawbacks, including a different thermal expansion coefficient than concrete and negative impact on the environment and health. As a result, bio-based calcite precipitation has been presented as a viable and environmentally acceptable fissure healing method.Bio-mineralization of calcium carbonate is one such strategy to remediate cracks in building materials. Because oxygen is responsible for initiating the corrosion process, the consumption of oxygen during metabolic biochemical processes to generate CaCO3 is predicted to aid in the arrest of corrosion of steel, therefore enhancing the durability of steel reinforced concrete structures.In this thesis, an attempt has been made in the first phase to find the optimum concentration of bacterial cells to be incorporated in concrete. Based on the state-of-the-art information available in the literature three different bacterial samples are considered in concentrations of 104,105 and 106 cells/ml. The bacteria considered are Bacillus subtilis,Pseudomonas aerugonisa and Bacillus megaterium and the optimum concentration is found to be 105, 105 and 104cells/ml respectively based on compressive strength results.

Keywords: bio based calcite precipitation ,Bio-mineralization of calcium carbonate, CaCO3, Bacillus subtilis, Pseudomonas aerugonisa and Bacillus megaterium and the optimum concentration.

1 INTRODUCTION

The history of civil engineering and the use of cementing materials goes back as far as Egyptian times. The ancient Egyptians used calcined impure gypsum. The Greeks and Romans utilized calcined limestone, and subsequently learned to add sand and crushed stone, or brick and broken tiles to lime and water. This was the world's first concrete. Isaac Johnson invented modern cement in 1845, when he burned a combination of clay and chalk until it clinked, allowing the reactions essential for the production of powerfully cementitious compounds to occur.Concrete is one of the most versatile and widely used construction materials of all in the world. The proportionate mixture of cementing materials, water and aggregates, and sometimes admixtures, when placed in forms and allowed to cure, hardens into a rock-like mass known as concrete. The chemical interaction between water and cement causes the hardening. The voids of bigger particles (coarse aggregate) are filled by smaller particles (fine aggregate), and the voids of fine aggregates are filled with cement in this hardened concrete. The idea of considering concrete as a whole rather than its constituents as a construction material is gaining traction.The interest is now in having the desired properties of concrete without bothering about the ingredients.Concrete has high compressive strength, but its tensile strength is very low and hence cracks easily. In situations where tensile stresses are developed, the concrete is strengthened by steel bars forming a composite construction called Reinforced cement concrete (RCC). Reinforced concrete buildings are an important element of all industrialized countries' engineering infrastructure, and their long-term durability is critical to their economic viability.

1.1.Cracks - A Pathway for Corrosion Acceleration

Though concrete is quite strong mechanically, it is highly susceptible to larger tensile stress, and thus concrete structures get damaged and even fail unless some measures are adopted to counteract deterioration of concrete and thereby increasing the durability of concrete structure. A durable concrete is dense, workable having permeability as low as possible under the given situation. In the case of reinforced concrete, the ingress of moisture or oxygen through the cracks may lead to corrosion of steel,

ScienceDirect

Materials Today: Proceedings

Volume 39, Part 1, 2021, Pages 776-780

Mechanical and flexural behaviour study on fibrillated concrete as partial replacement of M-Sand and metakaolin

R. Abiraami [a], R. Anuradha [b], V. Johnpaul [c], M. Guruprasad [d], R. Gobinath [e], A. Sivakrishna [d], S. Shrihari [f]

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Abstract

Generally, the fine aggregate of the concrete mix facilitates a huge workable one. Currently, there is a demand in river sand supply to undertake construction work. Compared to the river sand, M-Sand works as an eco-friendly resource. Metakaolin, introduced to increase the compression and the bending nature of concrete. Steel fibre is used to measure the ductility of the concrete. The experimental work carried out by preparing five concrete mixtures varying 10% of M-Sand ranging 60–100 percent by weight of fine aggregate, 15% by weight of cement, and 1% by volume of steel fibre; the fraction kept constant based on previous studies. Various proportions of M30grade concrete were examined by conducting mechanical and flexural behaviour tests. The results obtained are satisfactory for 80% of the M-Sand replacement. Additional M-Sand replacement tends to reduce concrete strength.

RETRACTED ARTICLE: A hybrid metaheuristic approach for efficient feature selection methods in big data

Original Research Published: 01 January 2020

Volume 12, pages 3743–3751, (2021) Cite this article

Journal of Ambient Intelligence and Humanized Computing

Aims and scope

Submit manuscript

S. Meera & C. Sundar

This article was retracted on 19 May 2022

This article has been updated

Abstract

The big data is based on the 3V challenges that are the volume, the variety, and velocity. Big data is collected from various sources and it is seen that data comes in a various format in high speed that are gathered together rapidly as well as they are created as an ancient batch models where it is infeasible to process in real time. Big data has become an imminent part of all industries and

Big Data > Vol. 8, No. 2

Research Article NO ACCESS Published Online: 17 April 2020

SecDedoop: Secure Deduplication with Access Control of Big Data in the HDFS/Hadoop Environment

Authors: P. Ramya and C. Sundar | AUTHORS INFO & AFFILIATIONS

Publication: Big Data https://doi.org/10.1089/big.2019.0120

Abstract

With the rapid growth of storage providers, data deduplication is an essential storage optimization technique that greatly minimizes data storage costs by storing a unique copy of duplicate data. Nowadays, deduplication introduces various new challenges such as security and insufficient space issue. Hence, in this article, we propose a secure data deduplication with access control of big data over HDFS (Hadoop **Distributed File System**)/Hadoop environment, called SecDedoop. First, the system achieves security for data confidentiality by third party vendor using elliptic curve cryptography. There are two types of keys (public key and private key) generated for data retrieval. Second, we consider data deduplication. The user's original file is divided into a number of equal chunks. Then, each chunk (e.g., 1. txt) is tokenized into words and the weight of words is computed by using TF-IDF frequency. The SHA-3 hash computation is performed to the user's original file. If the hash value is not duplicate, then we store data in HDFS. The PSO (particle swarm optimization)-based MapReduce model is the proposed best data node selection. Initially, MapReduce process is finished for the

RETRACTED ARTICLE: Automatic liver cancer detection in abdominal liver images using soft optimization techniques

Original Research Published: 06 April 2020

Volume 12, pages 4765–4774, (2021) Cite this article

Journal of Ambient Intelligence and Humanized Computing

Aims and scope

Submit manuscript

V. Hemalatha & C. Sundar

This article was retracted on 20 June 2022

This article has been updated

Abstract

The liver is present underneath the diaphragm and extends from right to left upper part of the belly. The liver is an organ which has many responsibilities for producing different chemicals needed for physical body. The conversion of an image into information is helpful for research people to share. The method of conversion prevents manual error because it depends on technology and algorithm.

Brain Tumor Detection and Segmentation by Intensity Adjustment

Patient Facing Systems Published: 12 July 2019

Volume 43, article number 282, (2019) Cite this article

Journal of Medical Systems

Aims and scope

Submit manuscript

P. G. Rajan & C. Sundar

Abstract

In recent years, Brain tumor detection and segmentation has created an interest on research areas. The process of identifying and segmenting brain tumor is a very tedious and time consuming task, since human physique has anatomical structure naturally. Magnetic Resonance Image (MRI) scan analysis is a powerful tool that makes effective detection of the abnormal tissues from the brain. Among different techniques, Magnetic Resonance Image (MRI) is a liable one which contains several modalities in scanning the images captured from interior structure of human brain. A novel hybrid energy-efficient method is proposed for automatic tumor detection and segmentation. The proposed system follows K-means clustering, integrated with Fuzzy C-Means (KMFCM) and active contour by level set for tumor segmentation. An effective segmentation, edge detection and intensity enhancement can detect brain tumor easily. For that, active contour with level set method has been utilized. The performance of the proposed approach has been evaluated in terms of white pixels, black pixels, tumor detected area, and the processing time. This technique can deal with a higher

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Article 414431

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Research article ○ Abstract only

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R. Khordad, S.A. Mohammadi
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Research article ○ Abstract only

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Shurong Wang, Yinsheng Peng, Long Li, Zhineng Zhou, ... Minghai Yao
Article 414363

Article preview

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Research article ○ Abstract only

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A.P. Sefage, M.A. Mamo, P.L. Masiteng, A. Balakrishna, ... L. Reddy
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Research article ○ Abstract only

Synthesis, characterizations, and electrochromic studies of WO_3 coated CeO_2 nanorod thin films for smart window applications

G.V. Ashok Reddy, Habibuddin Shaik, K Naveen Kumar, Hitha D. Shetty, ... B.H. Doreswamy
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Article preview

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Recent Trends in Electronics and Communication Systems

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Health Monitoring Iot Based Virus Fever Detection System Using Non Inversive Method

T. Chitra, Chitradevi M, C. Sundar

Abstract

Health monitoring IoT to detect and count platelet to diagnose virus Fever this reduces labour intensive, time and cost. Vital signs are indicators of the body's fundamental processes. Body temperature, heart rate, breathing rate, and respiration are the four primary vital indicators that healthcare professionals regularly check (respiration). They can be measured in a hospital, at home, during an emergency medical situation, or while travelling. On-invasive blood related parameters covering technology has come a transnational exploration content and a new system which could bring relief to a vast number of cases. This paper reviews the exploration progress and major challenges non-invasive blood glucose discovery technology in recent times, and divides it into three orders optics, microwave oven and electrochemistry, grounded on the discovery principle. In addition, the current exploration achievements and limitations non-invasive electrochemical blood related parameter seeing systems in nonstop monitoring, point-of- care and clinical settings are stressed, so as to bandy the development tendency in unborn exploration. With the rapid-fire development of wearable technology and transdermal biosensors, non-invasive blood related parameter monitoring will come more effective, affordable, robust, and more competitive on the request.

Keywords

Arduino IDE, Temperature Sensor, Heart rate Sensor, Temperature Sensor Respiration Sensor

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An Intelligent Intrusion Detection and Classification System using CSGO-LSVM Model for Wireless Sensor Networks (WSNs)

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Keywords: Wireless Sensor Network (WSN), Cuckoo Search – Greedy Optimization (CSGO), Network Security, Preprocessing, Intrusion Detection System (IDS), Support Vector Machine (SVM) Classification

ABSTRACT

Providing security to the Wireless Sensor Networks (WSN) is more challenging process in recent days, due to the self-organization nature and randomness of sensor nodes. For this purpose, the Intrusion Detection System (IDS) is mainly developed that supports to increase the security of network against the harmful intrusions. The conventional IDS security frameworks are highly concentrating on improving the reliability and safety of networks by using different approaches. Still, it limits with key problems of increased time consumption, more delay, and reduced efficiency, inefficient handling of large dimensional datasets, and high misclassification outputs. In order to solve these problems, the proposed work develops an intelligent IDS framework for enhancing the security of WSN by using the Cuckoo Search Greedy Optimization (CSGO) and Likelihood Support Vector Machine (LSVM) models. In this model, the most extensively used network datasets such as NSL-KDD and UNSW-NB15 are considered for validating this model. Initially, the dataset preprocessing is performed for normalizing the attributes based on the processes of irrelevant information removal, missing value prediction, and filtering. After preprocessing, the optimal number of features are selected and given to the input of CSGO algorithm, which computes the optimal fitness function for selecting the best features. Finally, the LSVM based machine learning classification technique is utilized for predicting the classified label as whether normal or abnormal. During results evaluation, the performance of the proposed security model is validated and compared by using different performance measures.

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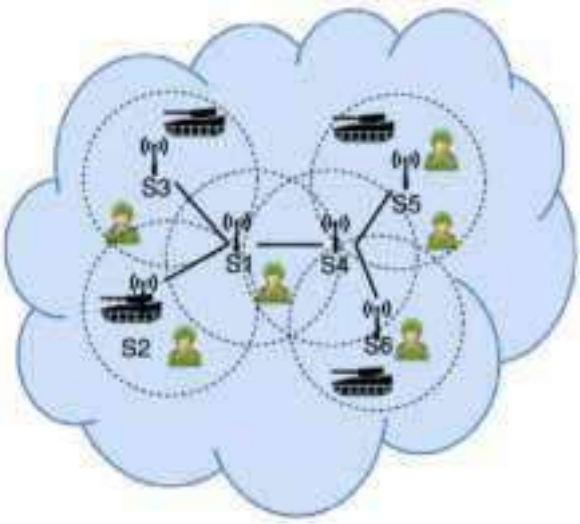

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Hemanand, D., Reddy, G. ., Babu, S. S. ., Balmuri, K. R. ., Chitra, T., & Gopalakrishnan, S. (2022). An Intelligent Intrusion Detection and Classification System using CSGO-LSVM Model for Wireless Sensor Networks (WSNs). *International Journal of Intelligent Systems and Applications in Engineering*, *10*(3), 285–293. Retrieved from https://ijisae.org/index.php/IJISAE/article/view/2167

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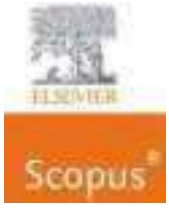

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Performance analysis of multicast routing using multi agent zone based mechanism in MANET

Document Type : Research Paper

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10.22075/IJNAA.2021.24657.2792

Abstract

Mobile Ad-Hoc Network (MANET) is a structure less and emerging technology in recent years. Generally, this structure forms a network with nodes with inherent characteristics, including resource heterogeneity, node reliability, etc. In this manuscript, we proposed a Multi-Agent-Based Zone Routing (MAZR) protocol for enhancing the performance of MANET. Our proposed MAZR is works based on the principle of packet forwarding through intermediate and zone leaders. It consists of multiple agents, which include static and dynamic mobile agents. The proposed implementation is done as follows: Initially discovering the zone leader's .The discovered zone leaders are connected to the communication nodes. The communication nodes and zone leaders are associated for building the network backbones for achieving multicast routing .To the multicast, zone members are connected .The zone managements, backbone and highly mobile nodes are initiated. The proposed MAZR protocol comprises five types of agents: Path agent, Network control agent, Multicast control agent, Network launch agent, and Multicast control agents. The Path agent, Network control agent, and Multicast control agent are static, and Network launch agents and Multicast control agents are mobile. The future protocol's performance is determined using the experimental work based on the evaluation metrics like delay, power consumption, and network lifetime. The obtained results prove the future MAZR is far improved than the Zone-based Hierarchical Link Protocol and Zone Routing Protocol in all aspects and ensures flexibility with versatile multicast service.

Keywords

Mobile Ad hoc Network (MANET) ; Multicast routing ; Zone protocols ; Backbones ;
Multi-Agent-Based Multi-Hop Routing (MAMR) protocol

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Volume 13, Issue 1
March 2022
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Int. J. Nonlinear Anal. Appl. 13 (2022) No. 1, 643–651
ISSN: 2008-6822 (electronic)
http://dx.doi.org/10.22075/ijnaa.2021.24438.2744

Investigation and classification of chronic wound tissue images using random forest algorithm (RF)

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(Communicated by Madjid Eshaghi Gordji)

Abstract

The broad increase make use of of digital cameras, by hand wound imaging has turn out to be common practice in experimental place. There is in malice of still a condition for a reasonable device for accurate wound curing consideration between dimensional facility and tissue categorization in a exacting simple to exploit technique We achieved the major unit of this plan by computing a 3-D model for wound dimensions using un calibrated revelation techniques. We highlight at this point on tissue classification from color and eminence region descriptors computed after unverified segmentation.

As a result of perception distortions, unconstrained lighting provisions and view points, wound assessments modify commonly in the middle of patient review. The majority significant separation of this article is to overcome this trouble by means of a multi inspection approach for tissue classification, relying on a 3-D model onto which tissue labels are mapped and categorization result merged. The investigational categorization tests communicate that improved repeatability and robustness are obtained and that metric assessment is attain through appropriate region and degree dimensions and wound chart origin.

In this manuscript we proposed wound image segmentation, tissue classification in grouping with the Random Forest (RF). These methodology are helpful for classifying the rate of injured tissue in a segmented element and improved accuracy.

Keywords: Mean Shift Filtering, Region Growing Method, Neural Network, and Random forest Classifier, Tissue classification.

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Received: April 2021 *Accepted:* September 2021

1. Introduction

1.1. Experimental Exercise

The broad ranging lesion estimation go behinds the patient assessment. The injure assessment will describe the position of the injure and begin to mark restriction to the curing process. Blockade consisting of restricted and widespread factors may difficulty or impede healing. During the evaluation it's significant to sort these element to begin earlier lesion healing every time possible.

Cataplasms are constituent of a entire wound running sketch by means of particular long-suffering goals. Individual objective could also be to assist earlier wound curing by on stipulation that the best environment for healing to maintain However, it's essential to seem at the entirePatient, original disease operations and patient-consolidate concerns previous to examination at the wound itself.

Wound bed training extends the existing perform of applying a aggregate come close to guage and takes away all blockade to healing, in sequence that abrasion repair can development usually. The common aim of managing is to apprehend a steady wound that has strong disintegrated tissue and single that is described by a well- vascularized wound cradle.

Figure 1: Tissue type (a) granulation, (b) slough, (c) necrotic.

2. Routine Wound Segmentation

As [1] stable Picture element arrangement proved to be ineffectual we experienced several greatly establish unsupervised segmentation algorithms competent on consistency pictures , to provide an regular marking out of tissue instance and to cut down the subsequently categorization stair by means of wresting extra robust and discriminating restricted assign on tissue regions : the color structure code (CSC), efficient graph-based image segmentation (EGBIS) , mean shift, and J-SEG the plain outcome were acquired by means of J-SEG (average OS of 73.1%), by transfer to each unspecified area the type of tissue generally displayed within the equivalent region of the medical orientation and constitute the OS connecting the allocate labeling and hence the medical indication.

Figure 2: Illustrated interfaces for the high-quality guide category.

The control of the J-SEG algorithm inside the separation of the segmentation process into two liberated giving out stages: color quantization and spatial segmentation These two ladder are restricted by free specification which must be particularly tuned to modify the quantity of output areas: subordinate segmentation leads to miscategorization of areas which contain several component of tissues, though over-segmentation enlarge the subsequently and intermission and guide to arrangement misconception on little element where ordinary and strong descriptors can't be obtained without analytical indication.

Tissue Categorization from a Preferred Assessment

2.1. Characteristicvector Generation

The color and quality label formerly realistic in internist imaging systems, particularly for wound and ulcer tissues. Color is perhaps the massiveness common presiding image on time as established by the red/yellow/black remedial picture estimation through experimental visits. The colour label we've extracted are: the mean color descriptor (MCD), the locally adapted dominant color descriptors (DCD) supported the mean shift iterative color clustering algorithm and 2-D and [2]3-D color histograms, experienced in disparate color area and sizes.

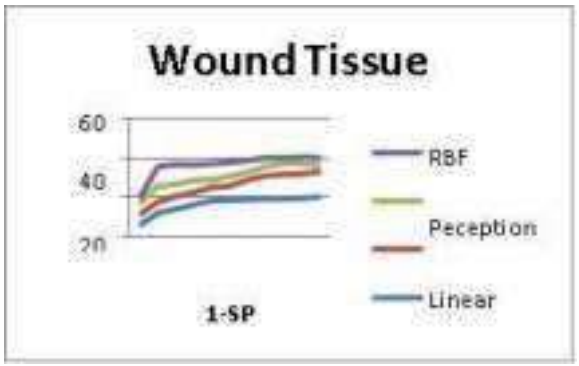


Figure 3: ROC twist acquire by four dissimilar kernels.

3. Literature survey

3.1. 3-D dimension and tissue arrangement

The separation relating to to calculation of a [7]3-D representation has been accessible, and at the same time as the categorization tool has also formerly been express personally During this script, we reveal that the adding of those two modules gives contact to enhanced tissue and size as some views are combined to categorize the tissues and so the outcome mapped straight onto the network outside to attain tissue areas.

Consistency features was bring out using GLCM technique. The yield from GLCM was providing for as the input to SVM for classifying into cancerous and noncancerous module.

3.2. Meanshift Filtering

Mean shift is a procedure for locating the maxima of a consistence task given discrete values sampled from that function. It is helpful for determine the modes of this thickness. This is an iterative method, and we begin among an inventive estimate x. Let a kernel function $K(x_i - x)$

be given. This function determines the weight of close by Points for re-evaluation of the involve on typical we use the Gaussian kernel the space to the current approximation,

$$K(x_i - x) = e^{c\|x_i - x\|^2}$$

The weighted mean of the density inside the window determined by K is

$$m(x) = \frac{\sum_{x_i \in N(x)} K(x_i - x)x_i}{\sum_{x_i \in N(x)} K(x_i - x)}$$

Where $N(x)$ is that the region of x, a group of points that $K(x) \neq 0$. The mean-shift algorithm at this time sets $x \leftarrow m(x)$, and replicate the estimation awaiting $m(x)$ converges to x.

4. Existing Method

4.1. Neural Network

Neural networks are self-possessed of directly ahead basics working in comparable .These fundamentals are stimulated by genetic nervous systems. As in nature, the set-up principle is determined mostly by the associates connecting basics you'll guide a neural network to execute a exact function by redesign the values of the links (weights) among essentials.

Generally neural networks [8],[11]are used to, or trained, in order that a preferred input outcome in a accurate goal output. Such a condition is exposed below. There, the system is adjusted, supported a relationship of the yield and so the goal until the system output matches the target. Normally a lot of such input/target pairs are required to guide a set-up.

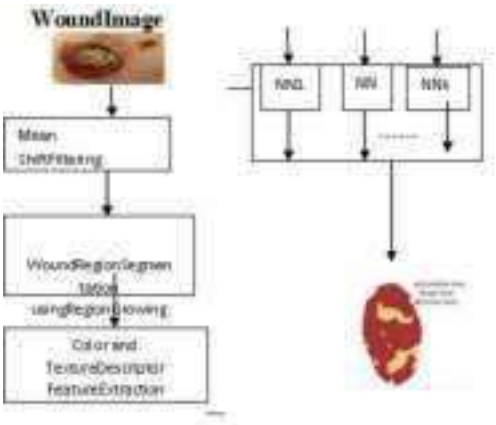
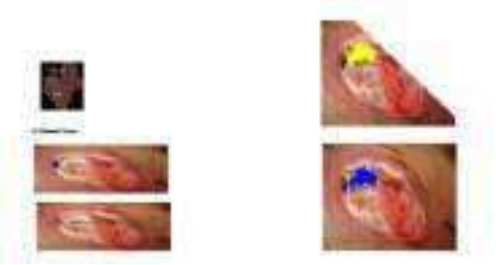


Figure 4: Figure of Existing method.

5. Proposed Method

This script express [8],[6] an automated analytical arrangement for still chronic wound measurement is serious position monitoring. Exact and interrupted wound estimation is dangerous for complete greatest wound be concerned .Automated wound analysis is practical for the aging population, to get a handling-connected result for clinicians. Wound restoring examinations are often done using image pre-processing, segmentation, and categorization, with illustration estimate by a studied clinician.



(a) (b)

Figure 5: Detection of (a) Necrosis and (b) Slough.

5.1. Randomforest(RF) classifier

The majority controlling numerical classifier, random forest, possibly a non-linear arrangement method is employed used for examine and classifying lesion tissue. RF uses a DT as a bottom classifier and also generates numerous decision trees. This indiscriminate can be classified in multi ways - a sampling of image data bootstrap samples, and random selection of input adaptable for generate a private foundation decision hierarchy. This classifier is typically used for elevated dimensional data examination purposes due to its ease and outstanding presentation.

The merit of RF classifiers are (a) incredibly classification accuracy, (b) Cooperative in determining variable's significance (c) having the control to replica planned the primary admired forest creation process that's arbitrarily elected from a quality subspace at each nodule to improve split of DTs subsequently the capture method is in use to provide preparation data subsets for creating entity trees, and ultimately trees are joint to build the random forest model. The RF classifier is employed to unravel classification and regression problems; it creates each of the choice trees and therefore the forest. Two main steps are implicated in arbitrary selections that are old when forming the trees in the forest. The first procedure randomly identify by means of substitute statistics from instruction sets to generate every tree. A variety of subsets for every tree on or after the training data is in use to expand the alternative tree and consequently the outstanding statistics are wont to experiment accuracy. by way of in the subsequent procedure, the analyst variables are indiscriminately preferred to make the binary law at every join [9] This employment attempts to improve the performance of the RF classifier in stipulations of accuracy and time essential for wound classification. It's an all together learning system where a choice tree has been used, and as a result the yield are going to be calculated based by best part vote. Initially data are at random separated into dissimilar subsets, and every subset is engaged to coach guide the entity DT. For the duration of this move toward, the tree size has been preferred supported founded on out-of-bag (or OOB) error. The RF algorithm is as follows:

5.2. Algorithm: RF classifier

1. Decide a alternate bootstrap data set from preparation samples.
2. Expand an un-pruned tree on this bootstrap.
3. Each inner node selects mtry predictors (datasets) by chance, and set up the simplest divide using single these predictors.
4. Decide on tree dimension supported on OOB error.
5. Don't execute price-complication pruning. keep a tree and built thus so far.

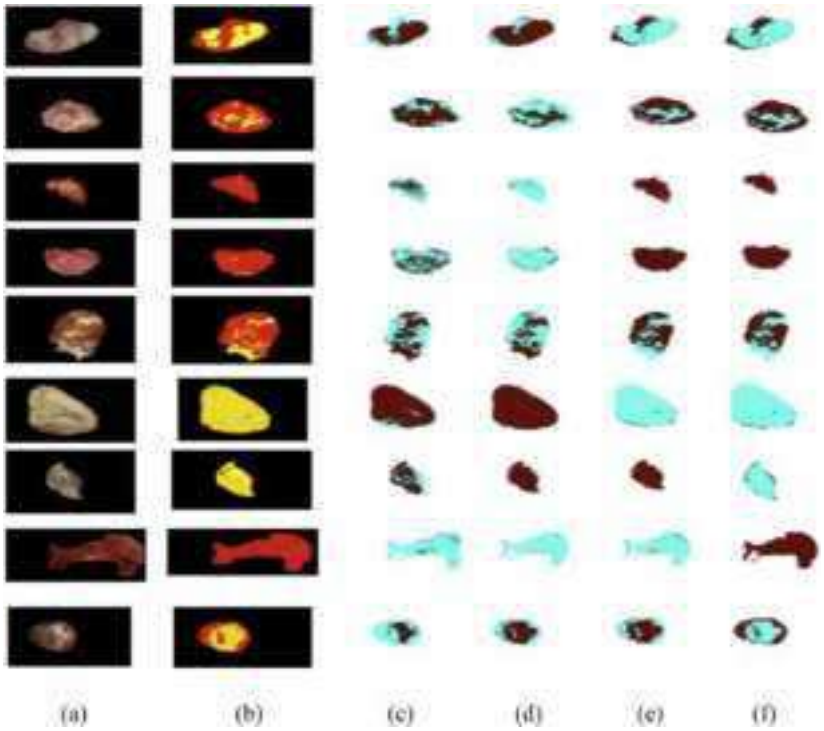


Figure 6: Predicted yield using four dissimilar classifier a) Original b)Ground truth c)NB d) DT e)LDA f) RF.

6. Results and Comparison

Table 1: Lesion model Assessment Table

Lesion Model	RF Category Detection	Neural network classifier detection	SVM Classifier detection
Granulation	2.8	2.9	2.92
Necrotic	2.76	2.8	2.9
Slough	0.2	0.73	0.9
Accuracy	93.8	88.08	87.37

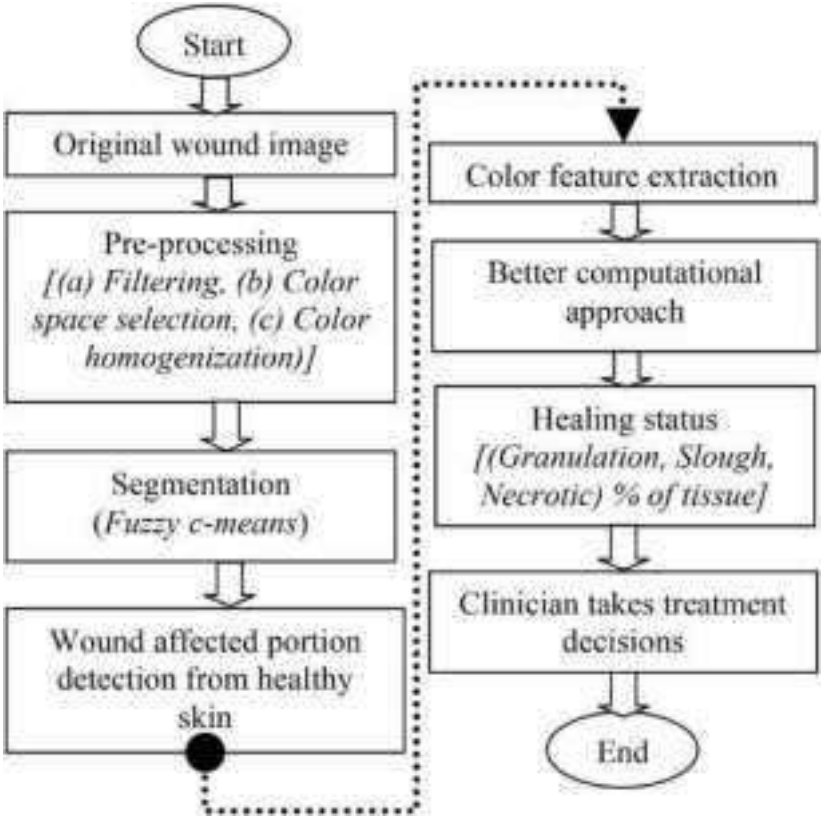


Figure 7: The computerized wound healing process.

7. Graph and Results

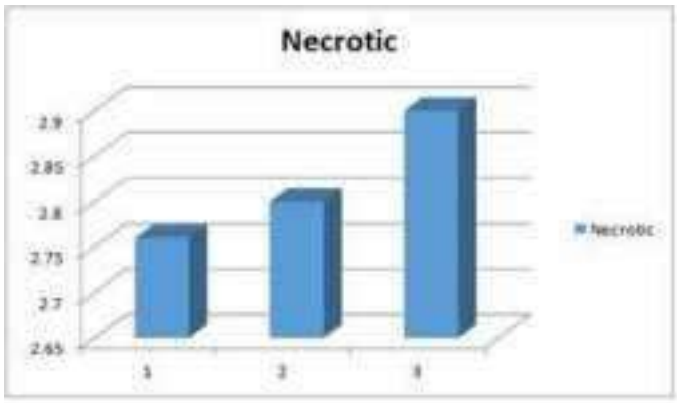


Figure 8: Necrotic Tissue Classifications.

8. Conclusion

Tissue categorization is critical separation of wound evaluation. By means of incorporate color and quality descriptors as an input vector of a SVM technique, lesion tissues are classified from a individual analysis into granulation, slough, and necrotic tissues, challenging among experts who had not seen the patients. [2] as a result of grouping 3-D lesion surface capacity by tissue categorization

Figure 9: Slough Tissue Classification and accuracy.

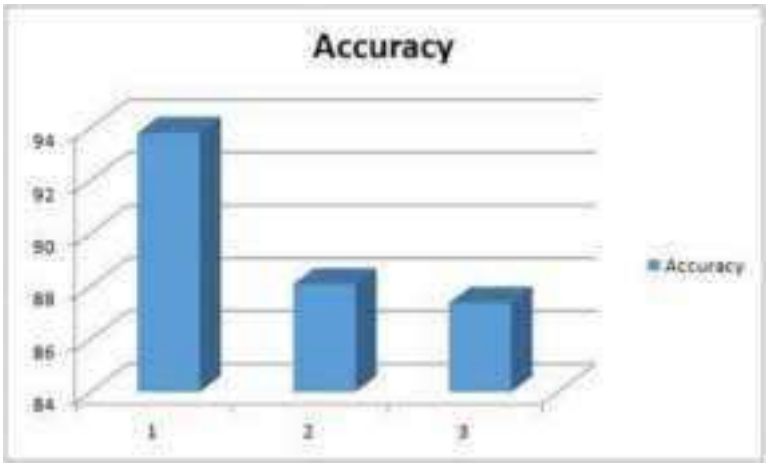


Figure 10: Accuracy.

in a specific original and accessible tool, improved wound healing evaluation has been attain and as simply an trouble-free hand held camera is vital, its extensive use by clinical team are going to be very trouble-free. Investigational [3] tests display that enhanced observable and robustness are acquire for tissue classification which metric evaluation is achieved throughout real area dimensions, wound sketch taking away and middle volume computation, the procedure used for tissue arrangement were SVM ,so adapting this way using neural networks ,would make it additional useful for extra accuracy level. The computer-aided chronic diagnostic machine has been planned for lesion tissue classification correctly and it can deal with a variety of patients. Intended method is Random forest, are near to attain computerized lesion tissue classification for pressure and diabetic ulcer analysis. This prospect model is additional exact than the manual test outcome are observed. Clinicians can now be given a consistent and experienced computational tool for segmentation and classification of the lesion parts , aid an accurate lesion healing estimation. The common accuracy is gained 93.8% This method gives a utmost accuracy as compared to manual examination by a clinical specialist it's simple to use, has least cost, low in time consumption, and provides accessibility to clinicians below a telemedicine stage.

Figure 11: Granulation.

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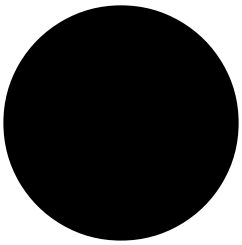

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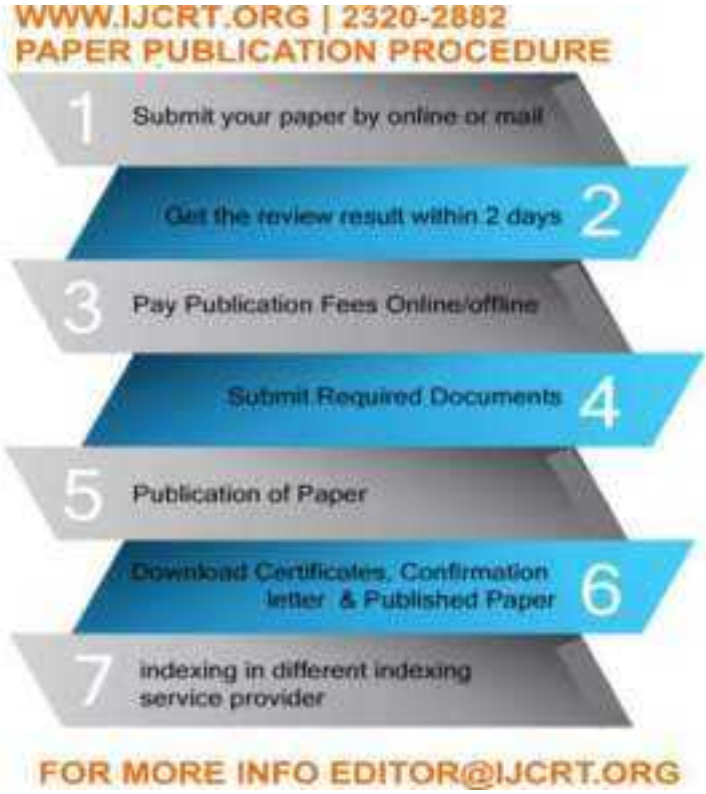

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Sub-tree Complex Metrics Computed Dissemination Protocol for VANET

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Abstract:

Vehicular Ad-hoc Networks (VANETs) are composed of moving vehicles. The VANET can process, store, and communicate via a wireless medium. VANETs potential a wide scope of services, such as safety and security, traffic efficiency, and other kinds of facilities related to vehicular information. A VANET application can sense, control and decrease traffic jamming based on the data that describes traffic patterns for an instance. Broadcasting data is a challenging task, because of its specific characteristics, i.e., heterogeneous density, short-range communication, and node mobility. Meanwhile present protocols for data dissemination do not efficiently address the high overhead. In this study, we introduce a disperse protocol based on multipart structure' measure for inner-city scenarios, called SCMC'S. Every means of transportation require construct a sub-graph to recognize the impart joint to maintain the spreading process. Derived from the limited diagram, it is possible to choose the transmit nodes rooted in multifarious system metrics. Replication results show that mentioned request elevated proficiency in conditions of exposure, the amount of dispatch package, holdup, and packet concussion differentiate to familiar statistics allocation protocols. as well SCMC'S produce important strengthening to a TMS that desires capable data distribution.

Keywords: VANET, (AoE)Area of Event, (AoI) Area of Interest, (LAN) Local Area Network, (WAN) Wide Area Network, Dissemination, EDDP, SCMC, Network simulator.

1. INTRODUCTION

To alleviate the threats of accidents and develop the driving experience, car manufactures and the telecommunication industry has made unlimited efforts to equip each vehicle among wireless strategy to permit them to be in touch with every other in addition to the roadside infrastructure located in critical points of the road. That is how the Vehicular Ad hoc Network is born. VANET is a subclass of the network of MANET (mobile ad hoc networks) collected of numerous vehicles, interacting with other vehicles and roadside units (RSUs). Every vehicle is equipped with an intern unit called an onboard unit (OBU). It has four communications patterns: vehicle-to-vehicle(V2V),vehicle-to-infrastructure (V2I),infrastructure-to-infrastructure(I2I), and vehicle-to-X(V2X) as shown in Fig. 1.Appropriately and due to the dynamic topology of the network, the huge number of vehicles and some others VANET characteristics, malicious vehicles simply propagate false information, change or drop replaced messages among vehicles which lead to corrupt network functioning and affect its performances[15],[16]. Henceforth, securing VANET has become a widespread research area over the last years.

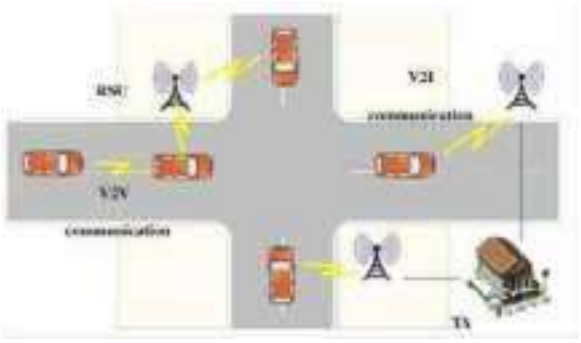

Fig.1. VANET Architecture

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II. EXISTING SYSTEM:

There is rapid improvement in technology that is inducing human life in numerous aspects, but we still need to accept new technologies with which we can make human life easier to live. The design deliberations of urban layout as well as message format, broadcast suppression mechanism, and delay control. The EDDP make use of the developments of the expected messages beside with detecting in order to construct determinations on eradication telecast, intending to develop attention in diverse directions without avoidable transmissions.

First, it specifies the assumptions and requirements for road layout, mobility, and communication. Second, it highlights the message format. Finally, it specifies data dissemination in EDDP from three characteristics; traffic regime estimation, broadcast suppression, and delay control. VANET requires the consideration of three different models: road layout, mobility, and communication. For the urban road layout, we consider a realistic city map. For road traffic mobility modeling, we rely on SUMO to produce realistic traffic flows for simulation-based performance assessment. For vehicular communication, we assume a vehicular environment where each vehicle is equipped with On-Board Unit (OBU).[11]

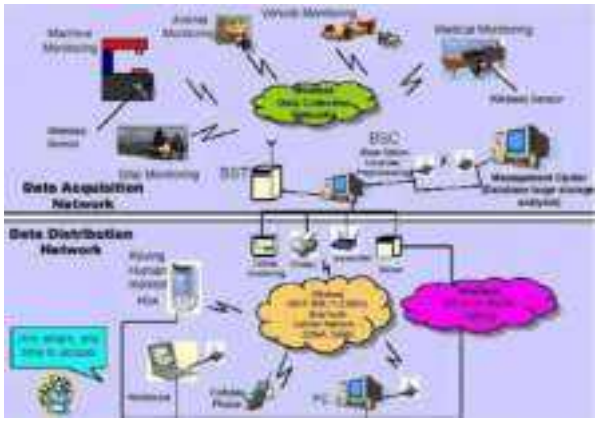

Fig.2. Wireless Network EDDP

As shown in Fig.2 EDDP is a delay-based data distribution protocol that suggestions multi-directional broadcast mitigation in a multi-hop manner, to support different types of applications in the context of urban vehicular environments. The broadcast suppression in EDDP permits for selecting rarer vehicles as relay nodes to forward data further, by assigning vehicles to different timeslots according to traffic condition. A timeslot can be defined as the period during which a scheduled broadcast waits before disseminating the scheduled message or discarding it. Messages, according to the IEEE WAVE standard for WAVE are shown in Fig 3.

Fig.3 Vehicular Environment

In the resulting, we define the basic terms used are Broadcast Initiator is the vehicle that invents a new message and intends to distribute it to nearby vehicles. Relay vehicle is the vehicle which informs traffic condition before rebroadcasting a message that was originally initiated by another vehicle. Area of Event (AoE) is the road or

connection where an event happens and a message is initiated to indicate that event. Area of Interest (AoI**)** is a wide area in the selected map where data should be delivered with the highest possible ratio. Approaching Vehicle is the vehicle that is moving towards the relevant AoE. A receding Vehicle is a vehicle that is moving away from the appropriate AoE.

EDDP functions on top of the MAC layer, as follows: A broadcast initiator creates a message and broadcasts it to its one-hop neighbors. Upon receiving a message, a receiving vehicle checks if it has already received a copy of the same message. If so, it checks if it has already scheduled an instance of it. A receiving vehicle suppresses scheduled broadcasting any of these three conditions apply: receiving a duplicate from the same road it is currently driving in, receiving a duplicate while approaching the relevant AoE, or receiving a duplicate while receding the relevant AoE from a farther relay.

Fig 4. Explains the algorithm of EDDP procedure upon message retrieval. If a receiving vehicle with a scheduled broadcast overhears the dissemination of the same message in another direction, it does not suppress the scheduled broadcast, so as not to prevent data dissemination in its direction. This way, the integrated broadcast suppression does not prohibit.

INPUT: ($x_{s,}$ y_d), ($x_{d,}$ y_d),//The coordinate of the sender
And the receiver
Message message //the received message
OUTPUT: delay
Start
If (Message known (message))
If (Message Scheduled (message))
If (SuppressionCondition Applies (message))
Cancel broadcast timer;
End if;
End if;
Discard Data;
Else// Consider New Message
number of-slots → *S*(Ceil ((-m+1)*
message.(CF+m):
dist→sqrt (pow ((X_d- X_s), 2)+pow(y_{d-} y_s),2));
my_ slot→floor((1- min(dist,range)/range)*no_of_slots);
delay→my_ slot*one _hop_delay+random();
End if;
End

Fig.4. Algorithm of EDDP

III, PROPOSED SYSTEM

Our design is based on SCMC (Subgraph Complex Metrics Computation). The dispensation of a information communication is essential used for complex procedure, where Metrics prime just the mechanism that are within the AoI to impart the information. Moreover, a motor vehicle merely execute the retransfer the moment it is the initial point receiving the message and has been indicated as a relay node in the field relays contained in the message which reduces the amount of outmoded communication along with small package destruction significantly. Exclusively, both truck *vi* transmit regular flare by dereliction restrain its id also additional message, where complex metrics constitute the details about its present location *Li(x*, *y)*, in addition its 1-hop adjacent *(vi)*.

Ahead getting such a beacon, the vehicle saves/updates this information on its list of neighbors list(vi*)*. Then construct the border- induced subgraph *G_E_u_* with contextual knowledge about 2-hop neighbors for each nearby vehicles *u*∈listN(vi*)*. This illustrate the relation links connecting the motor vehicle vi by means of its 1-hop and 2-hop adjacent because edifice a sub-graph through a worldwide realization expansion the transparency furthermore inexactness, appropriate to the physiographic alternate produced through touching vehicle. By using various methods for the communication to get efficiency. We are using a relay selection method for the communications to achieve full diversity and energy efficiency.

A .Relay collection

Within the relay knob range footstep, SCMC examine metrics: *i)* degree essentiality, and *ii)* connecting centrality. The extent centrality deliberate the reputation of a specified apex in the diagram in terms of the numeral of nearest enumerate based on Eq.

$$G(i) = \sum_{j=1}^{N} a_{ij}$$

where I mean the vehicle that wants to find its degree centrality, *j* represents all other vehicles, *n* is the total number of vehicles, and *a* denotes the adjacency matrix, in which the cell a_{ij} is set to 1 if there is the correlation to the join j and 0 or else. The middle center ground is a measure of centrality in a graph based on the short paths of a network.

B.Network Simulation

In communication and computer network research, network simulation is a technique where a program models the behavior of a network either by calculating the interaction between the different network entities (host/routers, data links, packets, etc) using mathematical formulas or capturing and playing back observations from a production network. The behavior of the network and the various applications and services it supports can then be observed in a test lab.

Various attributes of the environment can also be modified in a controlled manner to assess how the network would behave under different conditions. When a simulation program is used in conjunction with live applications and services to observe end-to-end performance to the user desktop, this technique is also referred to as network emulation.

C. NS Simulator

Ns or the Network simulator (also popularly called ns-2) is a discrete event network simulator. It is popular in academia for its extensibility (due to its open-source model) and plentiful online documentation. Ns is popularly used in the simulation of routing and multicast
protocols, among others, and is heavily used in ad-hoc networking research supports an array of popular network

IV. RESULT

Every single node here are representing those vehicles that are being connected through multiple nodes is shown in Figure 5.

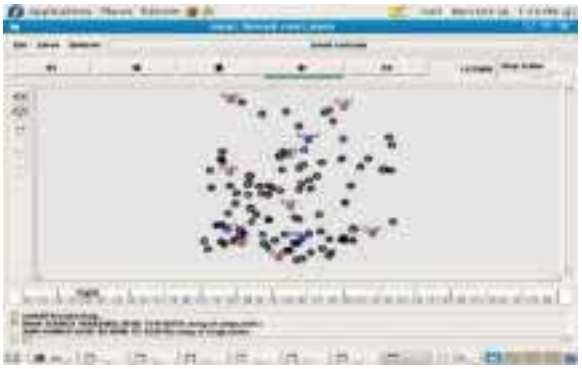

Fig.5.Relay Nodes for Dissemination

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Fig. 6. Traffic Flow

Figure 6 shows traffic flow identification between subgraph nodes. The main technology used here is a two-hop neighbor with belongingness where the nodes are mutually benefited by each other's data transmission.

Figure 7illustrate the energy comparison between existing and proposed system.

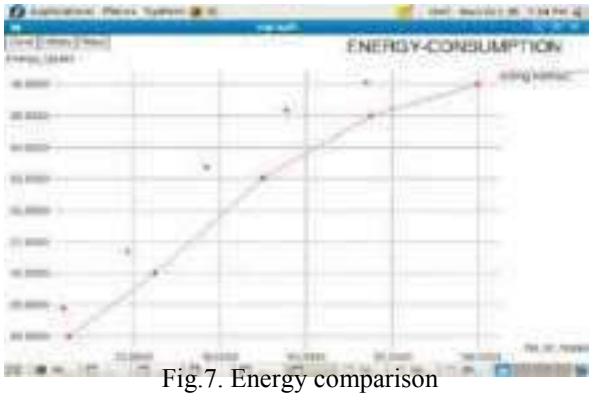

Fig.7. Energy comparison

The proposed algorithm increases the number of packet delivery when compared to the existing system is shown graphically in Figure 8.

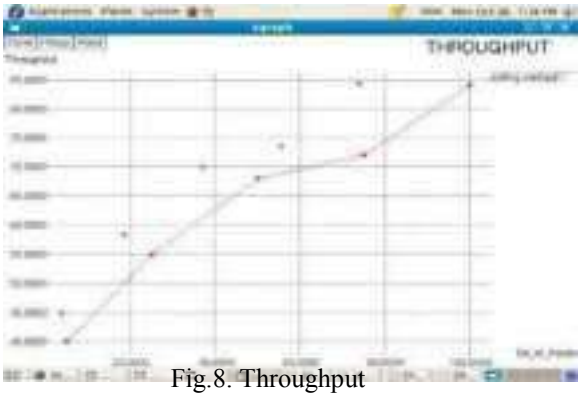

Fig.8. Throughput

Figure 9illustrates the delay comparison between the proposed and existing system. The proposed delay overhead reduces energy consumption even if the number of nodes increases.

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Fig.9.Density Vs. Relay

Figure 10. shows the graphical representation of the end to end latency of the nodes.

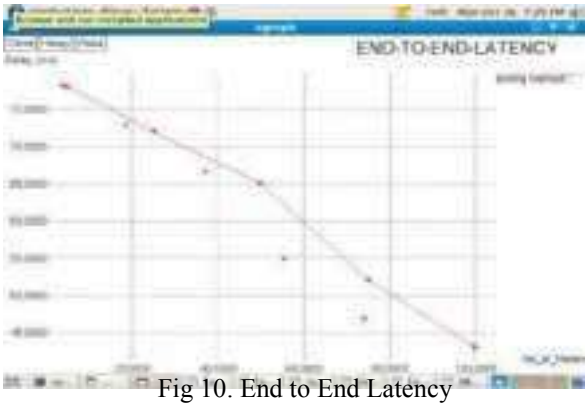

Fig 10. End to End Latency

The performance analysis of the proposed system with the existing system is given in Table No.1.

Table.No.1. Performance Analysis of Proposed System with Existing System.

Parameters	Existing System	**Proposed System**
Throughput	40	**85**
Coverage	88%	**95.5%**
Density	4	**18**
Energy Consumption	88	**96**

V. CONCLUSION

Disseminating data in VANET is a challenging task enduring specific, i.e., varied thickness, limited transmission also nodule portability. In this revise, we future a distribution protocol based on complex networks' metrics for urban VANET scenarios, called SCMC'S. In SCMC, each vehicle must maintain local knowledge of its 1 and 2-hops neighbors is be used to construct a sub-graph. Based on such a sub-graph, SCMC choose the greatest vehicles to retransmit the message based on system multifaceted metrics, i.e., connecting centrality, and level centrality. Simulation outcomes show that SCMC'S tender high-level effectiveness in conditions of exposure, many communicate packets, holdup, also packet collisions correlated to eminent statistics dissemination protocols.

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Cluster Based Malicious Node Detection System for Mobile Ad-Hoc Network Using ANFIS Classifier

Gopalakrishnan Subburayalu, Hemanand Duraivelu, Arun Prasath Raveendran, Rajesh Arunachalam, Deepika Kongara & Chitra Thangavel

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developed. The conviction parameters to be extract of the reliable and malevolent nodes and these parameters are qualified by ANFIS classifier. Further, the individual nodes in MANET are classified in testing mode of classifier. The network performance will be degraded with the increased number of malicious nodes. Certain conditions like packet delivery ratio, throughput, detection rate, energy consumption, and precision value and link failures occur due to malicious node in the network. The anticipated malicious node detection structure be compare by means of the conservative techniques such as Optimized energy efficient routing protocol (OEERP), Low energy adaptive clustering hierarchy (LEACH), Data routing in network aggregation (DRINA)and Base station controlled dynamic clustering protocol (BCDCP). The proposed ANFIS classifier is designed in Matrix Laboratory (MATLAB) and it can be interfaced with NS2 using “c” programming.

Keywords: ANFIS testing mode trusty nodes features malicious nodes classifier detection rate

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Archived In Portico

Index Copernicus International

ICV 2021: 94.19

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Editors Communique

Have we tamed the coronavirus? May be yes,

as pandemics do not die, they can only be faded !

Science and technology has made it possible, in the shortest span of time, it has shown that with firm determination and international cooperation, we can win over the onslaughts of even the worst of the pandemics. COVID-19 is perhaps fading over now, due to our coordinated efforts worldwide. Though we have lost millions, in the two year period, partly due to the mishandling of the viral attacks and

somewhat by our own follies and carelessness. Anyway lessons learnt from the past, always make us more stronger and determined. Let us now not relax and work on a better mode, as all is still not well yet. The almost taming of the virus and its cousins have indicated some of the concealed failures, on which we have to focus now. We have to be more vigilant, and even a bit of laxity can spoil the good work done. On societal and governmental parts, utmost care and caution is required on a long term basis.

On behalf of *Bioscience Biotechnology Research Communications*, we falter at words to express our deep sense of solitude and grief on the catastrophic events of the world wide pandemic, spanning over two years now. We pray for the strength to bear this universal calamity and come up with long lasting fortitude to eradicate it soon.

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Quality publication is one of the ways to keep science alive, and good journals have a leading role to play in shaping science for humanity! As teachers, we have great responsibilities, we have to advocate our students to accomplish and show them the path to test their mettle in hard times to excel, especially in the post COVID 19 era. Science and its advocates will rise more to the occasion and will soon provide succor to the already grief stricken humanity.

Sharique A. Ali, PhD
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REACTIVE POWER COMPENSATION IN WIND FARMS USING SVC

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Abstract: *Wind power generation technology has evolved considerably in the past few years with the demand for distributed, renewable energy growing.This paper examines the possibility of providing reactive power support to the grid from Wind Farms (WFs) as a vicinity of the ancillary service provisions. The minute-to-minute variations in wind power are decomposed into slow, fast and ramp components to assess the influence of every element on the power system operation. The induction generator in Wind Energy Conversion System (WECS) alwaysabsorbs specific amount of reactive power for its active power transfer. An elaboratesimulation is dispensedfor reactive power compensation in windfarms using Static VArCompensator (SVC), whichis used to improve voltage regulation, stability, and power factor in ac transmission and distribution systems.*

Keywords:*Wind Farms (WFs), Wind Energy Conversion System (WECS),Static VAr Compensator (SVC).*

I. Introduction

Reactive power is either generated or consumed in almost every component of the system, generation, transmission, and distribution and eventually by the loads. Power Generation and Transmission is a complex process, requiring the working of many components of the power system in tandem to maximize the output. It is required to maintain the voltage to deliver the active power through the lines. Loads like motor loads and other loads require reactive power for their operation. To improve the performance of ac power systems, we need to manage this reactive power in an efficient way and this is known as reactive power compensation.Reactive power support may be provided by avariety of devices, including generators, synchronous condensers, shunt capacitors/reactors and static VAr compensators(SVCs).

A new concept of optimal utilization of a unified power quality conditioner (UPQC) is introduced and the seriesinverter of UPQC is controlled to perform simultaneous (1) voltage sag/swell compensation and (2) load reactive power sharingwith the shunt inverter[1]. A methodology to address reactive power compensation using Evolutionary Particle Swarm Optimization (EPSO) technique programmed in the MATLAB environment is presented [2]. The control requirements of hybrid wind farms, comprising a relatively large number of conventional induction machines (IMs) along with one or very few permanent magnet synchronous machines (PMSMs), capable of compensating the reactive power demanded by the IMs during faulty conditions as well as attenuating the active power variations due to wind gusts is addressed [3].The application of DC-DC converter for supplying DC load from the standalone wind turbine is presented [4].Apart from the fixed cost and cost of loss components, a new method is proposed to calculate the opportunity cost component for a WF considering hourly wind variations [5]. Using detailed, long-term simulation models of wind power variations, most power systems can absorb the impacts of wind power variations with little difficulty is confirmed[6].A novel interface neurocontroller (INC) is proposed for the coordinated reactive power control between a large wind farm equipped with doubly fed induction generators (DFIGs) and a static synchronous compensator (STATCOM) [7].The extent to which the lowvoltage ride through (LVRT) capability of wind farms usingsquirrel cage generators can be enhanced by the use of aSTATCOM, compared to the thyristor controlled Static Var Compensator (SVC) is analyzed [8].A comprehensive design for reactive power markets was proposed for the procurement of reactive power from generators, capacitor banks, shunt reactors, SVCs or STATCOMs[9]. A fuzzy set based modeling of wind power generation is presented [10]. The proposed work in this paper is to develop a simulink model for reactive power compensation in windfarms using FACTS devices like SVC, which improves the voltage regulation, stability, and power factor in ac transmission and distribution systems. The SVC controller used in the model comprises of one TCR and three TSCs.

II. Reactive power compensation

VAR compensation is defined as the management of reactive power to improve the performance of ac power systems. The concept of VAR compensation embraces a wide and diverse field of both system and customer problems, especially related with power quality issues, since most of power quality problems can be attenuated or solved with an adequate control of reactive power.

Figure 1 shows the reactive power compensation scheme which improves the active power transfer and power factor.

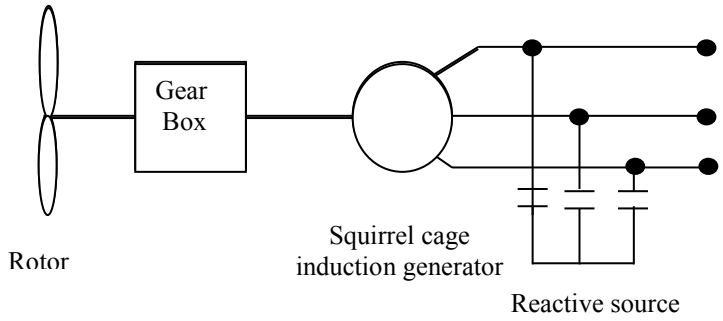

Figure 1 Reactive Power Compensation

Since the wind power is fluctuating in nature, wind mill farms cannot be controlled in its operation. This is applicable for older windmills, normally equipped with asynchronous generators (induction generators) because they absorb a substantial amount of reactive power from the grid. Therefore, it is required to equip those generators with capacitor banks or FACTS devices like SVCs at their grid connection point.

Further, corrections for power quality issues such as voltage sags, surges, flicker as well as grid stability support are demanded from installations that need to connect with the grid. The main reasons for reactive power compensation in a system are

1) the voltage regulation
2) increased system stability
3)better utilization of machines connected to the system
4)reducing losses associated with the system
5) to prevent voltage collapse as well as voltage sag.

III. FACTS Devices

Flexible AC Transmission System (FACTS) controllers can be used to control steady state active and reactive power flow, but it should be also noted that these fast controllers could have pronounced, positive impact on transient and dynamic conditions in a power system ifdesigned properly.Theconcepts behind them are to enable control of these parameters in real-time and, thus, vary thetransmitted power according to system conditions.

A static VAR compensator (or SVC) is anelectrical device for providing fast-acting reactive power on high-voltageelectricity transmission networks. SVCs are part of the FACTS device family, regulating voltage and stabilizing the system. A static VAR compensator has no significant moving parts (other than internal switchgear).Typically, an SVC comprises of one or more banks of fixed or switched shunt capacitors or reactors, Elements which may be used to make

- Thyristor controlled reactor (TCR), where the reactor may be air- or iron-cored
- Thyristor switched capacitor (TSC)
- Harmonic filter(s)
- Mechanically switched capacitors or reactors (switched by a circuit breaker)

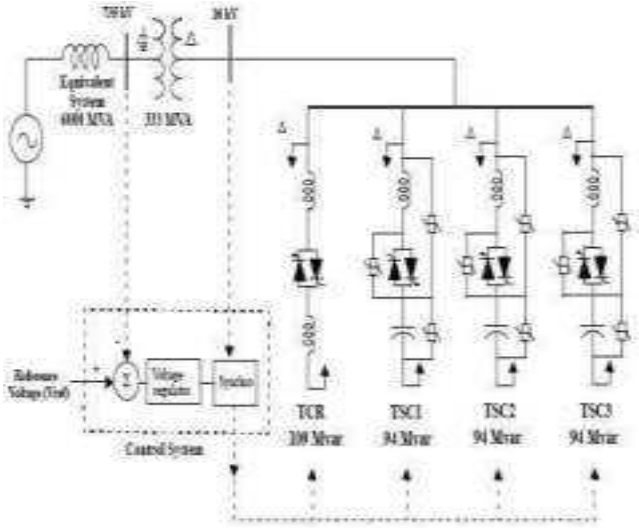

Figure 2 Mathematical circuit of SVC with firing circuits

Figure 2 depicts the mathematical circuit of SVC with firing circuits. The firing pulses are sent from the control system unit to trigger the TCR and TSCs. The main advantage of SVCs over simple mechanically-switched compensation schemes is their near-instantaneous response to changes in the system voltage.They are, in general, cheaper, higher-capacity, faster and more reliable than dynamic compensation schemes such as synchronous condensers.

IV. Wind power generation

Wind energy as an inexhaustible supply of renewable resources has became the hot spot of international communication.Wind Power generation is susceptible to fluctuations in the reactive power outlay based on wind speed variations. While these can be compensated broadly at an individual wind turbine level, there can be substantial difference in the reactive power needs at the Point of Common Coupling (PCC) due to the combined effects of all wind turbines, transformers, transmission lines etc. It is necessary to confirm to the grid codes for interconnection of the wind farms to the utility transmission lines at the PCC. International grid codes, for instance, require a Fault Ride ThroughLow-Voltage Ride Through facility that maintains the windfarm support to the grid during faults by having provision for substantial short-time reactive power available to maintain wind generation.

WindFarms provide reactive power support to grid as a part of ancillary service provision. Wind power generation system, the equipment that converts wind power into electrical power, influences greatly the efficiency of the conversion and the stability of the power grid.

Wind turbines extract the energy from thewind by transferring the thrusting force of the air passingthrough the turbine rotor into the rotor blades. The rotor bladesare aerofoil that acts similarly to an aircraft wing; this is the socalledprinciple of lift.The energy that a wind turbine will produce depends on itswind speed power curve and the wind speed frequency distributionat the installation site. The wind energy conversion intoelectricity is performed in wind turbine generators (WTG).

When wind power generation (WPG) units areinstalled in a distribution system, they may cause reverse power flows and voltage variations due to the random-like outputs of wind turbines. The asynchronous generator (induction generator) in Wind Energy Conversion System (WECS) shown in Figure 3 always absorbs certain amount of reactive power for its active power transfer. To solve this problem, Static VAr Compensator (SVC)are introduced into distribution systems, and if insufficient, combine the reactive power support from distributed diesel units for voltage control.

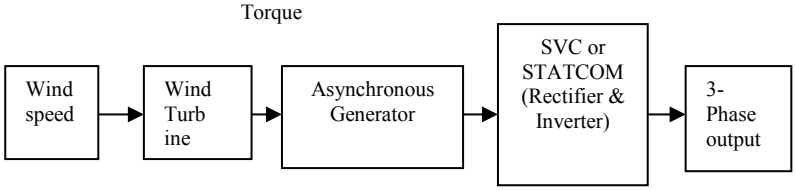

Figure 3 Wind energy conversion system

4.1 Mathematical Modeling of a Wind Turbine

There are three main equations that describe the windturbine system. The turbine mechanical power, the turbinemechanical torque and the turbine's tip-speed ratio isdescribed by (1), (2), and (3) respectively

$$P_m = 0.5\rho A C_p(\lambda,\beta)V_\omega^3 \quad (1)$$

$$T_m = P_m \frac{R}{G\lambda V_\omega} \quad (2)$$

$$\lambda = \frac{R\omega_b}{V_\omega} \quad (3)$$

where ρ = air density, A = rotor swept area, $C_p(\lambda,\beta)$=power coefficient function (which is dependent on λ, thetip speed ratio and pitch angle, β), V_ω = wind speed, and G= gear ratio between the turbine shaft and the generatorrotor shaft.

V. Simulations

5.1 Parameter Sets for Wind Turbines of Various Ratings

Theparameters which characterize the windturbine are

- the $C_p(\lambda,\beta)$ curve, the nominal rotor speed, andthe rotordiameter determine the nominal wind speed of awind turbineof given nominal power.
- the allowable amount of rotor over speedingdeterminestheparameters in the pitch angle controller.
- the minimum rotor speed determines the cut-inwindspeed.

Due to these interdependencies, it is essential to use a consistent set of parameters when using the general wind turbine model presented before, because otherwise incorrect results may be obtained.

5.2 Wind speed subsystem model

The wind speed model consists of a source that generates a wind speed signal to be applied to the wind turbine. The wind turbine model offers the possibility to change thevalues of all characteristics of the wind speed signal to be applied, apart from the starting value of the mean wind speed when the wind turbine delivers less than nominal power.

Wind-related events, or simply wind events, include wind die-outs, wind rises, wind lulls, and wind gusts, as well as sudden loss of a wind farm (WF). These events are considered as minute-to-minute variations, since their multi-minute durations do not fit into the hourly or second-by-second time frames.

Matlab is the interactive computing software. It is mainly oriented to Engineering and scientific. Simulink is an additional component of Matlab. It can be used to model, analysis and simulate dynamic systems which include continuous systems, discrete time systems, hybrid systems etc.Figure 4 shows the simulink model of the wind turbine and Figure 5 shows the wind turbine characteristics.

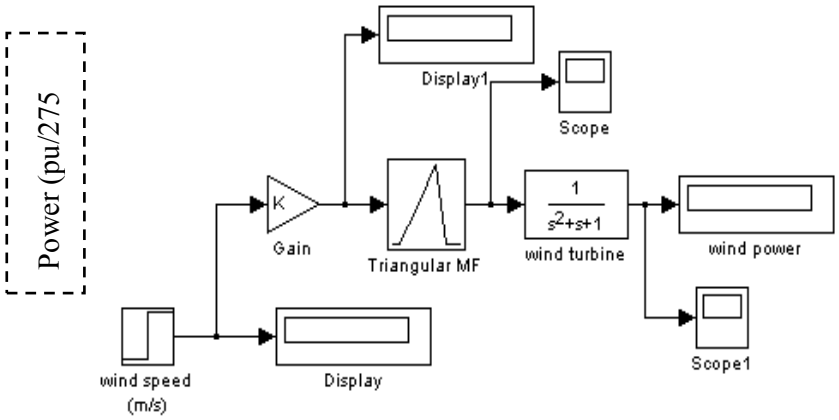

Figure 4 Simulink model of wind turbine

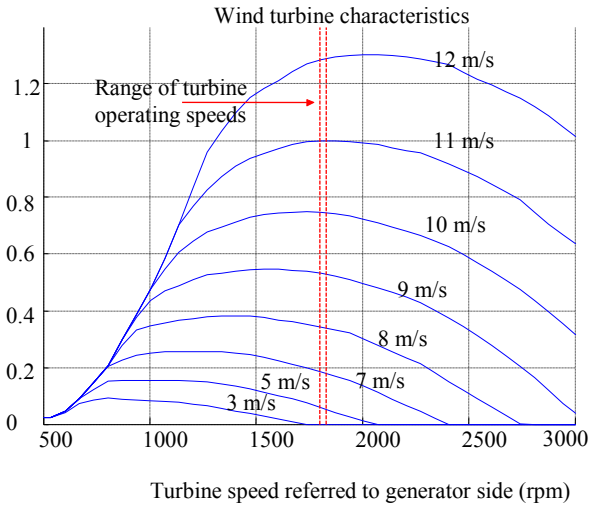

Figure 5 Wind turbine characteristics

5.3 SVC Controller model

SVC controller comprises of one ThyristorControlled Reactor (TCR) and three Thyristor Switched Capacitors (TSCs). Figure6 depictsthe simulink model of SVC controller.

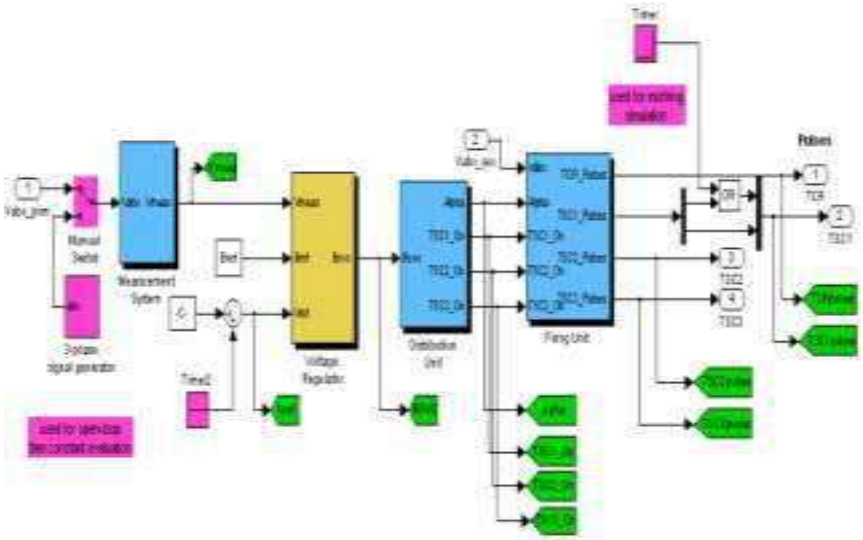

Figure 6 Simulink model of SVC Controller

There are four subsystems by the name Measurement system, Automatic Voltage regulator (AVR), Distribution unit and Firing unit. The measurement system is used to measure the three phase SVC voltage. The primary role of an AVR is to regulate the reactive power and voltage magnitude. The distribution unit distributes the SVC susceptance pulses from AVR to the firing unit to generate the firing pulses to turn on the three thyristor switched capacitors.

The voltage regulator module in SVC controller is shown in Figure 7. This model calculates the error between the measured and reference voltage which is then fed to proportional-Integral controller. The proportional gain (K_p) is set to 1 and integral gain (K_i) is calculated by Forward Euler method for a sampling time period (T_s).

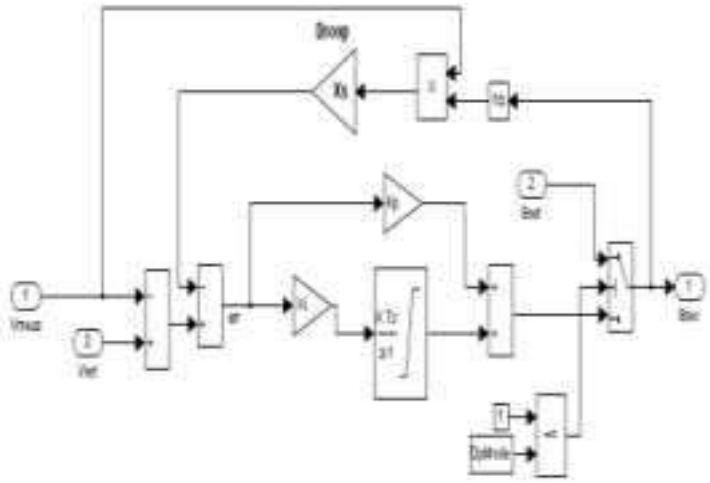

Figure 7 Voltage regulator module inSVC controller

From the AVR model, the following calculations can be performed.

$$V_{meas} = V_{ref} + X_s I \tag{4}$$

$$err = \left(K_p + \frac{K_i}{s} \right) X_s \tag{5}$$

Then the open loop time constant is evaluated using equations (6).

1) Open-loop time constant evaluation**:**

To verify the following formula, open the loop (using the manual switch) and add a 0.008 pu step to the reference voltage (V_{ref}).

Open-loop time constant -->

$$T_0 = \frac{1}{(K_i * X_s)} \tag{6}$$

Closed-loop time constant -->

$$T_c = \frac{X_s}{(X_r + X_s)} * T_0 \tag{7}$$

Where X_s -> Slope in pu/100MVA

K_i -> Integral gain (puB/puV/s)

2) Misfiring simulation**:**

Since the firing pulses from the firing unit are short spikes of smaller duration, additional pulses are provided from misfiring simulation block to improve the strength of the pulses for effective triggering of TCRs and TSCs under heavy and light loaded conditions. Therefore, a timer block and a OR block

which form Misfiring simulation unit are used to add pulses to the normal pulses coming from the firing unit. Timer block normally decides the duration of pulses whereas OR block is used for addition of these pulses with firing unit pulses.

VI. Proposed model description

This paper proposes the modeling of 9 MW wind farms with 1.5 MW wind turbine driving a 480 V, 275 KVA induction generator using SVC in MATLAB / SIMULINK environment and analyze the results. The stator winding is connected directly to the 60 Hz grid and the rotor is driven by a variable-pitch wind turbine. The power captured by the wind turbine is converted into electrical power by the induction generator and is transmitted to the grid by the stator winding. The pitch angle is controlled in order to limit the generator output power to its nominal value for high wind speeds. In order to generate power, the induction generator speed must be slightly above the synchronous speed (1.011 p.u.). But the speed variation is typically so small that the Wind turbine Induction Generator (WTIG) is considered to be a fixed-speed wind generator. The wind turbine senses the wind speed and it exerts a torque Tm which drives the asynchronous generator. According to turbine characteristics, for a 10 m/s wind speed, the turbine output power is 0.75 p.u. (206 KW). Because of the asynchronous machine losses, the wind turbine produces 200 KW. The reactive power absorbed by the induction generator is provided by the grid or by some devices like capacitor banks, SVC, STATCOM or synchronous condenser. This additional reactive power injected compensates the transmission line losses and increases the active power thereby improves the voltage profile to 1 p.u. and power factor.Figure8 presents the simulink model of windfarms using SVC. This model comprises of three subsystems, by the name of wind turbine model, asynchronous generator model and SVC controller model.

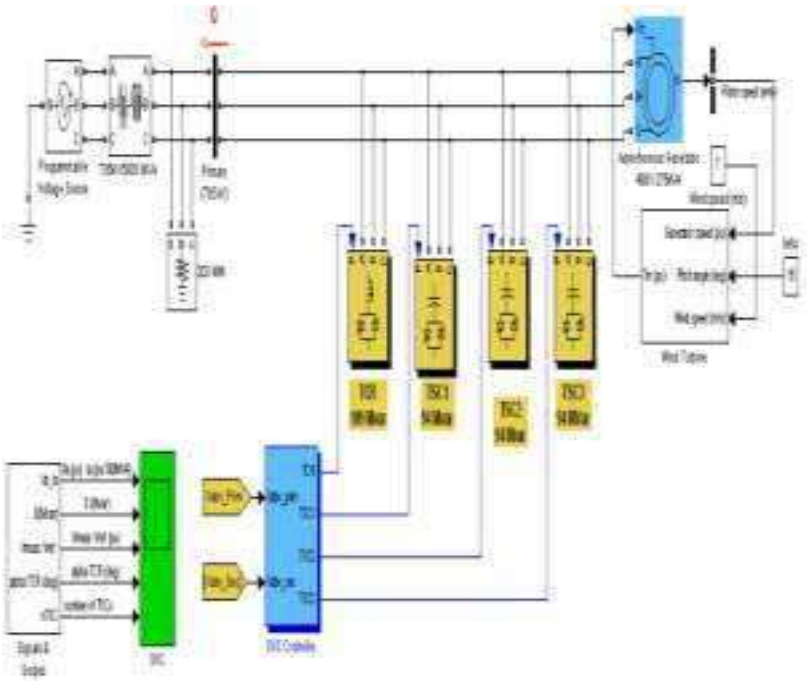

Figure 8 Simulink model of wind farms using SVC

The SVC controller model consists of one thyristor controller reactor bank (TCR) of 109 MVAR, and three thyristor switched capacitor banks (TSCs) of 94 MVAR. Outputs TCR,TSC1, TSC2 and TSC3 are vectors of six pulses for the TCR and the three TSCs. In Voltage control mode, the primary voltage (V_{abc_prim}) is controlled at V_{ref} within the maximum inductive and capacitive susceptance range and droop setting. In Var control mode, the SVC susceptance is kept constant at B_{ref} (B_{ref}<0 for inductive mode). The output of the variable pitch wind turbine model is the torque applied to the shaft of asynchronous generator. The turbine inertia must be added to the generator inertia.

VII. Results and Discussion

The developed simulink model can be simulated for various wind speeds and pitch angles and the output waveforms clearly depict whether the limits of measured voltage are violated or not. Based on this information, sufficient number of TSCs is triggered by providing firing pulses individually for the injection of reactive power accordingly. In Wind Turbine block, the settings of wind speed and pitch angle values are modified in its block properties for different wind speeds and pitch angles and then the simulink model is again simulated to get the results.

For a wind speed of 12 m/s and various pitch angles (β) of 0^0, 15^0, 30^0, the input voltages and currents in p.u., injected reactive power values in MVAr, measured and reference voltages in p.u., firing angles in degrees, number of TSCs triggered for injecting reactive power are depicted in Figures 9, 10 and 11 respectively. Similarly for a wind speed of 10 m/s and pitch angle (β) $=0^0$, simulation outputs of voltages and currents in p.u., injected reactive power values in MVAr, measured and reference voltages in p.u., firing angles in degrees, number of TSCs triggered for injecting reactive power are depicted in the Figure 12. Similarly for low wind speeds like 5 m/s, β $=15^0$ and 7 m/s, β $=30^0$,simulation results are depicted in Figure 13 and Figure 14 respectively. Likewise, for various wind speeds and pitch angles, this model can be simulated and similar results can be obtained to show the effectiveness of SVC for reactive power compensation.

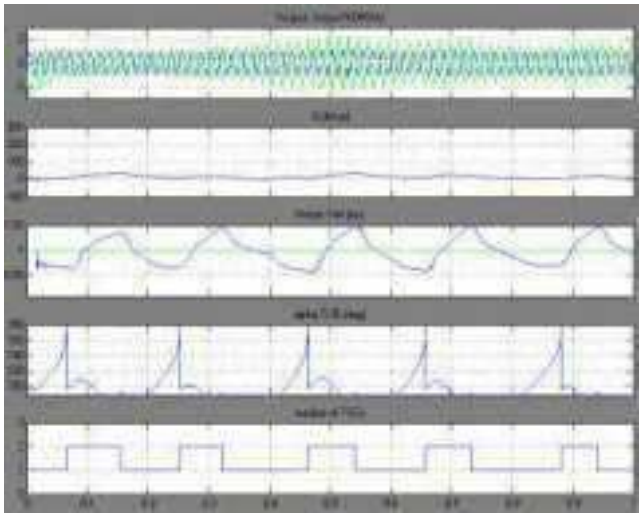

Figure 9 (a)V_a(p.u.), I_a(p.u./100MVA) (b)Q (MVAr) (c)V_{meas} ,V_{ref} (p.u.) (d)alpha TCR(deg) (e) number of TSCs for a wind speed=12 m/s and pitch angle, β=0^0.

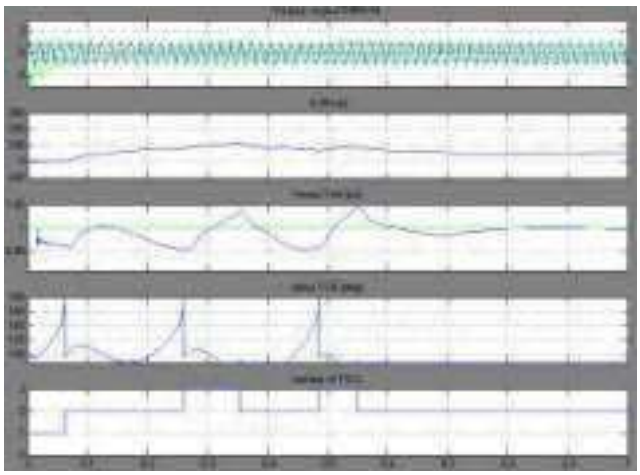

Figure 10 (a)V_a(p.u.), I_a(p.u./100MVA) (b)Q (MVAr) (c)V_{meas},V_{ref}(p.u.) (d)alphaTCR(deg) (e) number of TSCs for a wind speed=12 m/s and pitch angle, β=15^0.

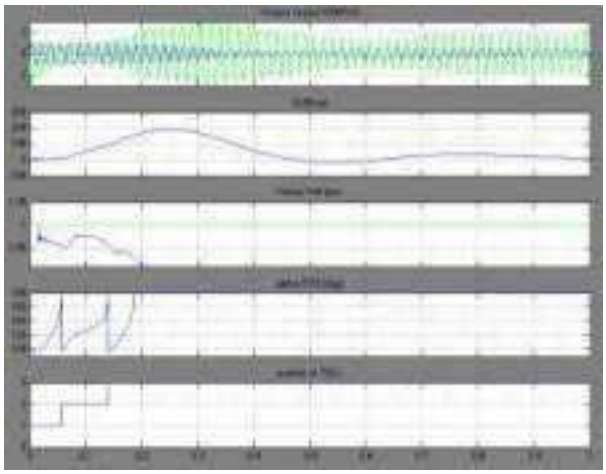

Figure 11 (a)V_a(p.u.), I_a(p.u./100MVA) (b) Q (MVAr) (c) V_{meas} , V_{ref} (p.u.) (d)alpha TCR(deg) (e) number of TSCs for a wind speed=12 m/s and pitch angle, $\beta=30^0$.

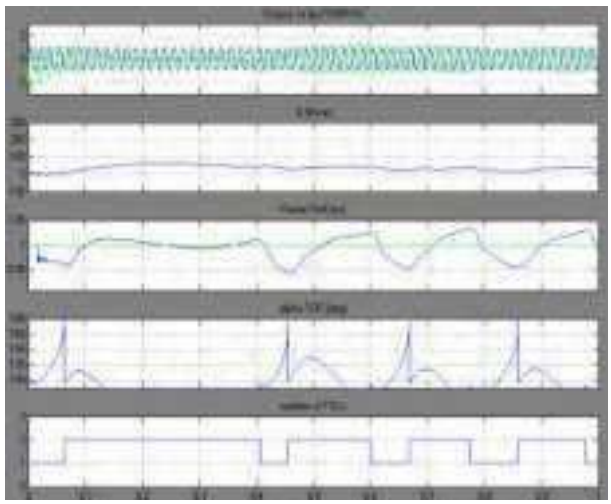

Figure 12 (a)V_a(p.u.),I_a(p.u./100MVA) (b)Q (MVAr) (c)V_{meas},V_{ref} (p.u.) (d)alpha TCR(deg)(e) number of TSCs for a wind speed=10 m/s and pitch angle, $\beta=0^0$.

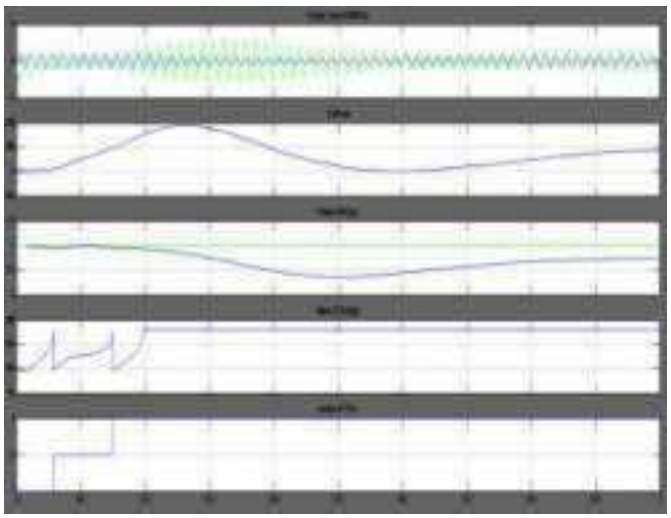

Figure 13 (a)V_a(p.u.), I_a(p.u./100MVA) (b) Q (MVAr) (c) V_{meas} , V_{ref} (p.u.) (d)alpha TCR(deg) (e) number of TSCs for a wind speed=5 m/s and pitch angle, $\beta=30^0$.

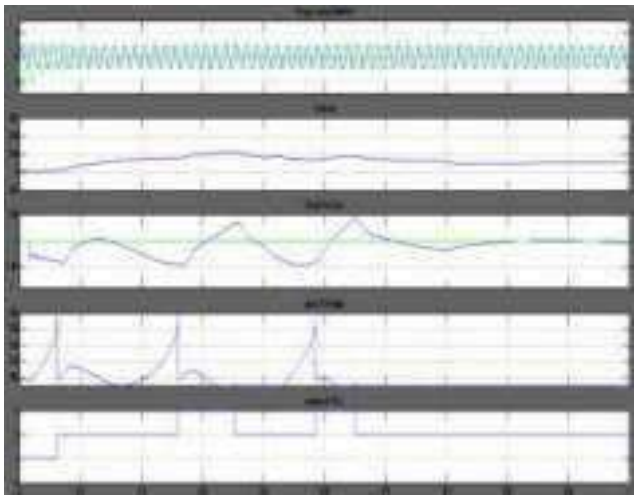

Figure 14 (a)V_a(p.u.), I_a(p.u./100MVA) (b) Q (MVAr) (c) V_{meas} , V_{ref} (p.u.) (d)alpha TCR(deg) (e) number of TSCs for a wind speed=7 m/s and pitch angle, $\beta=15^0$.

The results show that the voltage is maintained within the permissible limits by the injection of sufficient amount of reactive power. For higher values of pitch angle (β), the reactive power injected, V_a and I_a in p.u. are high since the measured value of voltage (V_{meas}) falls below the permissible limit of 0.95 p.u. To achieve this higher reactive power, all the three TSCs need to be triggered.

VIII. Conclusion

Themodel of windfarm is developed usingSVCinMATLAB/SIMULINK environment and the output waveforms are analyzed. It is inferred that SVC provides an improvement in voltage regulation, thereby stability, and power factor in ac transmission and distribution systems. Further, STATCOM andUPFC can also be utilized for reactive power compensation in windfarms which cost high. As wind is fluctuating in nature, the output power and terminal voltage of wind generator also fluctuate randomly. The proposed reactive power compensation scheme using Flexible AC Transmission System (FACTS) devices can maintain constant voltage magnitude at wind farm terminal.

Further, STATCOM and UPFC can also be utilized for reactive power compensation in wind farms, but the investment cost of these devices is high. STATCOM acts as a good under- voltage performance current source which can be used only for symmetrical control range. Otherwise, it leads to hybrid solutions. But SVC is agood overvoltage performance impedance which is freely adjustable to any control range by TCR / TSC branches. When considering the transient behavior, STATCOM is self protecting only at critical system faults whereas SVC is available before, during and after critical system conditions. UPFC doesn't provide continuous reactive power since it has two switching converterssharing the same storage capacitor from a common dc link and it has a little effect on the voltage angle. Compared to STATCOM and UPFC, the availability of SVC is high and has reduced losses. Therefore, SVC maintains the demand of reactive power within the limits set by utilities, thereby avoiding penalties.

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