Domain Adaptation for Biomedical Image Segmentation Using Adversarial Training

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Abstract: **Medical Image Segmentation is the process of automatic or semi-automatic detection of boundaries within a 2D or 3D image. A major difficulty of medical image segmentation is the high variability in medical images. First and foremost, the human anatomy itself shows major modes of variation. Furthermore many different modalities like X-ray, CT, MRI, microscopy, PET, SPECT, Endoscopy, OCT, and many more are used to create medical images. The result of the segmentation can then be used to obtain further diagnostic insights. Possible applications are automatic measurement of organs, cell counting, or simulations based on the extracted boundary information. The role of segmentation is to subdivide the objects in an image; in case of medical image segmentation the aim is to Study anatomical structure, Identify Region of Interest i.e. locate tumor, lesion and other abnormalities, Measure tissue volume to measure growth of tumor, Help in treatment planning prior to radiation therapy; in radiation dose calculation. Automatic segmentation of medical images is a difficult task as medical images are complex in nature and rarely have any simple linear feature.**

This paper focus on some image segmentation and methods of image segmentation, some literature survey on image segmentation and adversarial machine learning training

Keywords: Image, Segmentation, Adversarial machine learning, 2D, 3D

I INTRODUCTION

The huge and rapid growth of medical and biomedical image data, energy-efficient solutions for analyzing such image data that can be processed fast and accurately on platforms with low power budget are highly desirable.[1]

Deep learning based methods for segmentation in medical imaging are being vastly explored in recent years and may vary in the specifics on how they handle the task. With the growing interest on deep learning for several computer vision tasks, the first attempts on using Convolutional Neural Networks (CNNs) for image segmentation were based on processing image patches through a sliding window, which yielded segmented patches. Those independent segmented patches were then concatenated for the creation of the final segmented image. The main drawbacks of this approach are regarding computational cost several forward passes for generating the final result as well as regarding inconsistency in predictions which can be fixed by overlapping sliding windows.[2] The most common deep architecture for segmentation nowadays is the so-called

Fully Convolutional Network (FCN). This architecture is based solely on convolutional layers with the final result not depending on the use of fully-connected layers. FCNs can provide a fully-segmented image within a single forward step with variable output size depending on the input tensor size. One of the most well-known FCNs for medical imaging is U-net which combines convolutional, down sampling, and up sampling operations with skip non-residual connections.[2] Deep Domain Adaptation (DDA), which is a field unrelated in essence to medical imaging, has been widely studied in the recent years.

II LITERATURE REVIEW

1) Mehran Javanmardi and Tolga Tasdizen focus on biomedical image segmentation in the context where there is variation between source and target datasets and ground truth for the target dataset is very limited or non-existent. They use an adversarial based training approach to train CNNs to achieve good accuracy on the target domain. They use the DRIVE and STARE eye vasculature segmentation datasets and show that their approach can significantly improve results where they only use labels of one domain in training and test on the other domain. They also show improvements on membrane detection between MICCAI 2016 CREMI challenge and ISBI 2013 EM segmentation challenge datasets.[3]

2) Yroslav Ganin, Eveganiya Ustinova and et alintroduce a new representation learning approach for domain adaptation, in which data at training and test time come from similar but different distributions. Authors are directly inspired by the theory on domain adaptation suggesting that, for effective domain transfer to be achieved, predictions must be made based on features that cannot discriminate between the training (source) and test (target) domains. The approach implementation is in the context of neural network architectures that are trained on labeled data from the source domain and unlabeled data from the target domain (no labeled target-domain data is necessary). As the training progresses, the approach promotes the emergence of features that are (i) discriminative for the main learning task on the source domain and (ii) indiscriminate with respect to the shift between the domains. Here in this paper authors show that this adaptation behavior can be achieved

Medical Image Segmentation Use Neural Network for Novel Domain Variation Framework

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Abstract: **We propose a division structure that utilizes profound neural systems and present two developments. In the first place, we portray a biophysics-based space adjustment technique. Second, we propose a programmed strategy to portion white and dark issue, and cerebrospinal liquid, notwithstanding faint tissue. Concerning first development, we utilize a space adjustment structure that consolidates a novel multispecies biophysical tumor development display with a generative ill-disposed model to make sensible looking engineered multimodal MR pictures with known division. With respect to second advancement, we propose a programmed way to deal with enhance accessible division information by processing the division for solid tissues. This division, which is finished utilizing diffeomorphic picture enrollment between the BraTS preparing information and many relabeled map books, gives more data to preparing and diminishes the class irregularity issue. Our general methodology isn't explicit to a specific neural system and can be utilized related to existing arrangements. We exhibit the execution improvement utilizing 2D U-Net for the BraTS'18 division challenge. Our biophysics based space variety accomplishes better outcomes, when contrasted with the current best in class GAN demonstrate used to make manufactured information for preparing.**

*Keywords:-*Segmentation, Neural Network, Machine Learning, tumor growth models

I INTRODUCTION

Programmed division techniques can possibly give precise and reproducible names prompting improved tumor anticipation and treatment arranging, particularly for situations where access to master radiologists is constrained.

In the BraTS rivalry, we try to section multimodal MR pictures of glioma patients. Normal cerebrum MRI modalities incorporate post-Gadolinium T1 (used to improve difference and representation of the blood-mind boundary), T2 and FLAIR (to feature distinctive tissue liquid powers), and T1. We utilize the information for these four modalities to create the divisions utilizing a philosophy that we diagram beneath.

REVIEW OF LITERATURE-:

In most image classification tasks, deep neural networks (DNNs) have been a very powerful technique that tends to outperform other approaches and BraTS is no different. From past BraTS competitions two main DNN architectures have emerged- Deep Medic and U-Net. How can we further improve this approach? Most research efforts have been on further improving these architectures, as well as coupling them with post-processing and ensemble techniques. In our work here, we propose a framework to work around the relatively small training datasets used in the BraTS competition. Indeed, in comparison to other popular classification challenges like Image Net (which consists of one million images for training), the BraTS training set contains only 285 instances (multimodal 3D MR images), a number that is several orders of magnitude smaller than the typical number of instances required for DNNs to work well.

As we can see from the intensity distributions, the values in the adapted images are qualitatively closer to the real images.

1. *Data augmentation-* We propose a biophysics based area adjustment methodology to include engineered tumor-bearing MR pictures to the preparation precedents. There have been numerous striking attempts to mimic tumor development. We utilize an in-house PDE based multispecies tumor development model to recreate engineered tumors. Since recreated information does not contain the right powers circulation of a genuine MR picture, we train a helper neural system to change the mimicked pictures to coordinate genuine MRIs. This system gets a multimodal input and changes this information to coordinate the dispersion of BraTS pictures by forcing certain cycle consistency limitations. As we will appear, this is an exceptionally encouraging methodology.
2. *Extended division-* We stretch out the division to the solid parenchyma. This is done in two stages. To begin with, we section the preparation dataset utilizing a chart book based gathering enrollment (utilizing an in-house diffeomorphic enlistment code). Second, we train our DNN system to fragment both tumor and sound tissue (four classes, glial issue, and cerebrospinal liquid, dim, and white issue). Our methodology includes imperative data

Feature Extraction and Analysis of MRI Images for Breast Cancer

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Abstract: **Breast cancer is a disease that starts in the breast with a malignant tumor. A malignant tumor is a mass of cells that grows out of control. The cancerous cells can also metastasize, or move to other tissues or parts of the body. The cancer can develop in any of the three types of breast tissue- lobules, ducts, and connective tissue. Breast cancer that spreads into normal tissue is called invasive breast cancer. Noninvasive breast cancer stays within the breast lobule or duct. Feature extraction is a process of image processing which is used to select and extract those features/properties which are helpful in identifying the problem of interest. It is a methodology followed not only in digital image processing but also in machine learning, pattern recognition and computer vision. Feature extraction involves reducing the amount of resources required to describe a large set of data. When performing analysis of complex data one of the major problems stems from the number of variables involved. Analysis with a large number of variables generally requires a large amount of memory and computation power, also it may cause a classification algorithm to overfit to training samples and generalize poorly to new samples. Feature extraction is a general term for methods of constructing combinations of the variables to get around these problems while still describing the data with sufficient accuracy. Many machine learning practitioners believe that properly optimized feature extraction is the key to effective model construction. This paper focus on some symptoms and causes of breast cancer, some literature survey on Feature extraction.**

Keywords: Cancer, Malignant tumor, Feature extraction, machine learning

I INTRODUCTION

There are around 3.1 million breast cancer survivors in the United States (U.S.). The chance of any woman dying from breast cancer is around 1 in 37, or 2.7 percent. Awareness of the symptoms and the need for screening are important ways of reducing the risk. Breast cancer can affect men too, but this article will focus on breast cancer in women. Here are some fast facts about breast cancer. Breast cancer is the most common cancer among women. Symptoms include a lump or thickening of the breast, and changes to the skin or the nipple. Risk factors can be genetic, but some lifestyle factors, such as alcohol intake, make it more likely to happen. A range of treatments is available, including surgery, radiation therapy, and chemotherapy. Many breast lumps are not cancerous, but any woman who is concerned about a lump or change should see a doctor.

The exact cause remains unclear, but some risk factors make it more likely. Some of these are preventable. The risk increases with age. At 20 years, the chance of developing breast cancer in the next decade is 0.6 percent. By the age of 70 years, this figure goes up to 3.84 percent.

Women who carry the BRCA1 and BRCA2 genes have a higher risk of developing breast cancer, ovarian cancer or both. These genes can be inherited. TP53 is another gene that is linked to a greater breast cancer risk. Women who have had breast cancer before are more likely to have it again, compared with those who have no history of the disease. Having some types of benign or non-cancerous breast lumps increases the chance of developing cancer later on. Examples include atypical ductal hyperplasia or lobular carcinoma in situ. Breast cancer is more likely to develop in higher density breast tissue. Being exposed to estrogens for a longer period appears to increase the risk of breast cancer.

This could be due to starting periods earlier or entering menopause later than average. Between these times, estrogens levels are higher. Breast-feeding, especially for over 1 year, appears to reduce the chance of developing breast cancer, possibly because pregnancy followed by breastfeeding reduces exposure to estrogens. Women who are overweight or have obesity after menopause may have a higher risk of developing breast cancer, possibly due to higher levels of estrogens. High sugar intake may also be a factor. A higher rate of regular alcohol consumption appears to play a role. Studies have shown that women who consume more than 3 drinks a day have a 1.5 times higher risk. Undergoing radiation treatment for a cancer that is not breast cancer increases the risk of breast cancer later in life.

The use of hormone replacement therapy (HRT) and oral birth control pills have been linked to breast cancer, due to increased levels of estrogens. In 2012, researchers concluded that exposure to certain carcinogens and endocrine disruptors, for example in the workplace, could be linked to breast cancer. In 2007, scientists suggested that working night shifts could increase the risk of breast cancer, but more recent research concludes this is unlikely.

Comparative Study and Analysis of Security Mechanism in IoT

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Abstract: **The paper deals with the comparative analysis of the security of the services used in IoT. The paper presents theoretical foundations and the IoT architecture. It describes in detail the architecture and types of IoT services in IoT, as well as the protocols used to communicate with the services in order to review possible security issues and suggest possible improvements regarding the security of IoT services. The work includes IoT devices, which are the basis of IoT, and their importance in the safe operation of IoT services is presented.Internet of things is based on sensors, communication networks and intelligence that manage the entire process and the generated data. Sensors are the senses of systems, because of this; they can be used in large quantities. Sensors must have low power consumption and cost, small size and great flexibility for its use in all circumstances. Therefore, the security of these network devices, data sensors and other devices is a major concern as it grows rapidly in terms of nodes interconnected via sensor data.**

Keywords: **IoT security, IoT services, data sensors, communication networks**

I Introduction

The term Internet of Things (IoT) was created in 1999. It was conceived as a world of objects that exchange data.Data exchange is not only between man and machine; butcommunication between machines (M2M) is alsointroduced. Kevin Ashton, in his paper published in 2002, under the title IoT, said- "We need an internet for things,and a standardized way for computers to understand thereal world."The International Organization for Standardization (ISO),in 2012 founded the group ISO/IEC JTC 1/SWG 51,which will deal with standardization in the area ofInternet of Things (IoT). This group defined IoT as- "Aninfrastructure of interconnected objects, people, and systems and information resources together with intelligentservices to allow them to process information of physicaland virtual world and react." [1][2]Nikola Tesla had a vision of IoT almost 100 years ago,„when wireless is perfectly applied, the whole earth willbe converted into a huge brain ... ". Researchers Caceresand Friday identified two critical infrastructures that willimpact ubiquitous computing - Cloud Computing and theInternet of Things. [3]IoT can be viewed from two perspectives. The first, where IoT is viewed from the perspective of the Internetwhere attention is paid to Internet services, while thesecond perspective focuses attention on smart things. [4]

I.I Security Challenges in IoT

As more and more IoT devices make their way into the world, deployed in uncontrolled, complex, and often hostile environments, securing IoT systems presents a number of unique challenges. According to Eclipse IoT Working Group's 2017 IoT developer survey, security is the top concern for IoT developers [5].

Follow are the top ten challenges for IoT security-

1. **Secure constrained devices** - Many IoT devices have limited amounts of storage, memory, and processing capability and they often need to be able to operate on lower power, for example, when running on batteries.
2. **Authorize and authenticate devices** - With so many devices offering potential points of failure within an IoT system, device authentication and authorization is critical for securing IoT systems.
3. **Manage device updates** - Applying updates, including security patches, to firmware or software that runs on IoT devices and gateways presents a number of challenges.
4. **Secure communication** - Once the devices themselves are secured, the next IoT security challenge is to ensure that communication across the network between devices and cloud services or apps is secure.
5. **Ensure data privacy and integrity** - It is also important that wherever the data ends up after it has been transmitted across the network, it is stored and processed securely. Implementing data privacy includes redacting or anonymizing sensitive data before it is stored or using data separation to decouple personally identifiable information from IoT data payloads.
6. **Secure web, mobile, and cloud applications** - Web, mobile, and cloud apps and services are used to manage, access, and process IoT devices and data, so they must also be secured as part of a multi-layered approach to IoT security.
7. **Ensure high availability** - As we come to rely more on IoT within our day-to-day lives, IoT developers must consider the availability of IoT data and the web and mobile apps that rely on that data as well as our access to the physical things managed by IoT systems.

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Analysis of Causes and Effects of Longer Lead Time in Software Process Using FMEA

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Abstract— Longer lead time in small and medium enterprises results in direct impact on delivering the project at the stipulated time period, hence resulting in more costs involved. The reason for the delay in the lead time is because of the various 'waste' factors which can be analyzed by using Failure Mode Effective Analysis (FMEA). The paper discusses on the steps used in FMEA right from listing of potential failure modes to taking necessary actions in eliminating or reducing the high-risk failure modes.

IndexTerms— Longer Lead Time; Smaller and Medium Enterprises (SMEs); Waste; Failure Mode.

I. Introduction

As per the definition the "Lead time" refers to the time required for the organization in delivering the order being placed by the customer. The "Longer Lead Time" is delay in delivering the order placed by the client. The reason for the longer lead time is because of various factors:

A. Handoffs

When the requirement flows from one batch to another batch, it flows in the forms of queues. During batch flow the information flows between various departments. The delay in sending information from one batch will lead to delay in receiving the information in another. As a result it will lead to longer lead time, the solution to this is to have an automated approach also to make batches work in parallel so as to save time and hence delivering the order within the stipulated time period.

B. Approval Process

The SMEs handling larger projects, the most important factor here is sharing of the data. The lack of data sharing between the departments leads to the complexity hence resulting in approval process being near to impossible for the delivery tea9m. Thus there is a need of usage of automated tool known as the Jira tool, which is a repository for storing all the codes developed by different departments.

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C. Environment Management and Provisioning

The development team requires a platform where new feature can be tested. Lack of availability of such environment leads to delay in addressing the problems with different versions of the software. For example, there is a version control software which is a repository of storing multiple versions of the software. The version control provides access the different versions of the code and thus reducing the complexity between various versions of software code.

D. Deployments of the software manually

The deployment of the software manually are prone to errors as it is difficult to handle the large code manually. Thus there is a need of reliable of automated process like Jira tool where different modules of codes are integrated in the common platform.

E. Manual Software Testing

It is always better to have code tested automatically that is in case of the project of huge scale. If manually tested the amount of bug detected is less and amount of investment done will be huge. If automatically tested using automated testing tools like Selenium, we will be to test the code at faster rate and amount of bugs detected will be more.

II. Literature Survey

According to the paper by Baiqiao Huang et.al. [1] - it aims at classifying failure modes in the database first one being the general failure and the second being the special failure. The Failure mode databases is one of the prominent analysis techniques for workers analyzing FMEA, where it makes process not only software operate but also improves the efficiency. [6] [7] [8]

According to the paper by Peter L. Goddard [2] - it shows the methods that allows to assess the behavior of the software process. The paper also explains the use of fault tolerant platform. The author of the paper has successfully explained the Failure Mode Effective Analysis in the automotive platforms using brakes etc. The same concept has applied in the Software to find out the hardware failure causing failure of the software operation.

According to John B. Bowles et.al. [3] -The paper explains how FMEA can be effectively used in the embedded chip with not hardware protection. To begin with functionality of the system is being described followed by

between hardware and software. In the end FMEA is done to analyses the cause and effect of the software variables used.

According to Nathaniel Ozarin et.al. [4] - The paper explains how FMEA is performed on the software where there are many errors related to electronic hardware. The author explains the accuracy of the FMEA reduces as there is movement of analysis from lowest level to highest level. Lowest Level are the method to module level coding, highest level is the package level coding. The accuracy level for the package level coding is less when compared to the method level coding.

According to Dong Nguyen et.al. [5] The paper presents very appropriate method of providing solution the problem of causes and effects of the waste using FMEA. This approach provides every information that is required for causing the failure and its effect on the software system in everysoftware process. FMEA also checks for what are the possible failures that are going to occur at each stage in the software process. The author also explains what are the corrective actions need to be taken. [9] [10].

III. Results On Failure Mode Effective Analysis

Adopting FMEA - With usage of FMEA used in the three software development firms to assess the Software Development Life Cycle (SDLC). During the course of the cycle nine steps were being followed:

The first step is the process review –To begin with the software team had assessed the complete SDLC to give FMEA team the thorough knowledge of the project development done on the web application. The following Figure 1 shows the step by step analysis of the software development process for the web application.

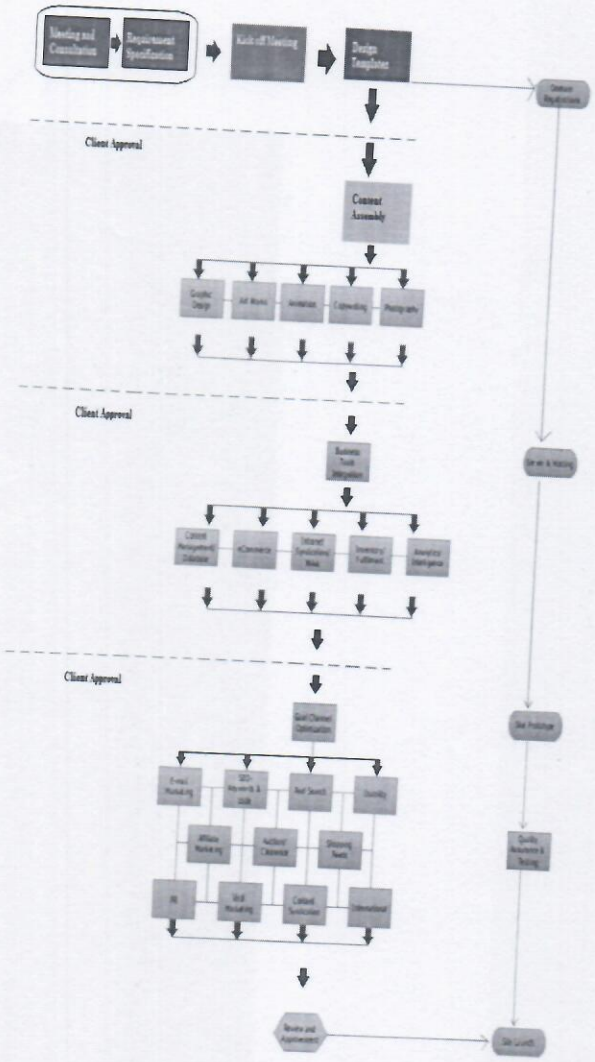

Figure 1: Step by step analysis for web application development.

As shown in the Figure 1, the software development process of the web application is done. In the beginning there will be continuous meetings and consultations with the clients and the development team. The outcome of this leads to finalization of the requirements for the web applications. After this kick off meeting is done to decide on the templates for the web applications and decide on the domain perspective. The next step is divided into two sets of stages one is the business perspective of the development process and the other is the technical stages. The business perspective has the following stages where the assembling of the contents is done according to the graphic designing, user interface etc. Which is followed by the integration of the various business tools like e-Commerce, content management system etc. Next step is to do decide on the profitable channel to market the web application. To this the client reviews and gives the approval for the same. On the technical perspective domain registration is done for the kind of website to be developed. Which is followed by hosting of the website is decided. Next step is done to prepare the prototype of the website followed by the quality assurances and testing. Once this is completed

1. **Finding out what are the potential failure modes** – Once the team understand about the software process, the team members started analyzing the causes of the potential failure and that which could influence the software process and its quality. After the rigorous brainstorming session the result of team members expressed the potential failure modes as shown in Table 1

Table 1: Potential Failure Modes for the following codes

Code	PotentialFailureForm
PFF1	Requirements defined pending
PFF2	Number of actual requirements and the addressed requirement is different
PFF3	Number of errors fixed versus no of errors pending
PFF4	The actual number of units coded,tested is less than those tested at the execution stage
PFF5	The number of unittesting pending
PFF6	The number of testing stage that was used
PFF7	The total number of errors being after testing
PFF8	Lack of understanding the requirement by the developers from the client
PFF9	Number of errors being rectified or fixed by the developers
PFF10	What are the gaps between every process
PFF11	Technical Skill of the customer is weak
PFF12	Increase in the requirements
PFF13	Lack of knowledge required for current technology
PFF14	Market and technological opportunities not translated into requirement
PFF15	The Defects of the software listed at one instances listed in the later stages.
PFF16	Lack of end user participation

What are the impacts for each potential failures caused– As shown in the Table 1 which shows different potential failure modes, where each failure modes are grouped and assessed for the potential impacts from the existing failure which is shown in the Table 2 below

Table 2: Effects for each failure modes

PFF1	Customer unsatisfied	PFF2	Business Loss	PFF3	Customer Unsatisfied	PFF4	Customer Requirements not understood
PFF5	Delay in Order Processing	PFF6	Delay in Order Processing	PFF7	System Compatibility requirements not evaluated	PFF8	Delay in Order Processing
PFF9	Customer expectations not met	PFF10	Delay in Order Processing	PFF11	Delay in Order Processing	PFF12	Delay in Order Processing
PFF13	Timely delivery Failure	PFF14	Timely delivery Failure	PFF15	Business Loss	PFF16	Customer expectations not met

Ranking for Severity of each Failure – The ranking is given as per the Table 3 below:

Table 3: Potential Failure Severity Ranking

Nature of the failure impact	The severity of the failure	Ranking
Dangerous without any warning	Rated very high in the severity index as the impact of the failure effects the function of the safe system without warning	10
Dangerous with warning	Severity wise is less effective but still hazardous as it effects the functioning of the safe system with a warning.	9
Impact very high	The functioning of the system is not operable causing destructive failure and not compromising the safety	8
High Impact	The functioning of the system becomes inoperable with	7

	damaging the equipment	
Medium Impact	The functioning of the system becomes inoperable with possibility of damaging the equipment being minimal	6
Low Impact	The functioning of the system becomes inoperable with possibility of little damage	5
Very Low Impact	System functional performance is significantly degraded	4
Minimal Impact	System functional performance is degraded slightly	3
Very Minimal Impact	System is functional with slight error	2
No Impact	No potential failure	1

Based on the Table 3, the Figure 2 showing the Pie Chart, ranking severity for each failure is done.

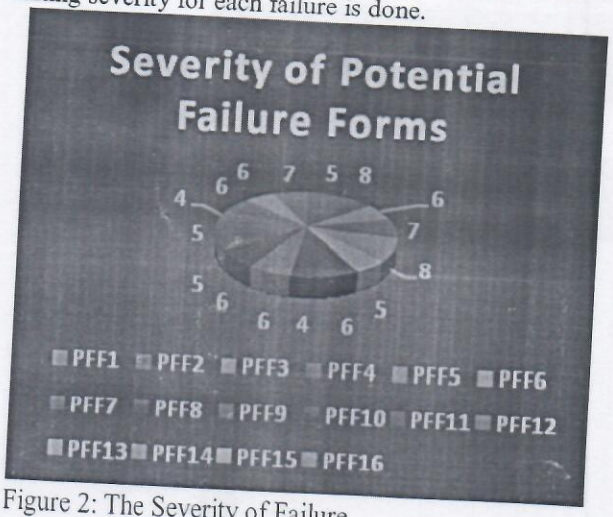

Figure 2: The Severity of Failure

As shown in the Figure 2, the potential failure forms PFF8, PFF13 has severity ranking 4 which means it is very low impact. The potential failure forms PFF1, PFF6, PFF11, PFF12 has severity ranking 5 which means low impact. The potential failure forms PFF3, PFF7, PFF9, PFF10, PFF14, PFF16 has severity ranking 6 which means medium impact. The potential failure forms PFF4, PFF16 has severity ranking 7 which means high impact. The potential failure forms PFF2, PFF5 has severity ranking 8 which means very high impact

Ranking for Occurrences of each Failure – The ranking is done based on the Table 4, which signifies how likely the failure is occurred frequently. The Figure 3 shows the ranking of occurrences of each failure.

Table 4: Frequency of Failure Occurred Ranking

Nature of the failure impact	The severity of the failure	Ranking
Very Hazardous	Rated very high as the failure is occurred frequently leading to failure in system functionality without warning.	10
Hazardous	Rated very high as the failure is occurred frequently leading to failure in system functionality with warning.	9
Very high occurrences	The functioning of the system is not operable causing destructive failure and not compromising the safety	8
High occurrences	The functioning of the system becomes inoperable with possibility of damaging the equipment	7
Medium occurrences	The functioning of the system becomes inoperable with possibility of damaging the equipment being minimal	6
Low occurrences	The functioning of the system becomes inoperable with possibility of little damage	5
Very low occurrences	System functional performance is significantly degraded	4
Minimal occurrences	System functional performance is degraded slightly	3
Very Minimal occurrences	System is functional with slight error	2
No occurrences	No potential failure occurrences	1

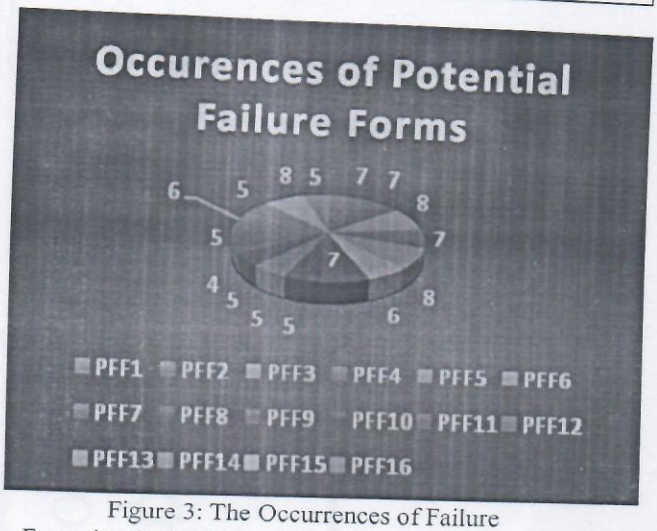

Figure 3: The Occurrences of Failure

From the above Figure 3, the occurrences of the failure forms for PFF11 is 4 which means very low. The occurrences of the failure forms for PFF8, PFF9, PFF10, PFF12, PFF14,

failure forms of PFF6, PFF13 is 6 which means medium. The occurrences of the failure forms of PFF1, PFF2, PPF4, and PFF7 is 7 which means high. The occurrences of the failure forms of PFF3, PFF5, and PFF15 is 8 which means very high.

To identify the ranking for each failure rates – The ordering of the failure is done based by giving ranking to each of the failure modes on the Table 5. As per the Figure 4, the detection of failure mode ranking is shown

Table 5: Frequency of Failure Identified Ranking

Nature of the failure impact	The Identification of the failure	Ranking
Very Hazardous	Rated very high as the failure is detected frequently leading to failure in system functionality without warning.	10
Hazardous	Rated very high as the failure is detected frequently leading to failure in system functionality with warning.	9
Very highlydetected	The functioning of the system is not operable causing destructive failure and not compromising the safety	8
Highlydetected	The functioning of the system becomes inoperable with possibility of damaging the equipment	7
Medium detected	The functioning of the system becomes inoperable with possibility of damaging the equipment being minimal	6
Low detected	The functioning of the system becomes inoperable with possibility of little damage	5
Very low detected	System functional performance is significantly degraded	4
Minimal detected	System functional performance is degraded slightly	3
Very Minimal detected	System is functional with slight error	2
Not detected	No potential failure detected	1

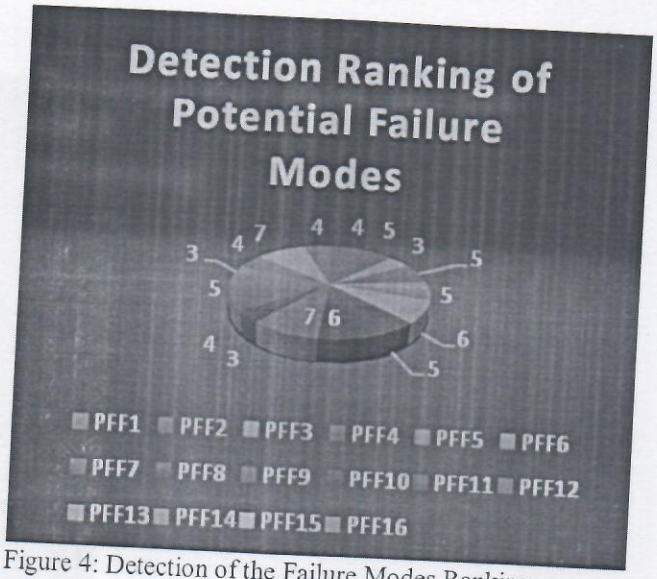

Figure 4: Detection of the Failure Modes Ranking

From the above Figure 4, the detection of the failure forms PFF3, PFF10, PFF13 is 3 which means minimal. The detection of the failure forms PFF1, PFF11, PFF14, and PFF16 is 4 which means very low. The detection of the failure forms PFF2, PFF4, PFF5, PFF7, and PFF12 is 5 which means low. The detection of the failure forms PFF6, PFF8 is 6 which means medium. The detection of the failure forms PFF9, PFF15 is 7 which means high.

The summary of the ranking for Potential Failure Modes in terms of Occurrences, Severity and Detection is shown in Table 6

Table 6: Summary of Ranking of each Potential Failure Modes in terms of severity, occurrences and detection

Potential Failure Forms	Failure Severity Index	Failure Occurrence Index	Detection of the Potential Failure
PFF1	7	5	4
PFF2	7	8	5
PFF3	8	6	3
PFF4	7	7	5
PFF5	8	8	5
PFF6	6	5	7
PFF7	7	6	5
PFF8	5	4	6
PFF9	5	6	7
PFF10	5	6	3
PFF11	4	5	4

PFF12	5	5	5
PFF13	6	4	3
PFF14	5	6	4
PFF15	8	6	7
PFF16	5	7	4

Calculating the priority of the risks for each failure modes –To calculate this we use need to find out The Risk Precedence Index(RPI) is calculated by

RPI= Severity of the FailureIndex x Occurrence of the FailuresIndex x Detection of the Potential Failure Index

The following Table 7 and Figure 5 shows the Risk Precedence Index for each failure modes

Table 7: Risk Precedence Index Calculation for each potential failure.

Potential Failure Forms	RPI
PFF1	140
PFF2	280
PFF3	144
PFF4	245
PFF5	320
PFF6	210
PFF7	210
PFF8	120
PFF9	210
PFF10	90
PFF11	80
PFF12	125
PFF13	72
PFF14	120
PFF15	336
PFF16	140

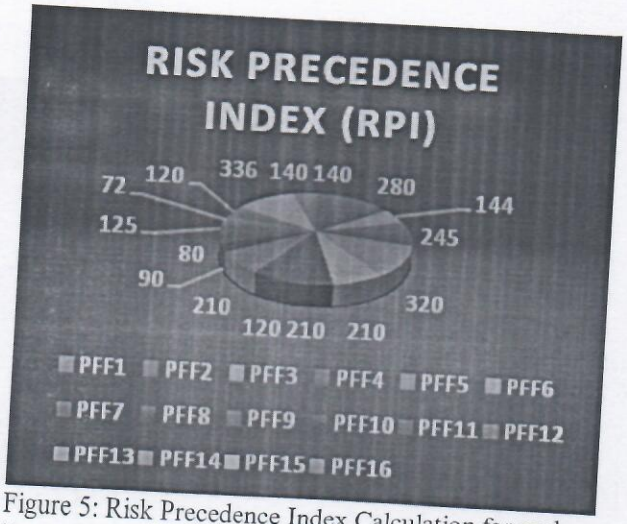

Figure 5: Risk Precedence Index Calculation for each Failure Modes/ Forms

From the above Figure 5, The Risk Precedence Index for PFF1 is 140, PFF2 is 280, PFF3 is 144, PFF4 is 245, PFF5 is 320, PFF6 is 210, PFF7 is 210, PFF8 is 120, PFF9 is 210, PFF10 is 90, PFF11 is 80, PFF12 is 125, PFF13 is 72, PFF14 is 120, PFF15 is 336 and PFF16 is 140.

Prioritize the Failure Forms for Action – Based on the highest Risk Priority Index (RPI) the potential failure forms are being prioritized. As per the Table 8 the highest priority listed to potential failure forms/ modes that is the failure with highest risk to lowest risk is sequenced as follows – PF15, PF5, PF2, PF4, PF6, PF7, PF9, PF3, PF1, PF16, PF12, PF8, PF14,PF10, PF11, PF13. Table 8 shows the prioritizing of the potential failure forms based on RPI.

Table 8: Priority of Potential Failure Forms based on RPI

Potential Failure Forms	Severity of the FailureI ndex	Occurrence of the Failure Index	Detection of the Potential Failure Index	RPI
PFF15	8	6	7	336
PFF5	8	8	5	320
PFF2	7	8	5	280
PFF4	7	7	5	245
PFF6	6	5	7	210
PFF7	7	6	5	210
PFF9	5	6	7	210
PFF3	8	6	3	144
PFF1	7	5	4	140
PFF16	5	7	4	140

PFF12	5	5	5	125
PFF8	5	4	6	120
PFF14	5	6	4	120
PFF10	5	6	3	90
PFF11	4	5	4	80
PFF13	6	4	3	72

Take Necessary Action to eliminate the high risk rate – As shown in Table 9 we tried to eliminate the high risk failure modes either completely or reduce to certain extent. Ideally it is not possible to eliminate the risk for all the potential failure modes/forms.

Table 9: Necessary action to eliminate high risk failure forms

Problems	SuggestedActions
Pendingtargets	Shows the details that are slowing the process. The errors that are found are needed to be fixed and then it is allowed to go the next stage. If there is any irregularity while collecting the data. Then the interview with the client must be stopped and ensure the right data is being collected. Once collected the data needs to be analyzed for practical applicability.
Highnumber ofdetailchang esgotversusn umberfinishe d	As the software process is Agile, which is incremental in nature, with each increments there are prerequisites that stops the advancements of the process. Thus whole process must be split into two Sprints
Moreorlessere rrorsintesting	The outcome of the Tests produces wrong results. An experienced tester ensures that each module is tested to accuracy of the outcomes and regular re-testing are done to ensure the outcome is accurate.
Number of errors being rectified or fixed by the developer	It is a necessary that the staffs who are being involved in the project have worked on the requirement will eventually do the testing and must report the errors to the developers to fix it.

IV. CONCLUSION

The Failure Mode Effective Analysis is technique in which we will be able to know from the potential failures caused during development process and its effects towards the system. As mentioned in this paper from the Table 1 we mentioned what are the Potential Failure Modes identified for the particular development project. With the order of ranking we found out the severity, occurrences and detection of the defects, from which we have prioritized the risk using RPI because of which it was possible as to what caused delay in the lead times or the longer lead time being caused in the software development process as mentioned in Table 2 to 8. To this suggested action is being provided to the problems listed in Table 9. From this we can conclude that although we have prioritized the risks for the potential failure modes, it is not always possible to eliminate high risk failures for all the potential problems.

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ROC Structure analysis of Lean Software Development in SME's Using Mathematical CHAID Model

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ABSTRACT

These days, numerous software associations are utilizing agile philosophies to improve the execution of their procedures. In any case, some of them are discovering benefits in the better approaches for improving these officially settled procedures. Lean software development has been utilized to upgrade these procedures significantly more, for the most part because of the decrease of waste. So as to have the capacity to push forward the impact of this marvel, giving progressively empiric proof on this theme is required. This Paper attempts to present a questionnaire survey summarized results of SME's in Bengaluru regarding Lean software development , Results are analyzed using IBM SPSS package , The questionnaire used was verified using Cronbach alpha test reading a high reliable and valid status of the conduction of collection process .

Keywords –Agile, IBM SPSS, Cronbach Alpha Test,SMEs

I. INTRODUCTION

"Lead time" is a term obtained from the assembling technique known as Lean or Toyota Production System, where it is characterized as the time passed between a client submitting a request and getting the item requested. There are different advantages of lead time:

- Flexibility amid fast moves in the market
- The capacity to outpace your rivals with quicker, progressively productive yield
- Quicker renewal of stock to maintain a strategic distance from stock outs, lost deals, and lost clients
- Meeting due dates reliably and effectively
- Increases in income on account of expanded request satisfaction

A. Difficulties looked in Lead times

Long Lead Times-Every venture IT association is extraordinary in that it will have diverse bottlenecks and requirements in its arrangement pipelines.

Handoffs-DevOps culture endeavors to separate the authoritative storehouses and progress more to item groups. This is on the grounds that the current siloed hierarchical structure gives headwinds to the goal of short lead times and persistent stream.

Endorsement Processes-Approval forms were initially created to moderate hazard and give oversight to guarantee adherence to auditable principles for moving changes into generation.

Condition Management and Provisioning-There is nothing more debilitating to a dev group than holding on to get a domain to test another element. Absence of condition accessibility as well as condition dispute because of manual procedures and poor booking can make incredibly long lead times, defer discharges, and increment the expense of discharge arrangements.

Manual Software Deployments-Machines are obviously better and substantially steadier at conveying applications than people. However there still are countless that still physically send their code. Robotizing manual arrangement can be a speedy win for these associations. This methodology can be conveyed quickly without major hierarchical changes. It isn't exceptional for associations to see sending lead times diminished by over 90%.

Manual Software Testing-Once nature is prepared and the code is sent, it's time to test to guarantee the code is functioning of course and that it doesn't break whatever else. The issue is that most associations today physically test their code base. Manual software testing drives lead times up on the grounds that the procedure is exceptionally moderate, blunder inclined, and costly proportional out crosswise over vast associations.

B. Problem Statement

The software advertise is winding up progressively powerful which can be seen in every now and again changing client needs. Software organizations should almost certainly rapidly react to these changes. This implies they need to end up light-footed with the target of creating highlights with exceptionally short lead-time and of high caliber.

An outcome of this test is the organizations should convey in all respects rapidly, in the meantime keeping up the quality. Our Research goes for Understanding the total procedures directly utilized in SME's, further recognizing the Non Value Added exercises and diminishing it by proposing a model.

II. LITERATURE SURVEY

According to EetuKupiainena, Mika V. Mantyla and JuhaItkonen [1] - The aim of the paper is to know the causes and effects of using the software metrices in agile development. The paper indicates that usage of metrics in agile approach is similar to the conventional method and hence the sprints and projects in the agile approach need to be detected and fixed.

According to Brian Fitzgerald, Klaas-Jan Stol, Ryan O'Sullivan, and Donal O'Brien [2] - The paper explains that the main aim of the research is to examine how in the controlled environment the standards can be met by agile development process. The paper also explains that in the controlled environment the product is first strategized for 3 months where numerous product backlogs are being listed which will be taken care during the sprints. Where each sprint has the daily scrum managed by the scrum master. During daily scrum the highly prioritized backlogs are being taken care and after the end of the sprint. The feedback is being taken from the client. The paper concludes that how the agile process works well in the controlled environment.

According to Robert Imreh and Mahesh S. Raisinghani [3] - The main objective of the study is to know the impact of using agile development process in improving the quality of the organizations. The methodologies followed in this paper is to find out the individuals thorough with the software tolls. Ensuring that every work is being documented. Making sure that the negotiation with the customer over scheduling and pricing is done and lastly to make sure the software responds to any alteration being asked by the client. The main outcome of the study with the usage of agile development process it is possible to establish the standardized approach to software development.

According to SandhyaTarwani and Anuradha Chug [4] - The point of this methodical writing audit: - Various Agile strategies for better software upkeep; Comparison of cascade demonstrate and nimble philosophy; the change from cascade model to dexterous techniques; various devices accessible for Agile approaches; Summarize the quality and shortcomings of Agile Methodologies. In the wake of watching the confirmations from the exploration ponders, it was seen that by presenting light-footed software development procedures there has been a constant improvement in the field of software development.

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An Fully Automated CAD System for Juxta-Vacular Nodules Segmentation in CT Scan Images

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Abstract — **Early detection of all kinds of lung nodules with different characters in patient's medical modality images is the best acceptable remedy to save the life of lung cancer sufferers. Even though day by day the prominence of Computer-Aided Detection/Diagnosis (CADe/x) systems have been increasing as a part of medical routine in detection of different types of lung nodules, but detection rate performance depends on accuracy of lung parenchyma and nodule segmentation procedures. Segmentation of Juxta-Vascular nodules attached very complex. In this paper new fully automated CAD system is developed to detect and classify Juxta-Vascular nodules. In proposed methodology, lung parenchyma is segmented using iterative thresholding algorithm and lung nodules are segmented using proposed modified region growing algorithm. Since in vascular nodules, separation of blood vessel from nodule is difficult as intensity feature of attached blood vessel and nodule is same. Two new methods nodule segmentation method and vessel removal based on multi features to separate the vascular nodule part from the attached blood vessels are developed. To achieve the higher nodule-vessel separation accuracy, nodule-vessel attached region is refined. Validation of proposed method is performed on LIDC-CT lung images. A fully automated method segments the vascular nodules with less computational time and high accuracy.**

Keywords—Lung parenchyma, Benign and malignant nodule, Juxta-Vascular nodule, Computed Tomography)

I. INTRODUCTION

Lung cancer is disease with highest death rate as compared to breast, prostate, brain and cervical cancers. Even with greater improvement in detection methodologies for lung cancer, death rate is still very high in patient with stage III and IV lung cancer. Thus early stage lung nodules detection followed by the proper treatment is best choice to avoid conversion of early stage nodules into malignant tumors and to reduce mortality rate. Lung nodules possible size ranges from 3mm to 30mm. Small, non-cancerous and smooth boundary lung nodules are benign nodules. Large, cancerous and irregular boundary lung tumors are knows as malignant nodules. Non-detected benign nodules may get converts into cancer tumors if left them without detecting and treating. Based on nodule's intensity variation, texture and additional connected components which are not a part of nodules, lung nodules are differentiated into well circumscribed, Juxta-Vascular Nodule (JVN) these are nodules attached to blood vessels, Juxta-Pleural Nodules (JPN) these are nodules attached to lung pleural and Ground Glass Opacity (GGO) nodules. Depending on solidity feature of the nodules, they are further classified into solid, partly solid or non-solid. Table I gives the complete details of non-solid, partly solid and solid lung nodules. Medical imaging modalities like X-ray, Magnetic Resonance Imaging (MRI), Diffusion Weight MRI (DWMRI), Computed Tomography (CT), Ultrasound (US) and other modalities have been part of medical routine for lung cancer detection. On medical images lung nodules appears as white patch. CT is GOLD STANDARD modality for detection of all types and stages lung nodules. As CT generates huge amount of images in single scan, interpretation of these images by radiologist to study the characteristic of nodules for further treatment is time consuming. Computer Aided Detection (CAD) system for lung cancer is different lung nodules detection tool that provides proper information about nodules for a radiologist to draw the useful conclusion about CT lung nodules (characteristic, size, benign or malignant), thus improves treatment option. Major steps of lung CAD system are pre-processing, lung parenchyma segmentation, nodule detection and nodule classification. Accurate nodule segmentation determines the performance of CAD system. Main challenges in lung CAD system are detection of all types of nodules. The main reasons are lung lobes shape is not same in all patients, high variation in geometric aspect of lung in different patients, existence of Juxta-Pleural and Juxta-Vascular nodules, overlap of chest wall, connected lung lobes. Lung region segmentation accuracy determines CAD system's nodule detection accuracy.

But segmentation of nodules with externally attached structures is highly challenging. In case of blood vessels attached nodules, identification of blood vessel and nodule part is very tough due to gray level similarity of blood vessel and attached nodule as shown in Figure 1. But properties of attached blood vessels such as their radius, length longer than nodules boundary irregularities and compactness of nodules are clues to separate the external connected blood vessels from nodule. By considering all above mentioned complexity it is required to design new method for automatic segmentation of vascular nodule with high accuracy and clinically acceptable time.

The rest of paper is organized as follows section I is about lung cancer, LIDC dataset, usage of CAD system in lung cancer detection. Section II gives previous related work,

section III describes proposed methodology, and IV discusses results and conclusion.

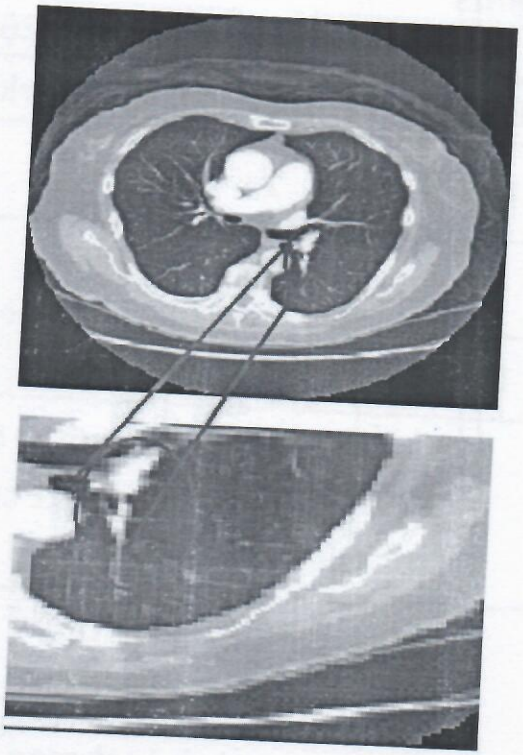

Fig. 1. Jucta-Vascular Nodule in CT scan image.

TABLE I. CHARACTERISTICS OF SOLID, PART SOLID AND NON-SOLID

Sl. No	*Characteristics*	*Solid*	*Part solid*	*Non-Solid*
1.	Shape	Round or irregular	Round or irregular with some solid sections.	Round
2.	Size in Diameter	3cm to 3cm	0.3cm to 3cm.	<0.3cm
3.	Attenuation	Homogeneous soft-tissue attenuation.	Large variations of intensity. Pure GGO.	Hazy increase in attenuation
4.	Obscuration of the underlying structures	Complete	Incomplete	Pure GGC
5.	Malignancy	Less malignant	More malignant	More malignant

II. RELATED WORK

In [1] supervised segmentation based on features such as shape, intensity and contrast of lung nodule was proposed. ANN was used to improve the segmentation accuracy. In [2] author proposed method to analysis the shape of lung nodule using nodule shape model with image intensity also. A. In [3] Fuzzy connectedness algorithm was used by author for lung segmentation. Author used texture features for accurate detection of lung nodules. Y. Lee et al. [4] proposed CAD for lung nodules segmentation in CT images. In this methodology Genetic Algorithm Template Matching (GATM) to Target position in input CT images, conventional template matching to determine the presence of nodules and Lung Wall Template Matching (LWTM) algorithms with semicircular models as reference patterns were used were used. Suzuki et al. [5] developed new CAD system based on supervised filter-Massive-Training Artificial Neural Network (MTANN) to detect the lung nodules. With this new approach 97% sensitivity was achieved with reduced false positive rate. MTANN was also used for classification of nodules. In [9] lung nodule detection was achieved with new automated method based on sign distance field. In testing phase 54 LDCT scan images with 184 lung nodules including part solid, non-solid were considered. A new CAD system to detect lung nodules with removal of attached external structures such as blood vessels was proposed in [10]. Significant nodule enhancement and blood vessel removal by selective nodule enhancement filter and automated rule-based classifier to reduce false positive were key features of this work. 153 nodules of different sizes, shapes and patterns from 117 thin section CT images were used. Experimental results showed that CAD system performance was high to detection nodules with high variation in size, shape and pattern. S. Diciotti et al. [11] proposed the methodology for segmentation of lung nodules which are small in size based on local shape analysis. In the process author also considered Juxta-Vascular and Juxta-Pleural nodules segmentation. CT images with 157 nodules were taken from LIDC public database and achieved sensitivity of 88.5%. SCES approach was used in [12] for solid tumor segmentation. Proposed method obtained 78.72% accuracy with one human interaction. Dynamic programming together with multidirection fusion techniques were used in [13] for lung nodules segmentation. LIDC set1 and set2 were used for validation purpose and 75% accuracy was achieved by this new approach. New method based on morphology operations and convexity models was proposed by T. Kubota et al. [14] for a segmentation of various densities pulmonary nodules. The implanted work was tested on CT scan images were taken from public database LIDC and 69% of segmentation accuracy was achieved. T. Messay et al. [15] proposed method for extraction and detection of lung nodule using multiple thresholds, morphological operations. For each extracted nodule 245 features were calculated. Optimal feature set were determined using SFS. Two classifier Fisher FLD classifier and Quadratic classifier were used for classification. Since FLD performance was outstanding it was considered for implemented CAD system. Author developed multistage CAD system Multiple thresholds, isosurface triangulation and phenotype feature were used by author for lung lesion detection in [16].

Lung cancer clinical diagnosis demands the fast, accurate and reliable CAD system with automatic lung parenchyma segmentation in turn different type of lung nodule detection at their earliest stage. To satisfy above mentioned point we present a new CAD system with proposed methodology for detection of vascular nodules.

III. METHOD

Segmentation of different types of lung nodules is not same. Well circumscribed, Juxta-Vascular, Juxta-Pleural and GGO nodules demands specific type of segmentation method as nodules differs very much in their properties. Thus accurate segmentation of different types of nodules is very challenging. Main difficulty in Juxta-Vascular nodule segmentation is separation of blood vessels attached to the nodule as both have similar intensity values and non-spherical shape of nodules. As discussed in literature CAD systems from many researcher have been developed, but accurate segmentation of different types of pulmonary nodules remains one of challenging research area. As non-solid and part solid nodules are highly malignant in nature with poor contrast and indistinct boundary from surrounding tissues results in high mortality rate. High intensity inhomogeneity and boundary irregularity of part solid nodules also challenging parameters for segmentation. Intensity and model based traditional segmentation methods leads to boundary leakage and over segmentation of Juxta-Vascular nodules.

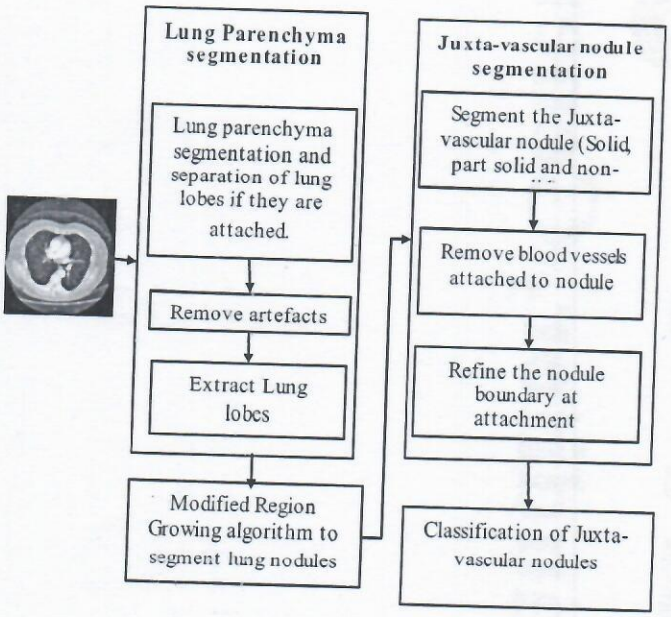

Fig. 2. Architecture of proposed system

A. *Lung parenchyma segmentation*

In this work, lung parenchyma segmentation is performed by

a. Apply iterative thresholding algorithm to obtain binary output image.
b. Apply automatic seed selection region growing algorithm to obtain lung lobes. If lobes are connected separate them.

B. *Juxta-vascular lung nodule segmentation*

Lung nodule detection process consists of two steps

i. Identify the center pixel of nodule candidates
ii. Detect the nodules based on intensity.

In segmented image lung lobes and nodule candidates are with black edges. Non-cancerous (< 3mm, benign) nodules are smaller in size compared to cancerous nodules (>3mm, malignant). Thus nodule size calculation is also key feature of this proposed nodules detection method. Black pixels collection in lung lobes shows the possibility of nodule candidates. Nodule Segmentation algorithm (Algorithm 1) first determines the center pixel of nodule candidates. In second step using center pixels, approximate elliptical boundary for each nodule candidate is identified to calculate average intensity of pixels within the boundary. As in CT lung image nodules appears as white spot with higher intensity value. Algorithm 1 uses this intensity feature to locate the exact nodules in segmented image. Nodule candidates with average pixel intensity greater than specified threshold are extracted and are correctly identified as lung nodules.

Algorithm-1 Nodule Segmentation algorithm

Input: Edge detected image
Output: Image with segmented nodules
Step 1: Begin with black edge pixels,
for each considered black edge pixels
Determine 8 – connected neighborhood black pixels and add to center pixels set
end /*Results in image CN */
Step 2: Obtain the mask image M of original input image.
Step 3: Superimpose CN with image M to obtain superimposed image S.
Step 4: Enhance the resultant image S of Step 3 to obtain enhanced image E.
Step 5: For nodule candidate i with center pixels Pxi in image E
i. Obtain elliptical boundary region.
ii. Calculate the average of pixels intensity (API) with in the nodule candidate.
if API > NT,
nodule candidate is correctly identified as lung nodule and set Cxj as its center pixels
end if
end for

C. *Separation of nodule part and vessel part*

Separation of only nodule parts from Juxta-Vascular Nodules - Region of Interest (ROI) in this study from blood vessel is challenging task as gray level component of both attached vessel and nodules is very much similar. Thus only gray level component is not enough in removal of attached vessel from the Juxta-Vascular Nodule. Multi features such as flow of blood direction in the vessels, shape of blood vessel (elongated tube form with length greater than boundary irregularities of nodules), absence of holes in vessels and distance of end points of blood vessels from center of nodules plays a crucial role in segmentation of vessel from attached nodule. To obtain only the nodule part accurately from Juxta-Vascular Nodules, multi features-nodule segmentation is

proposed, which is based on two proposed methods vascular nodule segmentation method and vessel removal method. To achieve the higher accuracy boundary between the nodule and attached vessel is refined.

Algorithm-2 Vascular nodule segmentation Algorithm

Step 1: Let the segmented nodule is N_v which is ROI in this study. Obtain the size of ROI.
Identify the center point (CP) of segmented nodule N_v using the Eq. 1

$$CP = \sum_{i=1}^{N} Nv_i / N \quad (1)$$

Where N is number of pixels in N_v and N_{vi} is i^{th} pixel in the nodule.

Step 2: Extract the boundary pixels of segmented nodule
Calculate the distance between the boundary point b_i and the center point CP of N_v using Eq.2

$$Di = \|bi - CP\|_2, (i = 0,1,2.....n) \quad (2)$$

Where D_i holds the distance between the boundaries point b_i and CP and n is number of boundary points.

Step 3: Determine end points of attached blood vessel

Case 1: For vessel end points the D_i is very larger compared to boundary points of nodule. In D_i set if only one Di is there with largest value then nodule is attached to one end of blood vessel and other end V_o is free.

Case 2: If two D_i values are larger, then nodule is attached somewhere in between the two ends of blood vessel. V_l and V_r are vessel left end point and right end point with largest D_i values. Using V_l and V_r or V_o blood vessels are tracked along the its path.

Step 4: Determine points of intersection of blood vessel and nodule

In order to find the points of attachment of blood vessel and nodule, nodule-vessel attachment method is proposed.

a. Consider vessel opposite boundary point B_o using center point of nodule CP.
b. Starting from B_o,

i. Boundary of nodule is tracked in anti-clockwise direction and starting with V_l left part of vessel is tracked along its boundary, Il is obtained left nodule-vessel attachment point.
ii. To obtain I_r right nodule-vessel attachment point, nodule boundary tracked clockwise direction starting with B_o and right vessel path is tracked starting with V_r. as shown in Figure 3.

Step 3: Determine nodule-vessel region of attachment

Segmentation of blood vessel from attached nodule is achieved by determining nodule-vessel region of attachment.

Blood Flow Direction (BFD) constrained Region growing is proposed to extract the nodule-vessel attachment region.

a) Starting with V_l and V_r apply region growing by considering flow direction vector F_v of attached blood vessel.
b) Obtain gradient value of each considered pixel to calculate eigenvalues λ_1, λ_2 and λ_3 vessel region. F_v is obtained using the Eq.3

$$F_y = l1 * \sqrt{\lambda_1 + \lambda_2} \quad (3)$$

Where l1 first eigenvalue's unit length.

This determines the nodule-attachment region.

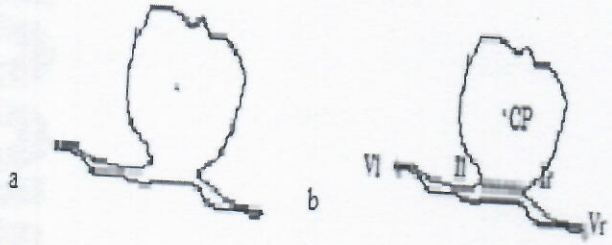

Fig. 3. a. Justa vascular nodule with attached blood vessel b. End points of vessels and attachment points of nodule and blood vessel

Algorithm-3 Vessel removal algorithm

Step 1: Starting with V_l and V_r move along with vessel path,
Step 2: At each step of movement determine number of pixels PCk between vessel end point and center pixel of nodule.
Step 3: Calculate the difference in pixels counts of previous and current step using Eq.4

$$DC_i = (PC_{k+1} - PC_k) / PC_k \quad (4)$$

Step 4: Apply morphology erosion from end of vessel
Step 5: Repeat step 2, 3 and 4 until obtained DCi, is maximum value and it indicates nodule-vessel attachment region.

a) Apply morphology erosion from end of nodule to attachment region to remove the vessel.

IV. RESULT

Total 26 CT scan images with JVN nodules (32) and GGO-JVN (4) nodules from LIDC public dataset [17] were taken to validate the performance of the newly developed CAD system. Table II provides nodule description and Table III explains considered 26 CT scan images from LIDC database. Nodules are either solid or GGO at uncertain locations with a possible size 3 to 30mm.

TABLE II. LIDC-CT IMAGE DESCRIPTION

LIDC-CT image description					
Intensity Value	*Resolution*	*Slice-thickness*	*Average no of slice/scan*	*Current range in X-ray tube*	*Pixel size*
16-bit	512*512	.5 to 2.5 mm	136	30-80mA	.5 to.75 mm/pixel

Proposed method segments and detects both JV and GGO-JV nodules. Obtained results of very steps are discussed as shown in following figures.

TABLE III. LIST OF 26 CT SCAN IMAGES FROM LIDC DATABASE

Sl.No	*LIDC CT Images*	*Nodule No*	*Nodule Type*
1.	LIDC-0003	Nodule 2	JVN(GGO type)
2.	LIDC-0008	Nodule 1	JVN(GGO type)
3.	LIDC-0017	Nodule 1	JVN
4.	LIDC-0021	Nodule 2	JVN
5.	LIDC-0044	Nodule 2, Nodule 3	JVN4
6.	LIDC-0047	Nodule 2	JVN5
7.	LIDC-0114	Nodule 1	JVN6
8.	LIDC-0131	Nodule 1, Nodule 2	Nodule 1-JVN(GGO type) Nodule 2-JVN7
9.	LIDC-0141	Nodule 4, Nodule 6	JVN8, JVN9
10.	LIDC-0146	Nodule 1	JVN10
11.	LIDC-0152	Nodule 1	JVN11
12.	LIDC-0159	Nodule 1	JVN12
13.	LIDC-0160	Nodule 1, Nodule 4	JVN13, JVN14
14.	LIDC-0162	Nodule 2, Nodule 3	JVN15, JVN16
15.	LIDC-0168	Nodule 1	JVN17
16.	LIDC-0175	Nodule 1	JVN18
17.	LIDC-0177	Nodule 1	JVN19
18.	LIDC-0252	Nodule 1,Nodule 2	Nodule 1-JVN20 Nodule2-JVN(GGO type)
19.	LIDC-0273	Nodule 1	JVN21
20.	LIDC-0477	Nodule 1, Nodule 2	JVN22, JVN23
21.	LIDC-0580	Nodule 1	JVN24
22.	LIDC-0915	Nodule 1	JVN25
23.	LIDC-0928	Nodule 2	JVN26
24.	LIDC-0941	Nodule 1, Nodule 2, Nodule 3	JVN29
25.	LIDC-0953	Nodule 1, Nodule 2	JVN31
26.	LIDC-0986	Nodule 1	JVN32

A. *Qualitative analysis*

In this section, segmentation of JVN by RG, FCM, ACM and proposed method was presented. In proposed system iterative thresholding is used to obtain the binary image. On binary image Automatic seed selection region growing algorithm is applied to obtain lung lobes. To improve the segmentation of nodules lung lobes if attached are separated. Artefacts such as CT examination bed, thorax etc. are removed. Small objects in processed images are eliminated. This reduces the search space for the nodules. In Figure 4 (a) shows the original input CT image with JVN, (b) is output of iterative thresholoding, (c), (d) and (e), images with removed artefacts and small objects, (f) and (g) shows the obtained lung lobes mask and enhanced mask.

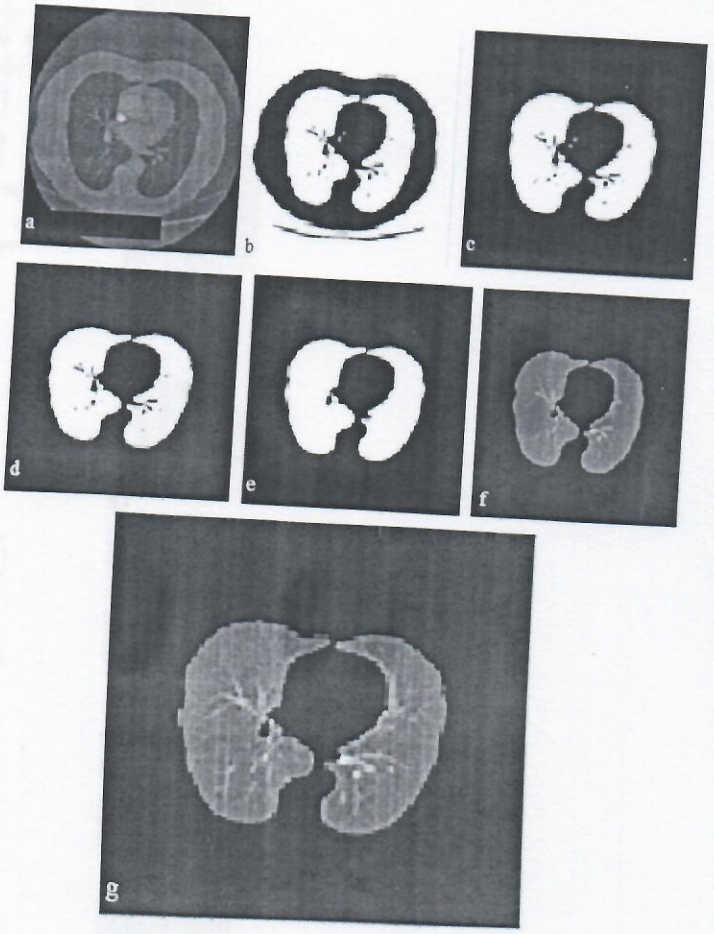

Fig. 4. (a) Original CT scan image, (b) Binaty image-Output of iterative thresholding, (c), (d) and (e) images with removed artefacts and small objects (f) and (g) lung lobe mask and enhanced mask.

The images in Figure 5 were grouped as i. Original CT lung image (a)-row1, row2, row3. ii (b) and (c)-row1, row2, row3 JVN segmentation by RG and FCM methods respectively, (a) and (b)-row4, row5, row6 JVN segmentation by ACM and proposed method. iii (c) - row4, row5, row6 Ground truth of nodules of CT images (a) - row1, row2, row3.

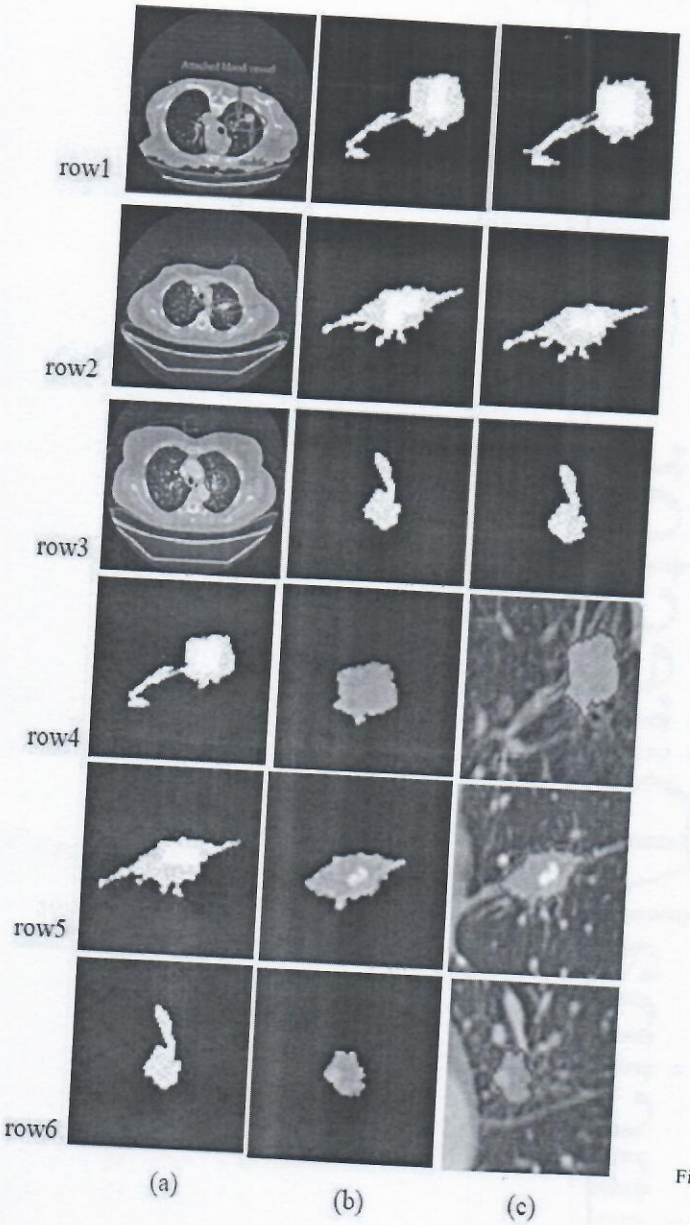

Fig. 5. (a)-row1, row2, row3 original CT lung image ii (b) and (c)-row1, row2, row3 JVN segmentation by RG and FCM methods respectively, (a) and (b)-row4, row5, row6 JVN segmentation by ACM and proposed method. iii (c) - row4, row5, row6 Ground truth of nodules of CT images (a) - row1, row2, row3.

B. *Quatitative Analysis*

To evaluate the segmentation results of JVN, we considered three quantitative metrics Time complexity, Pixel accuracy and Intersection over Union (cross-ratio). In the analysis process S represents segmented image and G represents reference image.

i. Pixel accuracy (PA).

PA is ratio of total number of correctly identified pixels to total pixels in given image. Eq. 5 conveys that higher pixel accuracy indicates better overlapped the results and gold standard.

$$PA = \frac{\sum_{i=0} s_{i1}}{\sum_{i=0} \sum_{j=0} g_{j1}} \tag{5}$$

Figure 6 shows the obtained pixel accuracy for our method and other considered methods for comparison. This indicates proposed method has higher pixel accuracy in lung parenchyma segmentation with JVNs. Figure – 14 clearly indicates that region growing and FCM methods had resulted in lower pixel accuracy values, whereas ACM method's pixel accuracy is better, but still lower as compared with proposed method.

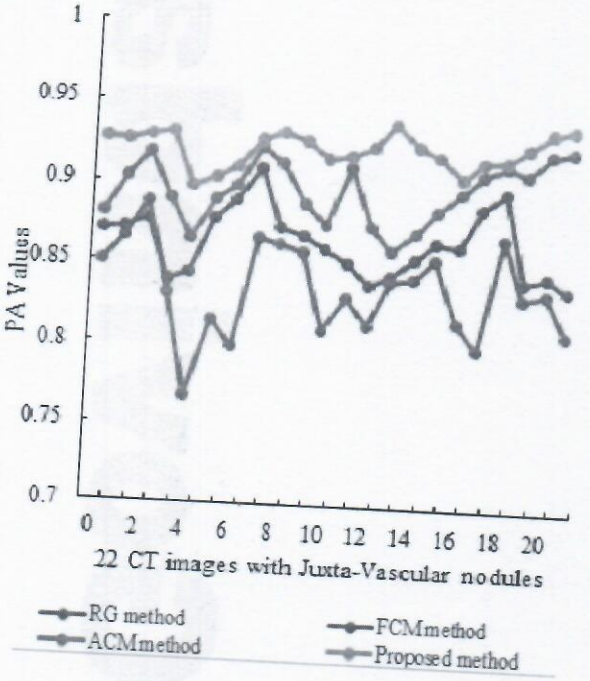

Fig. 6. Comparision of PA values of RG, FCM, ACM and proposed method

ii. Intersection over Union (IoU)

IoU or Jaccard index is similarity (intersection) to diversity (union) ratio of reference images and images to be segment to detect objects (in our case Juxta-Vascular nodules). It is given as Eq 6.

$$IoU = \frac{Area(G \cap S)}{Area(G \cup S)} \tag{6}$$

Where, G is ground truth of Juxta -Vascular nodule in image
S is segmented part of nodule.

Higher the IoU value represents the batter nodules segmentation results.

From Figure 7 it is clear that IoU values for proposed method are higher than all other three methods and segmented nodules part by our method is very close to ground truth.

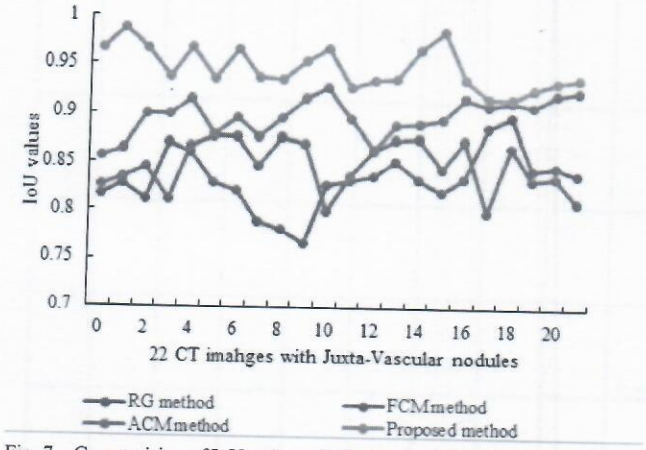

Fig. 7. Comparision of IoU values of RG, FCM, ACM and proposed method

iii. Time complexity

Quantitative metrics time complexity was calculated for all the four algorithms. Lowest, average, and longest time for the segmentation of 22 CT images was computed and compared. Figure shows the comparison of time complexity for all four methods.

As in Figure 8, time complexity of proposed method was lowest. Whereas Region growing and FCM had longest processing time. The average processing time of proposed method is also very less compared to other three methods.

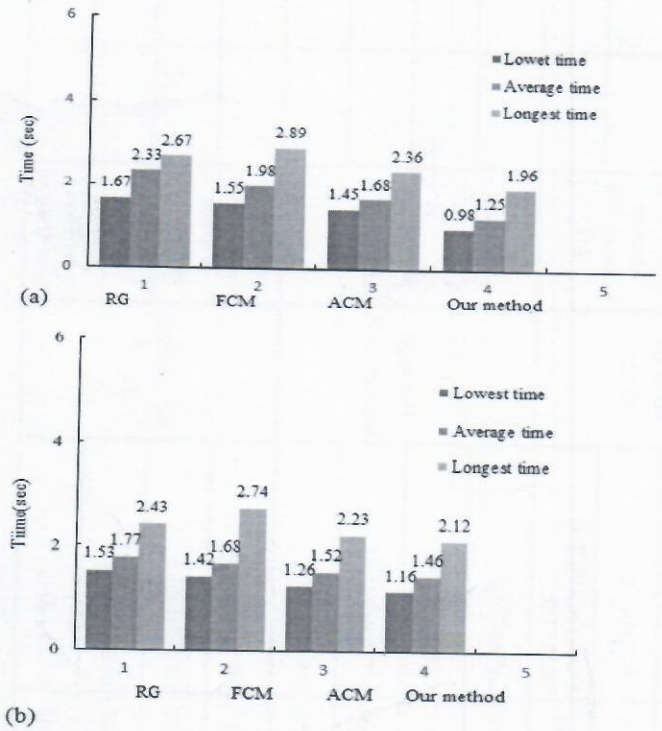

Fig. 8. Time complexity of all four methods (a) processing time for 15 images (b) processing time for 22 images

Result comparison for all four methods are given in Table IV

TABLE IV. JUXTA-VASCULAR NODULE SEGMENTATION RESULT FOR FOUR METHODS

Methods	*PA*	*IoU*	*Time Complexity*
RG [18]	.87	.817	2.67
FCM [17]	.85	.826	2.87
ACM [19]	.881	.856	2.36
Proposed Method	.927	.967	1.96

Experimental results for Juxta-Vascular Nodules segmentation have shown that RG and FCM were resulted in inefficient segmentation of nodules. ACM resulted were satisfied for certain extension. Compared to all the methods, proposed method's results were satisfactorily better with less computational time.

V. CONCLUSION

Juxta-Vascular Nodules segmentation by traditional segmentation methods results in inaccurate inclusion of nodule with over segmentation and edge leakage. CAD system with a new methodology has presented in this paper for accurate segmentation of all types of different size JVNs from CT scan images. In this work two algorithms vascular nodule segmentation algorithm and vessel removal algorithm are proposed for the segmentation of different size JVNs. Sixty CT scan images with Juxta-Vascular Nodules and GGO nodules from LIDC database were taken to evaluate the performance of method. Experimental results has shown that proposed methodology provides satisfactory performance with 96.3% of lung parenchyma segmentation, 95.8 % of JVNs segmentation and 94.35 of GGO nodules segmentation.

Compared with existing methods region based ACM, FCM and RG our method has advantageous as no user interaction, less computational time, improved sensitivity, accurate segmentation of JVNs and better performance.

ACKNOWLEDGMENT

I thank my research guide Dr Girijamma H A, Professor, Department of CSE, R N S Institute of Technology, Bangalore, India for supporting me to complete this research article. I would like thank public LIDC database from which images are taken to carry a reach work.

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SPRINGER BRIEFS IN APPLIED SCIENCES AND TECHNOLOGY · COMPUTATIONAL INTELLIGENCE

Surekha Borra
Rohit Thanki
Nilanjan Dey

Satellite Image Analysis: Clustering and Classification

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Digital Image Watermarking

Theoretical and Computational Advances

By
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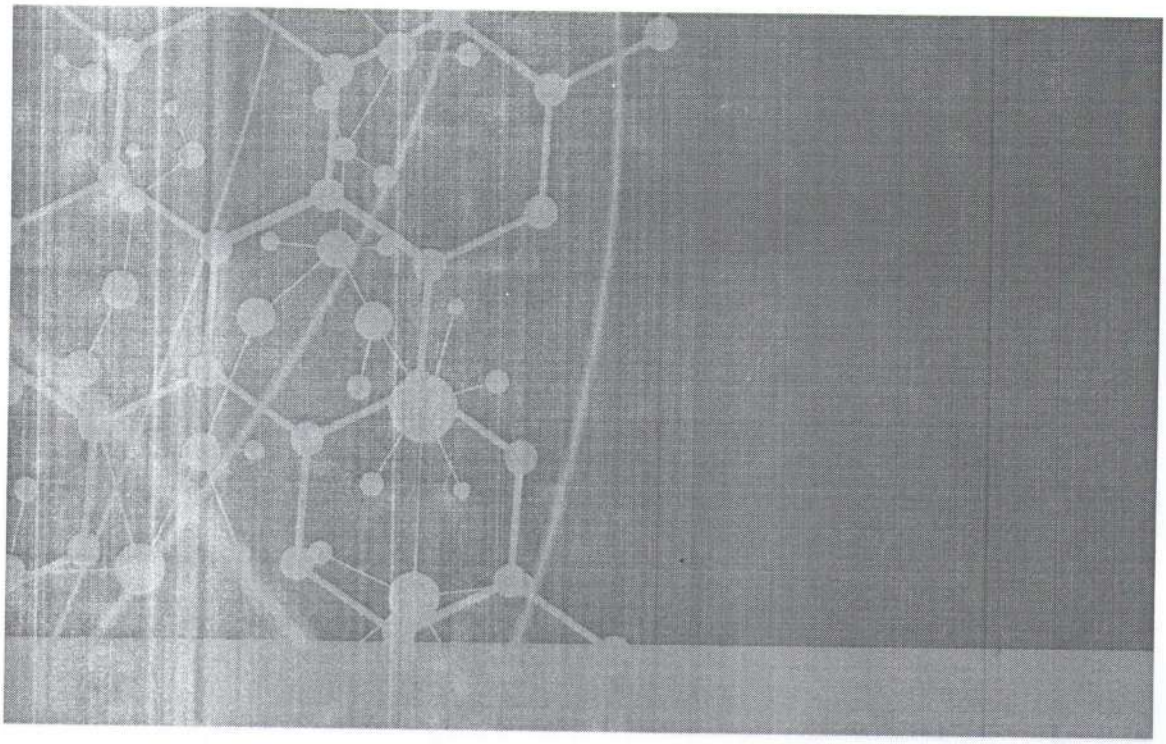
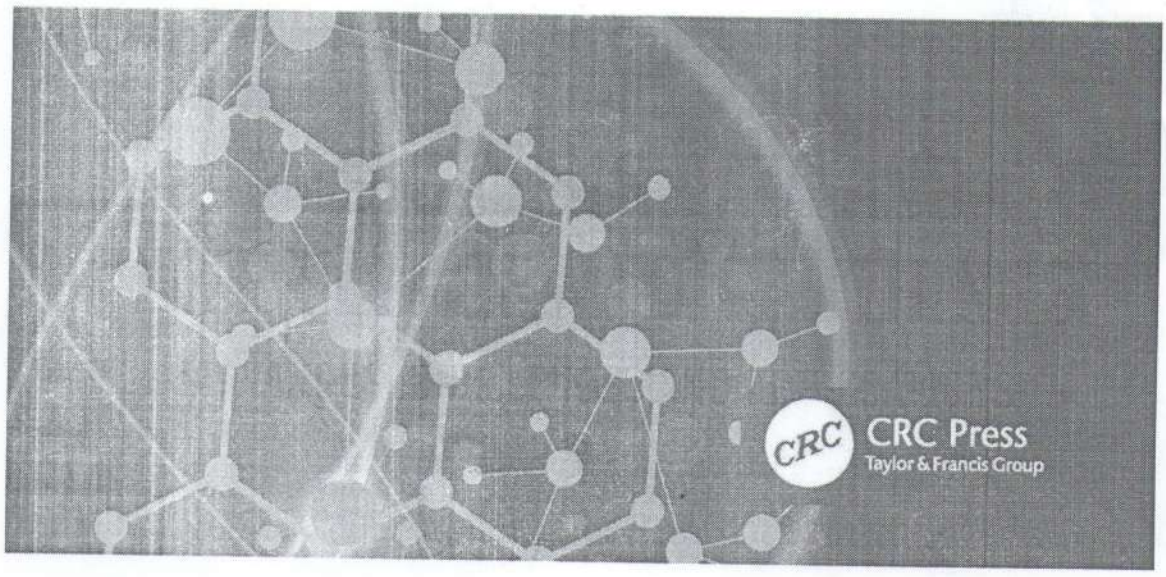


MEDICAL BIG DATA AND INTERNET OF MEDICAL THINGS

ADVANCES, CHALLENGES AND APPLICATIONS

Edited by
Aboul Ella Hassanien, Nilanjan Dey, Surekha Borra



MACHINE LEARNING IN BIO-SIGNAL ANALYSIS AND DIAGNOSTIC IMAGING

Edited by

Nilanjan Dey, Surekha Borra, Amira S. Ashour, Fuqian Shi

Machine Learning in Bio-Signal Analysis and Diagnostic Imaging presents original research on the advanced analysis and classification techniques of biomedical signals and images that cover both supervised and unsupervised machine learning models, standards, algorithms, and their applications, along with the difficulties and challenges faced by healthcare professionals in analyzing biomedical signals and diagnostic images. These intelligent recommender systems are designed based on machine learning, soft computing, computer vision, artificial intelligence, and data mining techniques. Classification and clustering techniques, such as PCA, SVM, techniques, Naive Bayes, Neural Network, Decision trees, and Association Rule Mining, are among the approaches presented.

The design of high accuracy decision support systems assists and eases the job of healthcare practitioners and suits a variety of applications. Integrating Machine Learning (ML) technology with human visual psychometrics helps to meet the demands of radiologists in improving the efficiency and quality of diagnosis in dealing with unique and complex diseases in real time by reducing human errors and allowing fast and rigorous analysis. The book's target audience includes professors and students in biomedical engineering and medical schools, researchers, and engineers.

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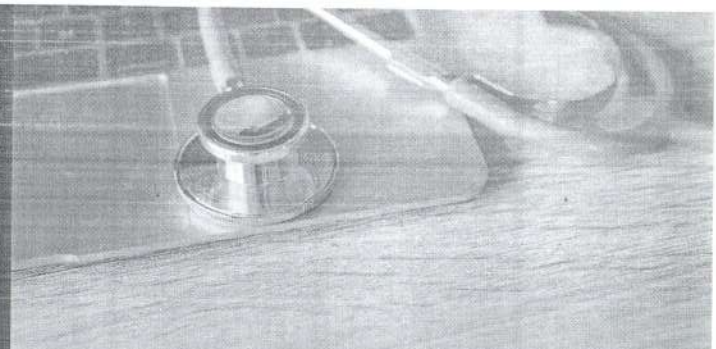
MACHINE LEARNING IN BIO-SIGNAL ANALYSIS AND DIAGNOSTIC IMAGING

Dey, Borra, Ashour and Shi



MACHINE LEARNING IN BIO-SIGNAL ANALYSIS AND DIAGNOSTIC IMAGING

Edited by
Nilanjan Dey, Surekha Borra,
Amira S. Ashour, Fuqian Shi

Efficient image zooming or interpolation algorithms that have low complexity and high quality is an important goal for multi-media distribution. This is because content is consumed with different sizes and sent over networks with different bandwidths. This book discusses four approaches for image zooming and multi-resolution image representation. It also presents a few new tools that can be used in the image/video compression pipeline and demonstrates a novel usage of dictionary coding for improved compression. It analyses a drawback in the hierarchical mode of the JPEG and proposes methods to overcome this. One of the unpleasant results of image interpolation is the introduction of localized artifacts. The methods described herein demonstrates an algorithm to [illegible]te this called Targeted Image Enhancement (TIE) wherein, a small a[illegible]nt of additional data is used to remove many of these artifacts. Finally, the book proposes a non-linear approach to interpolating digital images called Location and Neighborhood Adaptive (LNA) interpolation. The improvement stemming from this method is demonstrated on binary images.

Joy has been working on some of the cutting problems in image and video technologies since 2005. His focus has been codecs, studio systems and internet video. He has worked on these with leading companies in this space and has also been an active academic researcher. His current interest is improved quality of video consumed over the internet.

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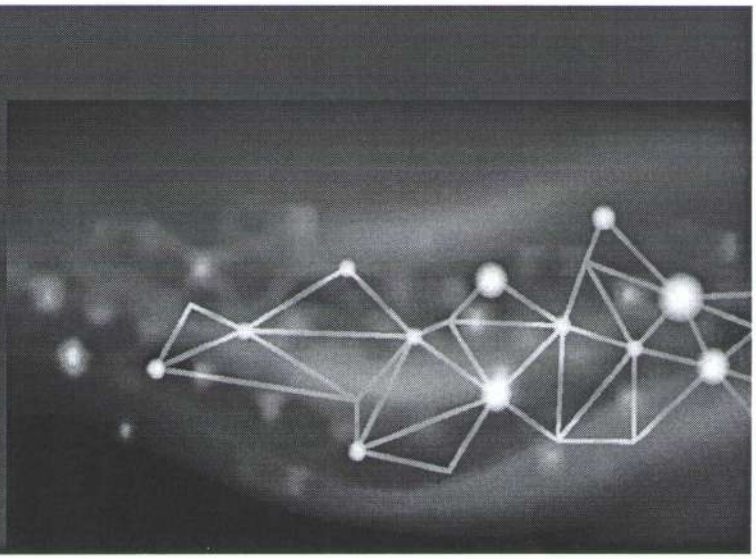
Techniques for Multi-resolution Imaging

Prabhakaran



P. Joy Prabhakaran

Novel Techniques for Multi-Resolution Imaging

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Chapter

Chapter 9
Security of Biometric and Biomedical Images Using Sparse Domain Based Watermarking Technique

Rohit Thanki, Surekha Borra, and Deven Trivedi

9.1 Introduction

The rise in the utilization of human related pictures over online networking poses genuine difficulties to the picture security. The watermarking system can be utilized for different applications, for example, copyright assurance, ownership identification, and secure correspondence [1–3]. The human related images are isolated into two kinds: biometric images and biomedical images. The biometric images reflect the conduct and/or physical attributes of human and hence are utilized as unique ID in different organizations. On the other hand, the biomedical images speak about wellbeing related data. Along these lines, the security of such images is vital when it is transmitted over a correspondence channel.

The many watermarking techniques in spatial and transform domain are proposed for the security of images [1–4] in the literature. Many researchers proposed transform domain techniques to result higher robustness and security. Hybrid watermarking techniques are also proposed by combining various image transforms [1, 2, 5]. In these techniques, cover image is converted into its transform coefficients before being modified by watermark image to get modified coefficients. In this chapter, compressive sensing (CS) theory is combined with sparsity property of DWT to propose a secure method for watermarking of human related images. The proposed technique is tested and analyzed using different kind of biomedical images and biometric images. The performance of the technique is further verified

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CHAPTER 11

Application of Machine Learning Algorithms for Classification and Security of Diagnostic Images

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1 Introduction

Medical science is a very important subject which is related to analysis and solution of health information of human. In modern medical science, advances in medical imaging play an important role in the treatment of many diseases. These medical images are known as diagnostic images and are divided into various types such as X-ray, computed tomography (CT), positron emission tomography (PET), magnetic resonance imaging (MRI), and ultrasonography (US) [1–5]. Due to high usage of diagnostic images in treatments, lot and lots of images of patients are available at system storage of hospitals which creates data management and security issues. The diagnostic data when transferred over open transmission network can easily be manipulated by attackers, which further leads to serious issues related to wrong treatment and diagnosis. Hence, it is very important to deal with these two problems which are related to diagnostic imaging in medical science.

Machine learning (ML) provides various algorithms that can help solve above two problems which are related to medical science [6]. The ML techniques determine predicated value from desired input data by means of different classification and pattern recognition algorithms. These techniques also automate many engineering problems with high accuracy and efficiency [7] which otherwise involve time-consuming process. ML is now being used for the classification of diagnostic images for better extraction of images from the large database. Often, watermarking techniques are used for providing security of the diagnostic images [8–16]. Recently, ML is combined with watermarking to improve the performance of conventional watermarking techniques for the security of diagnostic images [7].

This chapter is ordered such that Section 2 presents review of machine learning. Section 3 provides a review on various ML approaches for classification of diagnostic images. Section 4

Machine Learning in Bio-Signal Analysis and Diagnostic Imaging. https://doi.org/10.1016/B978-0-12-816086-2.00011-4

Real-Time Facial Recognition Using Deep Learning and Local Binary Patterns

B. Venkata Kranthi and Surekha Borra

Abstract Today, surveillance is everywhere where the operators continuously observe the video captured by the camera to identify the human/object for public safety. Automated systems are being developed for real-time facial recognition as it is highly difficult for the operators to track and identify in highly crowded areas. The feature selection process is generally used to represent faces, and a machine learning-based approach is used to classify the faces in face recognition. A variety of poses, expressions and illumination conditions make the manual feature selection process error-prone and computationally complex. This paper proposes a less computationally complex real-time face recognition algorithm and system based on local binary patterns and convolutional neural networks (CNNs). A modified version of LENET is used instead for face recognition. The recognition accuracy of the proposed method is tested on two publicly available datasets. A new database covering most of the challenges like illumination and oriental variations, facial expressions, facial details (goggles, beard and turban) and age factor is also developed. The proposed architecture proved accurate up to 97.5% in offline mode and an average accuracy of 96% in the real-time recognition process. In the real-time process, frame reading and frame processing are done in two separate threads to improve the frame rate from 28 to 38 FPS.

AQ1

Keywords Face recognition · Deep learning · Real-time system · Face detection LBP · Computer vision

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Chapter 12

Watermarking Techniques for Copyright Protection of Texts in Document Files

Surekha Borra, Rohit Thanki, and Nilanjan Dey

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Chapter 8

Compressive Sensing in Color Image Security

Rohit Thanki, Surekha Borra,
Komal Borisagar, and Nilanjan Dey

Contents

Chapter 2
Social Networking in Web Based Movie Recommendation System

Nabanita Das, Surekha Borra, Nilanjan Dey and Samarjeet Borah

Abstract Movie Recommendations Systems are a common practice by most of the online stores today. The web based movie recommendation systems makes predictions about the responses of the users based on their search history or known preferences. Recommendation of items is usually done based on the properties or content of the item or collaboration of the user's ratings, and by using intelligent algorithms that include classification or clustering techniques. Accurate prediction of what the customer may likely to busy or the user my visit is of utmost important, as it benefits both the service providers and customers. This chapter provides the evolution, fundamental concepts, classification, traditional and novel models, requirements, similarity measures, evaluation approaches, issues, challenges, impacts due to social networking, and future of movie recommendation systems.

Keywords Recommendation systems · Content based filtering
Collaborative based filtering · Deep learning · Social networks · Web

2.1 Introduction

With the rapid growth in the Internet and related technologies, online movie stores are gaining lot of interest. The online movie stores display movies without biasing towards the popularity and sales figures. Further there is no shelf space limitation as

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LIVE PRODUCTION DATA MONITORING SYSTEM TO SUPPORT INDUSTRY 4.0 SCENARIO

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Abstract :Digital touch is transforming the manufacturing industry to its most exciting times. 4th Industrial revolution demands manufacturing devices to be digitally enabled so that various devices can communicate to each other. Conventionally shop floor production monitoring and control in a manufacturing environment is by manual methods. These methods are laborious, inconsistent and person dependent. The data acquired are neither live nor accurate. These data have limited scope to bring in significant improvement in production efficiency. In the proposed work, an effort is made to digitally capture the data of production, rejection and idle times by using non invasive sensors in strategic locations. These data are acquired by a Data Acquisition System (DAQ) and locally treated. Overall Equipment Efficiency (OEE) of the manufacturing system is calculated using the computational capabilities of the DAQ. The performance of the manufacturing system is made known to the operator through a Human Machine Interface (HMI). This screen is named as "MY MACHINE" as it presents his own performance to the machine operator. This increases the operator engagement as he is compelled to enter the non performance reasons in the MY MACHINE screen. Such OEE data is taken to cloud server through the IoT enabled HMI and sent to management. This will trigger management to take actions to increase shop floor efficiency. The proposed system is implemented in an Indian Small and Medium Sized industry which is engaged in mass production of plug shell components and the results are validated.

Real-Time Facial Recognition Using Deep Learning and Local Binary Patterns

B. Venkata Kranthi and Borra Surekha

Abstract Today, surveillance is everywhere where the operators continuously observe the video captured by the camera to identify the human/object for public safety. Automated systems are being developed for real-time facial recognition as it is highly difficult for the operators to track and identify in highly crowded areas. The feature selection process is generally used to represent faces, and a machine learning-based approach is used to classify the faces in face recognition. A variety of poses, expressions and illumination conditions make the manual feature selection process error-prone and computationally complex. This paper proposes a less computationally complex real-time face recognition algorithm and system based on local binary patterns and convolutional neural networks (CNNs). A modified version of LENET is used instead for face recognition. The recognition accuracy of the proposed method is tested on two publicly available datasets. A new database covering most of the challenges like illumination and oriental variations, facial expressions, facial details (goggles, beard and turban) and age factor is also developed. The proposed architecture proved accurate up to 97.5% in offline mode and an average accuracy of 96% in the real-time recognition process. In the real-time process, frame reading and frame processing are done in two separate threads to improve the frame rate from 28 to 38 FPS.

Keywords Face recognition · Deep learning · Real-time system · Face detection LBP · Computer vision

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Study and Simulation of Digital Multipliers using 180nm Technology

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***Abstract*— With the advent of VLSI and Digital Signal Processing applications, hardware implementation of various computational units is gaining importance. One such most popular arithmetic unit is the multiplier. Multiplication is needed in almost all signal processing operations like FFT, DFT, DCT etc. Implementing multipliers in software makes the multiplication process slow and time consuming. By implementing multipliers as a hardware unit, we can optimize area, power and speed as per our requirements. There are many multiplier variants available and one among them can be chosen keeping in mind the design constraints. In this paper we have compared the area, power and speed of various multipliers highlighting their working principles, pros and cons.**

Keywords—multipliers, booth, array, Wallace, dadda

I. INTRODUCTION

A multiplier is a digital circuit that performs multiplication of two numbers. In the present study we have considered numbers in binary representation. It is one of the key hardware blocks in most high-performance systems and digital such as FIR filters, microprocessors and digital signal processors etc. [4].The multiplier plays a vital role in various DSP applications such as digital filtering, digital communications and spectral analysis. Performance of computation of a DSP system is limited by its multiplication performance and since multiplication dominates the execution time of most DSP algorithms, high-speed multiplier is much desired [3]. Multiplication can be implemented using software or hardware. The software implementation is done using micro-programmed control unit. These are simple in structure but are comparatively slow. Software implementation is useful when results are predictable or are partially known. The hardware implementation is done using hardwired control unit. The control logic includes gates, flip flops, decoders, etc. These have complex structure but are faster and hence are used in high performance systems. We discuss various hardware implementations of multipliers in this paper. In section II the overview of multiplication process is described. In section III, working principles of Array, Wallace, Dadda and Booth multipliers are described. Section IV summarizes the synthesis results and simulation waveforms. Section V concludes the paper.

II. MULTIPLICATION OPERATION

Multiplication involves three main steps:

1. Partial product generation: This step involves generation of partial products from multiplicand and multiplier. Figure 1 represents the partial product generation. This stage makes use of series of AND gates. The delay is negligible as all the computation is done in parallel. The inputs to the AND gate are binary operands we are using for computation starting from LSB to MSB. Each row is shifted by 1 bit towards the left. ($a_7a_6a_5a_4a_3a_2a_1a_0$ *$b_7b_6b_5b_4b_3b_2b_1b_0$). The partial products form a matrix of n rows and 2n-1 columns.

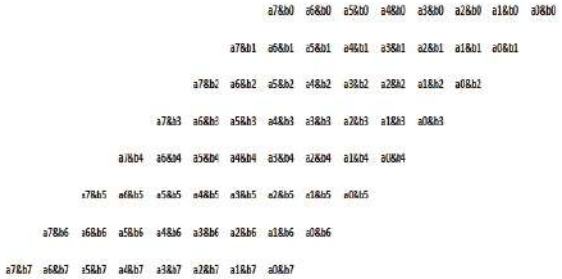

Fig 1: Partial product generation

2. Partial product reduction: The second stage of partial products reduction produces better performance and convenient design of the multiplier. In digital design many types of multipliers like Array multipliers, Booth multiplier, Dadda multiplier, Wallace Tree multipliers with different speeds, areas, and other configurations are used. The main aim is, to achieve partial product accumulated by successively reducing the number of bits of information in each column using full adders or half adders. By the application of the basic three-

Survey on Energy Harvesting Systems for Underwater Devices

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Abstract:- Underwater wireless communications play an important role in marine activities such as environmental monitoring, underwater exploration, and scientific data collection. Underwater wireless sensor node is such a device which is used in various applications like oceanographic data collection, pollution monitoring, offshore exploration, disaster prevention, assisted navigation and tactical surveillance applications. Though underwater communication provides enormous information about environmental conditions but it faces many technical issues and research challenges like large propagation delay, low bandwidth and dynamic nature of the work. Apart from all these issues energy is the main concern as the batteries used to power up the sensor nodes are difficult to recharge and replace in aquatic environment. So designing energy efficient UWSN is challenging. In this paper we present the literature survey on existing energy harvesting system for the UWSN.

Keywords - *UWSN [underwater Wireless sensor node], Energy Harvesting system, UWCD[underwater communication device]*

I. INTRODUCTION

With the rapid developments in technology, underwater communication has become a fast growing field, with broad applications in commercial and military water based systems. The need for underwater wireless communication exists in applications such as remote control in the off-shore oil industry, pollution monitoring in environmental systems, collection of scientific data from ocean-bottom stations, disaster detection, early warning, national security and defense (intrusion detection and underwater surveillance) as well as new resource discovery. Thus, the research on new underwater wireless communication techniques has played a most important role in the exploration of oceans and other aquatic environments. In contrast with terrestrial wireless radio communication, the communication channels in underwater wireless networks can be seriously affected by the marine environment, by noise, by limited bandwidth, power resources and by the harsh underwater ambient conditions. Hence, the underwater communication channel often exhibits severe attenuation, multipath effect, frequency dispersion and constrained bandwidth with minimal power resources, etc. Hence the underwater communication channel are considered as most complex and harsh channels in nature. Considering all these challenges associated with underwater communication devices the energy required to power-up these devices are the main constraint since powering the batteries in aquatic environment is difficult. The UWCD (Underwater Communication Device) is active only when it has the sufficient battery power, else the device will be inactive. So designing energy efficient UWCD is challenging. However many researchers have proposed some of the energy harvesting systems to power these batteries.

This paper gives detailed survey on existing energy harvesting systems to power-up the underwater communication devices.

II Literature Survey:

"Estimation of Solar Energy Harvested for Autonomous Jellyfish Vehicles (AJVs)" In this paper, researcher analyzed the applicability of solar cells as a power source for medusa-inspired biomimetic vehicles. Since these vehicles will be operating under ocean water and may need to dive at various depths, a systematic investigation was conducted to determine the variation of output power as a function of depth and salinity levels. They modeled solar energy harvested by flexible amorphous solar cell coated jellyfish vehicles by considering the variables bell diameter, turbidity, depth, and fineness ratio. Low fineness ratio shapes were found to be better for solar energy powered vehicles. Study of three representative species, Aurelia aurita (AA), Mastigias sp., and Cyaneacapillata indicates that harvested power was proportional to bell diameter. Optimum power can be harvested by tilting the vehicle axis to face refracted sunrays. Depending on a swimming pattern, power harvested in charging mode and in propulsion mode could vary significantly. But this model indicates that, under some circum-stances, amorphous silicon solar cell may be a cost-effective way to power autonomous underwater vehicles (AUVs) operating in shallow-water conditions with large lateral travel distances [1]

Artificial Intelligence Based Solar Vehicle

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Abstract— We live in the age of technological advancement. Developments in science and technology are altering the way people live. However, road safety is still a concern in today's world. Millions of people die every year due to road accidents, which may be caused by distraction of driver, over-speeding, drunken driving, not following the traffic rules or misjudging the situation. We aim to reduce this problem to some extent by introducing Artificial Intelligence and providing partial automation into vehicles. There is an automatic braking system which puts brakes when the vehicle detects any obstacle that may cause accidents. The vehicle can also adjust its own speed based on the speed of vehicles in front of it. A GSM/GPS module is used to alert about the accident occurred and its location to the emergency contact. Adding features to the vehicle makes it more dependent on fossil fuels. Hence to support sustainable development we introduce solar powering of the vehicle. The vehicle runs on solar energy, which is abundant in nature and a clean alternative for non-renewable resources like coal and petroleum. The vehicle can utilize electrical energy in absence of solar energy.

Keywords—Artificial Intelligence, Automatic Breaking System, Adaptive Cruise Control, Accident alert, Renewable Energy

I. INTRODUCTION :

Due to high population growth, traffic congestion is a common problem in urban areas. Also, road safety is a major concern. The number of deaths due to road accidents is staggeringly high. Most of these accidents occur due to poor judgment in driving, distraction, and over-speeding or by simply not following the lane discipline. Dealing about how the vehicle will interpret the surrounding is very important . There is a need of vehicular system which can act accordingly and provide more safety. The Vehicle-to-Infrastructure Communication provides communication between vehicle and infrastructure through which vehicle getsidea about the current environment. With the help of proper inter-vehicle gap between two vehicles the vehicle to vehicle communication can be maintained[1].An assistance to driver is required to avoid collisions between vehicles which can be achieved by using ultrasonic sensors to measure distance between the sensor and the target objects[2].The obstacle avoidance prototype which uses sonar to scan the surrounding area has disadvantage of depending on the distance of object which makes the robot turn instead of taking width also into consideration [3].An automatic collision control built with image processing and artificial intelligence follows lane driving at a constant speed of 30kmph with accident prevention gives more accurate resuts[4].According to R: Krauss, a system with combination of Raspberry pi and Arduino creates a real-time feedback control system that are connected using a USB cable for serial communication limits the digital control frequency to 100-150 Hz[5]. The system using two photoelectric distance measurement sensors, hydraulic circuit helps to reduce the close impact potential accident up to 10m[6]. The proposed system with RF transmitter and GPS can be used to identify accident occurred has a disadvantage of using EEPROM to store the mobile numbers which consumes more power[7].

The proliferating economic growth and energy consumption intensification are leading to ever-growing demand for energy. This problem is worsened by the steady depletion of fossil fuels such as natural gas, oil and coal. Burning these fossil fuels has increased the amount of toxic gases in the atmosphere leading to extreme weather patterns. There is a need for utilizing the natural resources such as solar and wind energy to meet the requirements of energy. A solar powered electric vehicle is used to reduce the Green-house effect using inbuilt solar panels. thereby encouraging pollution less transportation with minimal cost [8].

By implementing AI in driving, many accidents can be avoided. In this paper the main focus is to implement an electronic sensor network using ultrasonic sensor for measuring the distance between vehicle for stopping the vehicle when obstacle is too near and thereby varying speed accordingly.

II. METHODOLOGY

A. System Block Diagram

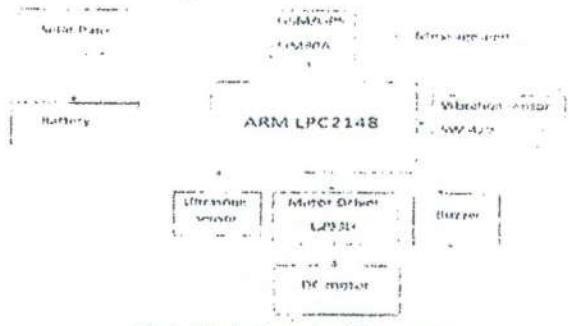

Fig 1: Block diagram of the system

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Comparative Study on Mechanical Properties of Hybrid Composites using Hemp and E-Glass by Hand Layup and Vacuum Bagging Technique

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***Abstract*—Over the last thirty years' composite materials, plastics and ceramics have been the dominant emerging materials. The volume and number of applications of composite materials have grown steadily, penetrating and conquering new markets relentlessly. This paper deals with the hybrid composite material made up of Hemp and E-glass fibers which are fabricated by hand layup and vacuum bagging technique using Lapox L12 epoxy and K6 hardener. The properties of the hybrid composites are determined by tensile test, flexural test, hardness test and are evaluated experimentally according to ASTM standards. The result shows that the hybrid composites prepared by Hemp and E-glass with vacuum bagging technique has better tensile and flexural strength as compared to hand layup technique. The microstructure of the hybrid composite material has been analyzed using SEM.**

***Keywords*—E-glass, Hemp, Hand layup, Vacuum bagging, Epoxy, Lapox L12.**

I. INTRODUCTION

A composite material is a combination of two or more than two different materials having different properties [1]. The combination of materials having different properties would give results having superior than the properties of the individual components when used particularly [2]. Composites are made up of reinforcements and to hold reinforcements matrix material is used. Generally, the reinforcement will be in the form of fiber and matrix would be resin for fiber reinforced polymer composites [3-4].

The use of composite materials has increased and has come into light because of their higher strength and also having high stiffness value, having low density compared to the metallic parts. The composite materials allow to reduce the weight of processed part. The reinforcement agents which are fibers provide the strength and makes composite material hard [5-6].

Natural fiber reinforced composite materials are considered as one of the new class of engineering materials. Interest in this area is rapidly growing both in terms of their industrial applications and fundamental research as they are renewable, cheap, completely or partially recyclable, and biodegradable. [7]. Glass Fiber Reinforced Polymers (GFRP) is a fiber reinforced polymer made of a plastic matrix reinforced by fine fibers of glass. Fiber glass is a lightweight, strong, and robust material used.

E-glass is known in the industry as a general-purpose fiber for its strength and electrical resistance. [8-9] It is the most commonly used fiber, in the fiber reinforced polymer composite industry. Composite materials reinforced with natural fibers, such as flax, hemp, kenaf and jute, are gaining increasing importance in automotive, aerospace, packaging and other industrial applications [10].

This work was intended to develop hybrid composite material from different production techniques such as Hand layup technique and Vacuum bagging technique. made of a plastic matrix reinforced by fine fibers of glass. The synthetic fiber E –glass and natural fiber hemp are used to develop the hybrid composite material with epoxy resin. Different mechanical tests like tensile, flexural, hardness test and SEM analysis were conducted and results were analyzed.

II. EXPERIMENTAL DETAILS

A. Hybrid composite material fabrication

1) Hand layup technique

Hand lay-up is the oldest but still widely used fabrication technique employed in the reinforced plastics industry. A large variety of products can be fabricated with this method reaching from smallest parts to large coverings or even sports boats. It is shown in fig. 1.

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Performance Analysis of Constant and Taper blade for Steam Turbine by using CFD

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Abstract—**The losses in the last stages of low pressure (LP) steam turbines are difficult to estimate. Two types of losses have to be considered in the last stages: aerodynamic losses due to the interaction between the fluid and the wall boundaries and thermodynamic losses occurring during the phase change. The aim of this work is to estimate the losses in blade profile through an LP steam turbine rotor. The performance of steam turbine blade is related to many factors. One of the important factors is the degradation and change in turbine blade profile after many hours of operation. This leads to increase in flow losses and hence reduction in overall turbine efficiency. The performance of turbine blade can be predicted and improved by using Computational Fluid Dynamics (CFD).**

Keywords—CFD, Constant blade, Steam turbine, Taper blade.

I. INTRODUCTION

In the power generation industry gas turbines and steam turbines are widely used for generating power. These industrial machines are capable of producing power in hundreds of megawatts. The efficiency of a turbine is largely dependent on its aerodynamic performance. Hence, the design of blade profiles for nozzles and rotors are continuously improved over the decades to achieve better overall efficiency for the turbine.

Currently over 35% of electrical energy demands are generated by steam turbine. Considering, the vast amount of fuel associated with this, it is importance that the steam turbines are running at their highest possible efficiencies. Any improvement in efficiency will result in a considerable amount of saving and it is anticipated that a single percentage change in steam plant efficiencies will result in an annual saving. The overall efficiency of a power plant is directly dependent on the turbine entry temperature and the back pressure, therefore it is important to realize that for a given main steam condition and back pressure, the overall plant efficiency can be improved by increasing the efficiency of the individual plant components. The steam turbine is one of the key components because it is the steam turbine that converts the thermal energy of the steam into rotational kinetic energy, which in turn, drives the generator shaft. It is therefore very important to keep the steam flow energy losses at a low level as possible. Research work aimed at reducing the aerodynamics and wetness losses and hence improving the steam turbine efficiency has attracted great deals of attention in recent years. Although the majority of the research work is directly relevant to steam turbine manufacturers, the tools developed can also be used by steam turbine operator to predict and improve the steam turbine efficiency.

The key in reducing the flow energy losses is the understanding of the steam flow behavior inside the steam turbine. Considerable experimental work has been performed in studying the flow. In parallel with this, due to the limitation of experimental measurement and to aid in interpreting experimental results, Computational Fluid Dynamics (CFD) analysis is used. In CFD, the relevant fluid flow governing equations are solved numerically using digital computer and applied to flow inside the turbine blade rows.

A. Problem statement

Steam turbine cascade analysis is usually conducted with the compliment of steam; instead air is being use as the analysis medium. Current setup for cascade analysis involves 2types of blade vanes used in the high-pressure stage of a Rateau steam turbine. These blades have a 2-D cross-section without twist and are used in multiple stages keeping similar blade profiles. The purpose of the nozzles is to accelerate and guide the flow into the next stage of rotors. Since a steam turbine can spend a considerable amount of time operating at off-design conditions, the mass flow in the turbine and the rotors' speed varies. Hence, the flow entering each stage of nozzles and rotors is inclined at an incident angle. Current analysis blades are made with taper & constant cross section. In both cases Taper & constant blade profiles flow path will be analyzed in CFD software & also report shall be compared with analytically for constant section profile.

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Evaluation of tensile and hardness characteristics of Aluminium 2024 alloy based Metal Matrix Composites

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***Abstract*—In this present investigation efforts are made to study the tensile strength and hardness of heat treated Al2024 composites SiC particulates reinforced. The vortex method of stir casting was employed, in which the reinforcements were introduced into the vortex created by the molten metal by means of mechanical stirrer. Castings were machined to the ASTM standards on a highly sophisticated lathe. The degree of improvement of tensile strength and hardness characteristics of MMCs is strongly dependent on the kind of reinforcement. An improved tensile strength and hardness characteristic occurs on reinforced compared to Unreinforced MMCs alloys.**

Keywords*—SiC particulates, Al 2024 alloy composite, tensile strength and hardness.

I. INTRODUCTION

During the past few years, the global economy has been exerting an increasing demand for novel processes, new products and innovative technologies to resolve sustainability issues [1] Materials design has shifted emphasis to pursue light weight, environment friendliness, low cost, quality and performance [2-4]. Modern composite materials constitute a significant proportion of the engineered materials. Though many desirable mechanical properties are generally obtained with the fiber reinforcement, these composites exhibit anisotropic behavior and are not easily producible by conventional techniques [5]. The need for advanced engineering materials in the areas of aerospace and automotive industries had led to a rapid development of metal matrix composites (MMC) [8]. Metal-matrix composites (MMCs) have been attracting growing interest [6-8]. Metal Matrix Composites (MMCs) reinforced with ceramic particulate offer significant performance advantages over pure metals and alloys [9].

Metal Matrix Composites are fabricated with help of introducing ceramic/ reinforcement particles in the matrix of any metal. In common words these particles increase the properties like abrasive, hardness, wear resistance, stiffness, strength to weight ratio and many thermal properties [10]. For applications in the automotive, transportation, construction, and leisure industries, affordable cost is also an essential factor. Apart from the emerging economical processing techniques that combine quality and ease of operations [11].

The cost-effective processing of composite materials is, therefore, an essential element for expanding their applications. The increasing demand for lightweight and high performance materials is likely to increase the need for Aluminum matrix composites [12]. Therefore, Aluminium-matrix composites have been used in aircraft, automobile and other transport vehicles successfully such as engine piston, brake drums and electronic packaging and so forth, and further application is expected with development of low-cost processing methods [13].

The availability of a wide variety of reinforcing materials and the development of new processing techniques like ultrasonic assisted casting, powder metallurgy, high energy ball milling, friction stir casting is recently being used for the production of Aluminum matrix composites [14]. Based on the stated potential benefits of MMCs, this paper discusses the effect of different weight percentages of reinforcement materials on the mechanical behavior of the Aluminium based MMCs.

The main objective of this work is to develop Al (2024)/ silicon carbide particulate metal matrix composites. Where different weight percentages of silicon carbide is used as reinforcement material & Al 2024 is used as matrix material. Specimens are prepared by using liquid route metallurgy technique. Improvement of mechanical properties is done by heat treatment process. Test specimens are prepared to evaluate tensile and hardness characteristics.

II. EXPERIMENTAL DETAILS

Following steps are carried out in our experimental work:

1. Material selection
2. Composite preparation
3. Heat treatment
4. Micro structural studies
5. Testing

A. Material selection

The Al 2024 alloy (matrix material), SiC 30-40 μm size particles (reinforcement) are used for fabrication of MMCs. The chemical composition of Al2024 is given in the Table 1.

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A Review on Person Identification using Deep Neural Network

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Abstract— With the development of shrewd tool and social media, the information bulk on Internet has grown with high velocity. As a critical component of image processing, person identification has come to be one of the international famous research fields. In current years, the dominant ability with feature learning and transfer learning of Neural Network has obtained mounting interest in the network, as a consequence making a series of essential breakthroughs in person identification. So it is an enormous survey that how to relate neural network to individual identification for better efficiency in feature extractors and classifiers. First the paper brought the simple idea of person identification by means of neural network. Finally, it combed the contemporary studies, achievements and intelligence of people identification, summarizing the critical development and discussing the destiny directions.

Keywords— Deep Neural Network, feature extraction, Classifiers, Region of Interest (ROI)

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