AN INTELLIGENCE MINING SYSTEM TO DIAGONISE CERVICAL CANCER

A PROJECT REPORT

Submitted by

ANAND.S	**(11810205004)**
JEEVA.R	**(11810205042)**
SABARINATHAN.P	**(11810205088)**

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

In

INFORMATION TECHNOLOGY

VEL TECH MULTI TECH Dr.RANGARAJAN Dr.SAKUNTHALA ENGINEERING COLLEGE

ANNA UNIVERSITY :: CHENNAI 600025

APRIL 2014

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report titled **"AN INTELLIGENCE MINING SYSTEM TO DIAGONISE CERVICAL CANCER"** is the bonafide work of **"ANAND.S (11810205004), JEEVA.R (11809205042) & SABARINATHAN.P (11810205088)"** who carried out the project work under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion of this or any other candidate.

SIGNATURE	**SIGNATURE**
Mr. R.PRABU, M.TECH.,	**Mr.P.ROBERT,M.TECH.,**
HEAD OF THE DEPARTMENT	**INTERNAL GUIDE**
ASSISTANT PROFESSOR	**ASSISTANT PROFESSOR**
INFORMATION TECHNOLOGY	INFORMATION TECHNOLOGY
VEL TECH MULTI TECH	VEL TECH MULTI TECH
Dr.RANGARAJAN	Dr.RANGARAJAN
Dr.SAKUNTHALA	Dr.SAKUNTHALA
ENGINEERING COLLEGE,	ENGINEERING COLLEGE,
42, ALAMATHI ROAD,	42, ALAMATHI ROAD,
AVADI, CHENNAI-600 062.	AVADI, CHENNAI-600 062.

CERTIFICATE OF EVALUATION

COLLEGE NAME : Vel Tech Multi Tech Dr.Rangarajan Dr. Sakunthala Engineering College

BRANCH : Information Technology

SEMESTER : VIII

<table>
<tr><th>S.NO</th><th>NAME OF THE STUDENT</th><th>TITLE OF THE PROJECT</th><th>NAME OF THE SUPERVISOR DESIGNATION</th></tr>
<tr><td>1.</td><td>ANAND.S</td><td rowspan="3">AN INTELLIGENCE MINING SYSTEM TO DIAGONISE CERVICAL CANCER</td><td rowspan="3">Mr.P.ROBERT M.TECH.,
ASSISTANT PROFESSOR</td></tr>
<tr><td>2.</td><td>JEEVA.R</td></tr>
<tr><td>3.</td><td>SABARINATHAN.P</td></tr>
</table>

The Reports of the project work submitted by the above student in partial fulfillment for the award of the **Degree of Bachelor of Technology in Information Technology** of **Anna University** were evaluated and confirmed to be the reports of the work done by the above student and then evaluated.

This Project was submitted for **Viva-Voce Examination** held on ____________ at VEL TECH MULTI TECH Dr.RANGARAJAN Dr.SAKUNTHALA ENGINEERING COLLEGE.

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ACKNOWLEDGEMENT

We thank God Almighty for giving me such tremendous opportunity and support through the way of **Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College.** We express our deep gratitude to the **Founder & Chairman Col.Prof. Dr.R. RANGARAJAN, B.E (Elec.), B.E (Mech.), M.S (Auto.), D.Sc,** and our **Vice-Chairman Smt Dr. SAKUNTHALA RANAGARAJAN, M.B.B.S** for the benefaction encouragement and facilities that were offering to us to carry out this project.

We thank our **Director Mr. K.V.D KISHORE KUMAR, B.E., MBA(US)**, **Principal Dr.V.Rajamani Ph.D**., and our **Principal Students Affair Dr.SIDDAPPA NAIDU, B.E., M.Sc. (Engg). Ph. D., MISTE,** who has always served as an inspiration for us to perform our institutes name and recognition. we would like to express our faithful thanks to our beloved **Head Of the Department Mr. R.PRABHU, M.Tech**, **Assistant Professor** and our respected **Internal Project Guide Mr. P.ROBERT, M.TECH., Assistant Professor** for having extended all the department facilities without slightest hesitation. We extend my gratitude to thank our **Project Coordinator Mr. D.SURESHBABU, M.E, Assistant Professor** for guiding me in every phase of the project development. Further we thank our **Parents, Friends** and **supporting Faculty member of IT Department** and **my batch mates**.

ABSTRACT

In health care centers and hospitals, millions of medical images have been generated daily. Analyses have been done manually with an increasing number of images. In the recent past, the development of Computer Aided Diagnosis (CAD) systems for assisting the physicians for making better decisions have been the area of interest. This has motivated the research in creating vast amount of image database. Computer output has been used as a second opinion for radiologist to diagnose the information more confident and quicker mechanism as compared to manual diagnosis. The goal is to design a system that could help the doctors to diagnose the cervical cancer with higher accuracy in minimal period of time. As the premise of feature extraction and pattern recognition, image segmentation is one of the fundamental approaches of digital image processing. It is a preprocessing step in many algorithms and practical vision system. In image segmentation, digital image divided into multiple set of pixels. In the proposed system, we have used Support Vector Machine (SVM) Algorithm which is one of the important techniques in classifier method and it helps to diagnose cervical cancer. SVM algorithm is an art and state of linear and non linear regression.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF ABBREVIATIONS

SVM - Support Vector Machine

CAD - Computer Aided Design

WHO - World Health Organization

GIEP - Gradual Increased Edge Penalty

SSE - Sum Square Error

IP - Individual Points

HPV - Human Papiloma Virus

AAR - Age adjusted incidence rate

ECA - Cancer cell abnormality

DNA - De oxy ribo nucleic acid

PCR - Polymerase Chain Reaction

SIL - Squamous intracancer lesion

IARC - International association of Research on Cancer

ECA - Cancer cell abnormality

NILM - No intra cancer lesion/malignancy

GOPD - Gynecology outpatient department

CHAPTER-1

INTRODUCTION

1.1.1Overview Of The Project:

An overview is firstly, spatiotemporal interests points are localized by the proposed V-FAST detector. Semantic texton forests (STFs) are learned to convert local spatiotemporal patches to visual codeword's. Secondly, structural information of human actions is captured by the pyramidal spatiotemporal relationship match (PSRM). Classification is then performed efficiently using a hierarchical k-means algorithm with the pyramid match kernel. The proposed method is adaptively combined with the priorart that uses the bag of semantic textons (BOST) and random forests as a classifier to further improve the recognition accuracy. In Cervical health, diagnosis or diagnostics is the process of identifying a cervical texture or problem by its signs, symptoms and the result of various diagnosis procedures. The conclusion reached through this process is called a diagnosis. The diagnosis system is a system that can be used to analyze any problem by answering some questions that lead to a solution to the problem. Cervical cancer is a malignant tumor that grows in the cervical cells and accounts for more than 50 percent of all cancers. In the US alone, more than 1 million Americans will be diagnosed in 2007 with non melanoma Cervical cancer, and *59,940* will be diagnosed with melanoma, according to the American Cancer Society. Fortunately, cervical cancers (basal cell and squamous cell carcinoma, and malignant melanoma) are rare in children. When melanomas occur, they usually arise from pigmented nevi (moles) that are large (diameter greater than 6 mm), asymmetric, with irregular borders and coloration. Bleeding, itching, and a mass under the Cervical are other signs of cancerous change. If a 2 child has had radiation treatment for cancer, nevi in the radiated area are at increased risk of becoming cancerous. Cervical Cancer Detection System (SCDS) is the system to identify and recognize cervical cancer symptoms and diagnose melanoma in early stages. The user can take early prevention of their healthy. Cervical Cancer Detection System will help save lots of doctor's time and could help to diagnose more accurate. It also can easily assess the future development of Cervical via dialysis today's age of the Cervical and put forward the best characteristic cervical cancer project to client.

1.1Aim of the Project:

Cervical detection is the process of finding Cervical-colored pixels and regions in an image or a video. This process is typically used as a preprocessing step to find regions that potentially have human faces and limbs in images. Several computer vision approaches have been developed for Cervical detection. A Cervical detector typically transforms a given pixel into an appropriate color space and then uses a Cervical classifier to label the pixels whether it is a Cervical or a non-Cervical pixel. A Cervical classifier defines a decision Boundary of the Cervical color class in the color space based on a training database of Cervical colored Pixels. Cervical color and textures are important cues that people use consciously or Unconsciously to infer variety of culture-related aspects about each other. Cervical color and texture can be an indication of race, health, age, wealth and beauty.
Cervical detection means detecting image pixels and regions that contain Cervical-tone color. Detecting Cervical-colored pixels, although seems a straightforward easy task, has proven quite challenging for many reasons. The appearance of Cervical in an image depends on the illumination conditions (illumination geometry and color) where the image was captured. The important challenge in Cervical detection is to represent the color in a way that is invariant or at least insensitive to changes in illumination. The choice of the color space affects greatly the performance of any Cervical detector and its sensitivity to change in illumination conditions. Another challenge comes from the fact that many objects in the real world might have Cervical-tone colors. For example, wood, leather, Cervical-colored clothing and hair. This causes any Cervical detector to have much false detection in the Background if the environment is not controlled.

1.3 Objectives:

The objectives of this project are:

i. To develop a prototype of cervical cancer detection system for diagnoses melanoma in early stages.

ii. To implement image processing to make a system that can recognize Cervical cancer symptoms.

iii. To help patients to prevent the melanoma in early stage.

We will look at two applications of STFs: image categorization (inferring the object categories present in an image) and semantic segmentation (dividing the image into coherent regions and simultaneously categorizing each region). The tool that will be used for both of these is the bag of semantic textons. This is computed over a given image region, and extends the bag of words model [6] by combining a hierarchical histogram of the semantic textons with a prior category distribution. By considering the image as a whole, a highly discriminative descriptor for categorization can be obtained. For segmentation, a bag of semantic textons can be computed for many local rectangular regions and then a second randomized decision forest can be built which achieves efficient and accurate segmentation by drawing on appearance and semantic context. The segmentation algorithm depends on image information that even with semi local context can often be ambiguous. The global statistics of the image, however, can be more discriminative and may be sufficient to accurately estimate the image categorization. It is therefore useful to use categorization as an image-level prior to improve segmentation by emphasizing the categories most likely to be present.

1.4 Description:

The method proposed is based on pixel-classification techniques for the detection of the nuclei markers, in order to avoid the over segmentation that the watershed algorithm may produce. Pap smear images exhibit great complexity and the number of pixel classes is not obvious. The rough assumption that all the pixels of the image are distributed into two classes, such as nuclei pixels and other pixels, would produce noisy results. This proposed method of automated cell nuclei detection in Pap smear images using morphological reconstruction and two types of clustering techniques. Unsupervised FCM and supervised Support Vector Machine (SVM) clustering are used in the study. The preprocessing of the images involved application of adaptive histogram equalization with Otsu’s method . The process is refined with the application of a 3x3 flat structuring element. Gray scale morphological reconstruction and h-minima transform are used to determine the centroids of the candidate nuclei. The problem of this method is requirement of prior knowledge of the problem do proposed a method of segmentation and classification of Pap smear images using HSI model and FCM algorithm. The extracted characteristics of the cell nuclei are morph metric feature, densitometric feature, colorimetric feature, and textural feature. The acquired images are preprocessed with a three layer processing: conversion to gray scaled image, removal of noise using brightness information, and application of fuzzy morphological operations. The proposed method of detection of cancer cells in Pap smear images using a combined framework of distance metric and FCM clustering algorithm.

CHAPTER-2

SYSTEM ANALYSIS

2.1 Literature Survey

Cervical cancer is the second most common cancer in women worldwide, and it is the principal cancer of women in most developing countries, where 80 percent of cases occur. Molecular epidemiologic evidence clearly indicates that certain types of human papilloma virus (HPV) are the principal cause of invasive cervical cancer and cervical intraepithelial neoplasia. More than 80 HPV types have been identified, and about 40 can infect the genital tract. Genital HPV types have been subdivided into low-risk types, which are found mainly in genital warts, and high-risk types, which are frequently associated with invasive cervical cancer. There is, however, no consensus concerning the categorization of many HPV types with low prevalence according to risk. Moreover, the number of putative high-risk types varies from 13 to 19, and only 11 HPV types (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, and 58) are consistently classified as entailing high risk. For these reasons, clear-cut criteria for classifying HPV types into low-risk and high-risk groups are needed. These criteria should be based on molecular epidemiologic studies that provide risk estimates and on functional evidence of the oncogenic potential of the various HPV types. A classification of HPV types based on their phylogenetic relationship has been proposed, but it has not been tested epidemiologically.

2.1.1 Framework for cancer detection:

Cancer detection process has two phases: a training phase and a detection phase.

Training a cancer detector involves three basic steps:

i. Collecting a database of cancer patches from different images. Such a database typically contains cancer-colored patches from a variety of people under different illumination conditions.

ii. Choosing a suitable color space.

iii. Learning the parameters of a cancer classifier.

Given a trained cancer detector, identifying cancer pixels in a given image or video frame involves:

i. Converting the image into the same color space that was used in the training phase.

ii. Classifying each pixel using the cancer classifier to either a cancer or non-cancer.

iii. Typically post processing is needed using morphology to impose spatial.

2.1.2Cervical detection:

A variety of classification techniques have been used in the literature for the task of cancer classification. A cancer classifier is a one-class classifier that defines a decision boundary of the cancer color class in a feature space. The feature space in the context of cancer detection is simply the color space chosen. Any pixel which color falls inside the cancer color class boundary is labeled as cancer. Therefore, the choice of the cancer classifier is directly induced by the shape of the cancer class in the color space chosen by a cancer detector. The more compact and regularly shaped the cancer color class, the more simple the classifier.

2.1.3Image Acquisition:

When implementing a vision system, nothing is more important than image acquisition. Any deficiencies or the initial images can cause great problems with image analysis and interpretation. An obvious example is that of lack of detail owing to insufficient contrast or poor focusing of the camera. This can have the effect, at best, that the dimensions of objects will not be accurately measureable form the images, and at worst that the objects will not even be recognizable, so the purpose of vision cannot be fulfilled. The following steps in image processing can only be proceeding after the image has been acquired. Finally, each segmented object is classified to one of a set of meaningful classes based on the set of those extracted features. Cervical Cancer Detection System (SCDS) use the texture and color techniques to classifier the result. A texture technique is a texture measures look for visual patterns in images and how they are spatially defined. Textures are represented by texels which are then placed into a number of sets, depending on how many textures are detected in the image. These sets not only define the texture, but also where in the image the texture is located. Texture is a difficult concept to represent. The identification of specific textures in an image is achieved primarily by modeling texture as a two-dimensional gray level variation.

2.1.4 Image Enhancement:

Image enhancement is steps in image processing to make an image result to be more suitable for a particular application. The examples include:

i. Sharpening or deblurring an out-of-focus image.
ii. Highlighting edges.
iii. Improving image contrast or brightening an image.
iv. Removing noise.

2.1.5 Feature Extraction:

Feature extraction involves subdividing an image into constituent parts or isolating certain aspects of an image to extract various images for identifying or interpreting meaningful physical objects form images, these including:

i. Finding lines, circles and particular shapes in an image.
ii. Identifying pimple, oil, white heads or black heads in aerial photograph.

In this, association rule mining is combined with neural network for medical data diagnosis. Here, association rules are used for feature reduction and neural network is used as an intelligent classifier. The classification accuracy obtained is 95.6%. In general, summarizing the generated rules is very difficult. This problem is addressed by Ordonez, 2006 and also specified the constraints and procedure for summarizing the generated association rules for medical data. They used the measures support, confidence, and lift to filter the rules. But, they worked only with high level data whereas our proposed system handles both low level data and high level information. In this article, we proposed an efficient CAD system, which tries to use the merits as well as overcome the drawbacks of the aforementioned techniques.

2.2 Existing System:

Segmentation algorithms are based on one of two basic properties of intensity values discontinuity and similarity.

First category is to partition an image based on abrupt changes in intensity, such as edges in an image.

Second category is based on partitioning an image into regions that are similar according to predefined criteria.

Histogram Threshold approach falls under this category. Threshold segmentation techniques can be grouped in three different classes:

1)Local techniques are based on the local properties of the pixels and their neighborhoods .

2) Global techniques segment an image on the basis of information obtain globally .

3) Split, merge and growing techniques use both the notions of homogeneity and geometrical proximity in order to obtain good segmentation results.

A training algorithm that maximizes the margin between the training patterns and the decision boundary is presented. The technique is applicable to a wide variety of the classification functions, including Perceptrons, polynomials, and Radial Basis Functions. The effective number of parameters is adjusted automatically to match the complexity of the problem. The solution is expressed as a linear combination of supporting patterns. These are the subset of training patterns that are closest to the decision boundary. Bounds on the generalization performance based on the leave-one-out method and the VC-dimension are given. Experimental results on optical character recognition problems demonstrate the good generalization obtained when compared with other learning algorithms.

2.2.1Algorithms

2.2.2.1. Linear Algorithm

We investigate the problem of training a support vector machine (SVM) on a very large database in the case in which the number of support vectors is also very large. Training a SVM is equivalent to solving a linearly constrained quadratic programming (QP) problem in a number of variables equal to the number of data points. This optimization problem is known to be challenging when the number of data points exceeds few thousands. In previous work done by us as well as by other researchers, the strategy used to solve the large scale QP problem takes advantage of the fact that the expected number of support vectors is small (<3,000). Therefore, the existing algorithms cannot deal with more than a few thousand support vectors. In this paper we present a decomposition algorithm that is guaranteed to solve the QP problem and that does not make assumptions on the expected number of support vectors. In order to present the feasibility of our approach we consider a foreign exchange rate time series database with 110,000 data points that generates 100,000 support vectors. There are now a wide variety of image segmentation techniques, some considered general purpose and some designed for specific classes of images. These techniques can be classified as: measurement space guided spatial clustering, single linkage region growing schemes, hybrid linkage region growing schemes, centroid linkage region growing schemes, spatial clustering schemes, and split-and-merge schemes. In this paper, each of the major classes of image segmentation techniques is defined and several specific examples of each class of algorithm are described. The techniques are illustrated with examples of segmentations performed on real images.

Linear Algorithm Characteristics

- In the midst of a visually enchanting world, which manifest itself with a variety of form and shapes, color and textures, motion and tranquility.
- The human perception has the capability to a machine in order to interpret the visual information embedded in still images, graphics and video or moving images in our sensory world.
- It is thus important to understand the techniques of storage, processing, transmission, recognition and finally interpretation of such visual scenes. Image processing is a many step process.
- Several steps must be performed one after another until the data of interest could be extracted from the observed scene.

2.2.2 Advantages

- The process of image segmentation consists of transforming an image into different phases (a cartoon version), while keeping track of important properties of each phase. This can be used for analysis of the image and/or for further processing of the image, as each of the different phases of the image can be treated differently after a segmentation process. One big application area is object detection.

- There exists several different methods for image segmentation. Many methods use statistical information in the image as a basis for the segmentation. A particularly simple, and often well-working algorithm is the isodata algorithm. This method gets into trouble when the noise level becomes high, though.

2.3 Proposed System:

Pure merging methods are, however, computationally expensive because they start from such small initial regions (individual points). We can make this more efficient by recursively splitting the image into smaller and smaller regions until all individual regions are coherent, then recursively merging these to produce larger coherent regions. First, we must split the image. Start by considering the entire image as one region.

1) If the entire region is coherent (i.e., if all pixels in the region have sufficient similarity), leave it unmodified.

2) If the region is not sufficiently coherent, split it into four quadrants and recursively apply these steps to each new region. A support vector machine constructs a hyperplane or set of hyperplanes in a high- or infinite-dimensional space, which can be used for classification, regression, or other tasks. Intuitively, a good separation is achieved by the hyperplane that has the largest distance to the nearest training data point of any class (so-called functional margin), since in general the larger the margin the lower the generalization error of the classifier.

Whereas the original problem may be stated in a finite dimensional space, it often happens that the sets to discriminate are not linearly separable in that space. For this reason, it was proposed that the original finite-dimensional space be mapped into a much higher-dimensional space, presumably making the separation easier in that space.

2.3.1 Advantages:

- SVMs are helpful in text and hypertext categorization as their application can significantly reduce the need for labeled training instances in both the standard inductive and transductive settings .

- Classification of images can also be performed using SVMs. Experimental results show that SVMs achieve significantly higher search accuracy than traditional query refinement schemes after just three to four rounds of relevance feedback.
- SVMs are also useful in medical science to classify proteins with up to 90% of the compounds classified correctly.
- Hand-written characters can be recognized using SVM.

CHAPTER-3

SYSTEM REQUIREMENTS

This chapter clearly depicts the software languages used in the system design and the significance of it.

3.1 Hardware Requirements:

The minimal software requirements are as follows,

- Hard Disk: 10GB and Above
- RAM : 1024 MB and Above
- Processor : Any Intel or AMD x86 processor supporting SSE2 instruction set

3.2 Software Requirements:

The minimal hardware requirements are as follows,

- Windows Operating System: 2000 and Above
- Software: MAT LAB version 7.6
- Collection of scanned images
- Set of tissue samples

3.3 Technologies Used:

3.3.1 About Mat lab:

In this system Mat lab is used for various purposes, mainly for the implementing various algorithms and for computing the metrics. Computations can be done in efficient manner.

3.3.2 Introduction:

Mat lab is a computer programming language. It enables programmers to write computer instructions using English based commands, instead of having to write in numeric codes. It's known as a "high-level" language because it can be read and written easily by humans. Like English, Mat lab has a set of rules that determine how the instructions are written.

These rules are known as its "syntax". Once a program has been written, the high-level instructions are translated into numeric codes that computers can understand and execute.

Easy to Use: The fundamentals of Mat lab came from a programming language called c++. Although a powerful language, it was felt to be too complex in its syntax, and inadequate for all of Mat lab's requirements. Mat lab built on, and improved the ideas of c++, to provide a programming language that was powerful and simple to use.

Reliability:

Mat lab needed to reduce the likelihood of fatal errors from programmer mistakes. With this in mind, object-oriented programming was introduced. Once data and its manipulation were packaged together in one place, it increased Mat lab's robustness.

Secure:

As Mat lab was originally targeting mobile devices that would be exchanging data over networks, it was built to include a high level of security. Mat lab is probably the most secure programming language to date.

Platform Independent:

Programs needed to work regardless of the machine they were being executed on. Mat lab was written to be a portable language that doesn't care about the operating system or the hardware of the computer.

3.3.3 Mat lab Operations

3.3.3.1 Read and Display an Image:

To read an image, use the imread command. The example reads one of the sample images included with Image Processing Toolbox, pout.tif, and stores it in an array named I.

I = imread('pout.tif');

imread infers from the file that the graphics file format is Tagged Image File Format (TIFF). For the list of supported graphics file formats, see the imread function reference documentation.

Now display the image. The toolbox includes two image display functions: **imshow**and **imtool**. **imshow** is the toolbox's fundamental image display function. **imtool** starts the Image Tool which presents an integrated environment for displaying images and performing some common image.

3.3.3.2 Displaying Multiple Images in the Same Figure :

You can use the**imshow** function with the MATLAB **subplot** function or the MATLAB subimage function to display multiple images in a single figure window.

Dividing a Figure Window into Multiple Display Regions subplot divides a figure into multiple display regions. The syntax of subplot is

subplot(m,n,p);

This syntax divides the figure into an m-by-n matrix of display regions and makes the p^{th} display region active.

Write the Image to a Disk File

To write the newly adjusted image I2 to a disk file, use the imwrite function. If you include the filename extension'.png', theimwrite function writes the image to a file in Portable Network Graphics (PNG) format, but you can specify other formats**.**

imwrite (I2, 'pout2.png');

See the **imwrite** function reference page for a list of file formats it supports.

3.3.3.3 Resizing an image:

Using **imresize**, you can specify the size of the output image in two ways:

- By specifying the magnification factor to be used on the image.
- By specifying the dimensions of the output image

Using the Magnification Factor To enlarge an image, specify a magnification factor greater than 1. To reduce an image, specify a magnification factor between 0 and 1. For example, the command below increases the size of an image by 1.25 times.

I=imread('circuit.tif');

J=imresize(I,1.25);

imshow(I) figure,imshow(J);

3.3.3.4 Reading and Writing Data in Medical File Formats:

The Image Processing Toolbox includes support for working with image data in the many commonly used medical file formats, described in the following sections:

- Reading Metadata from a DICOM File
- Reading Image Data from a DICOM File
- Writing Image Data or Metadata to a DICOM File

Including an example that reads image data and metadata from a DICOM file, modifies the image data, and writes the modified data to a new DICOM file. Reading Metadata from a DICOM File DICOM files contain metadata that provide information about the image data, such as the size, dimensions, bit depth, modality used to create the data, the equipment settings used to capture the image, and information about the study. The DICOM specification defines many of these metadata fields, but files can contain additional fields, called private metadata.

To read metadata from a DICOM file, use the **dicominfo** function. dicominfo returns the information in a MATLAB structure where every field contains a specific piece of DICOM metadata. You can use the metadata structure returned by dicominfo to specify the DICOM file you want to read using **dicomread**.

3.3.3.5 Reading Image Data from a DICOM File

To read image data from a DICOM file, use the dicomread function. The dicomread function reads files that comply with the DICOM specification but can also read certain common noncomplying files.

When using **dicomread**, you can specify the filename as an argument, as in the following example. The example reads the sample DICOM file that is included with the toolbox.

I = dicomread('CT-MONO2-16-ankle.dcm');

Reading and Writing Data in Medical File Formats

You can also use the metadata structure returned by dicominfo to specify the file you want to read, as in the following example.

info = dicominfo('CT-MONO2-16-ankle.dcm'); I = dicomread(info);

WritingImageDataorMetadatatoaDICOMFile:

TowriteimagedataormetadatatoafileinDICOMformat,use the **dicomwrite** function. This example writes the image It o the DICOM file **ankle.dcm.**

dicomwrite(I,'h:\matlab\work\ankle.dcm);

3.3.3.6 Detecting Edges:

In an image, an edge is a curve that follows a path of rapid change in image intensity. Edges are often associated with the boundaries of objects in a scene. Edge detection is used to identify the edges in an image.

Read image and display it.

```
I = imread('coins.png');
imshow(I)
```

2 Apply the Sobel and Canny edge detectors to the image and display them.

```
BW1 = edge(I,'sobel');
BW2 = edge(I,'canny');
imshow(BW1) figure, imshow(BW2)
```

3.3.4 Other Non-Functional Requirements:

3.3.4.1 Performance Requirements:

An image is use to receive multiple input of requesting text file. Using the three techniques we send the data efficiently to the user in less time. In our product, we use Support Vector Machine algorithms.

3.3.4.2 Safety Requirements:

1. The software may be safety-critical. If so, there are issues associated with its integrity level.
2. The software may not be safety-critical although it forms part of a safety-critical system. For example, software may simply log transactions
3. If a system must be of a high integrity level and if the software is shown to be of that integrity level, then the hardware must be at least of the same integrity level.
4. There is little point in producing 'perfect' code in some language if hardware and system software (in widest sense) are not reliable.
5. If a computer system is to run software of a high integrity level then that system should not at the same time accommodate software of a lower integrity level.
6. Systems with different requirements for safety levels must be separated.
7. Otherwise, the highest level of integrity required must be applied to all systems.

3.3.4.3 Security Requirements:

Do not block the some available ports through the windows firewall. Since we use the port which are free in the node to communicate.

3.3.4.4 Software Quality Attributes:

Functionality : are the required functions available, including Interoperability and security.

Reliability : maturity, fault tolerance and recoverability

Usability : how easy it is to understand, learn, and operate the software System

Efficiency : performance and resource behavior.

Maintainability : Maintaining the software.

Portability : can the software easily be transferred to another environment, including install ability

CHAPTER-4

SYSTEM DESIGN

4.1 System Architecture

It is one of the important tasks to identify and extract relevant features in order to reduce the complexity of processing. Not all the features of an image are useful for rule extraction.

Some of the above features are strongly correlated with each other. A feature selection procedure is applied to select a subset of the features in order to improve the performance of the system. In our system, we used linear technique for feature reduction called PCA. This method selects optimal features that are correlated with each other. The first step towards designing an image analysis system is digital image acquisition using sensors in optical or thermal wavelengths. Most of the time people will receive noisy images that are degraded by optical lens system in a digital camera. Thus, brightness and contrast of the image required improvement. Segmentation is a technique refers to subdivision an image into its constituent regions. The goal of segmentation is to simplify or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries in images. There are many techniques in segmentation so the subdivision is carried depends on the problem being solved. The result of image segmentation is a set of regions that collectively cover the entire image or a set of contours extracted from the images. Finally, each segmented object is classified to one of a set of meaningful classes based on the set of those extracted features. Cervical Cancer Detection System (CCDS) use the texture and color techniques to classifier the result. A texture technique is a texture measures look for visual patterns in images and how they are spatially defined. Textures are represented by texels which are then placed into a number of sets, depending on how many textures are detected in the image. These sets not only define the texture, but also where in the image the texture is located. Texture is a difficult concept to represent. The identification of specific textures in an image is achieved primarily by modeling texture as a two-dimensional gray level variation. The relative brightness of pairs of pixels is computed such that degree of contrast, regularity, coarseness and directionality may be estimated.

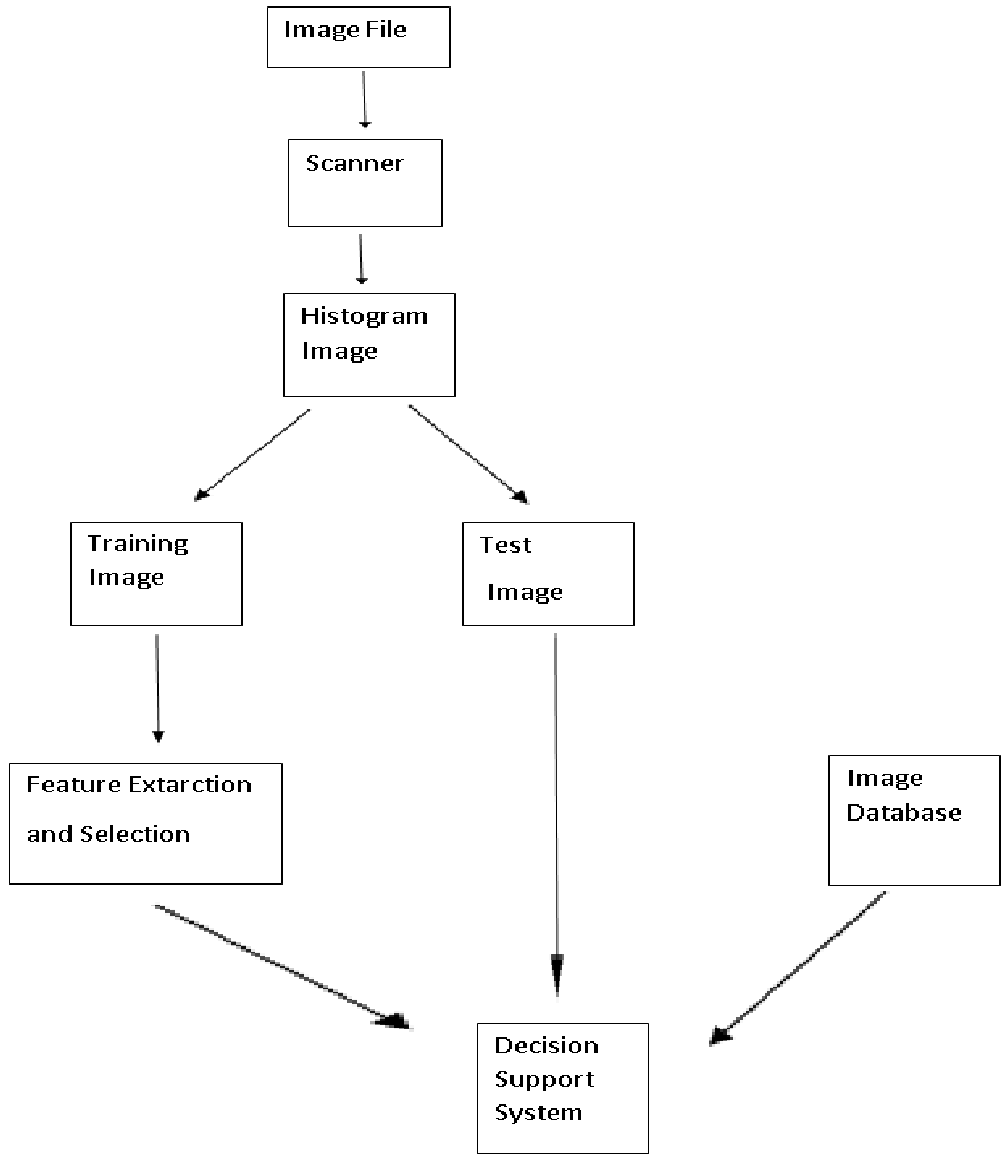


Fig 4.1 *Architectural Diagram*

After extracting each segment, the next task is to extract a set of meaningful features such as texture, color and shape. These are important measurable entities which give measures of various properties of image segments. Some of the texture properties are coarseness, smoothness, regularity, while the common shape descriptors are length, breadth, aspect ratio, area, location, parameter, compactness and etc. Each segmented region in a scene may be characterized by a set of such features.

4.2 Data Flow Diagram:

Data Flow Diagram (DFD) is a technique for modeling a system's high-level detail by showing how input data is transformed to output results through a sequence of functional transformations. DFD reveals relationships among and between the various components in a program or system. DFD consists of four major components:

- Entities
- Processes
- Data stores
- Data flows

When it comes to conveying how information data flows through system and how that data is transformed in the process, DFDs are the method of choice over technical descriptions for three principle reasons.

- DFDs are easier to understand by technical and non-technical audiences
- DFDs can provide a high level system overview, complete with boundaries and connections to other systems
- DFDs can provide a detailed representation of system components.

Symbols used for Data Flow Diagram:

There only four symbols used to write Data Flow Diagram as follows:

- External Entities –> Rectangular box
- Data Flow –> Arrow headed lines
- Process –> Bubble (Circle or round corner square)
- Data Store –> Narrow opened rectangle

4.2.1 Level 0:

Level 0 Data flow diagram will represent the input, process and the output of the system. In the proposed system file is sent from the Source node to request node or destination node. A DFD may look similar to a flow chart. However, there is a significant difference with the data flow diagram. The arrows in DFDs show that there is a flow of data between the two components and not that the component is sending the data that must be executed in the following component. A component in DFD may not continue execution when sending data and during execution of the component receiving the data. The component sending data can send multiple sets of data along several connections. In fact, a DFD node can be a component that never ends.

Level 0:

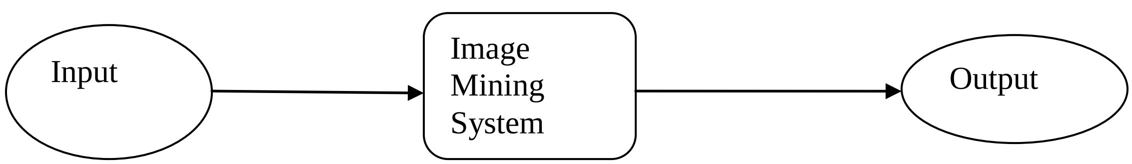


Fig 4.2 *Level 0 DFD*

The process will do by the Intermediate nodes. Finally the requested data will be delivered to the requesting node. It represents the overall process in the simple and short procedure. Here there are only to nodes Source which used transmit the data packet to the respective node and destination which are being used to receive the packet and gain the required data.

4.2.2 Level 1:

In the level 1 DFD describe the overall process of the system, in this level requesting text file has been request to source through wireless network then there is number of movable node only send the requesting file.

Level 1:

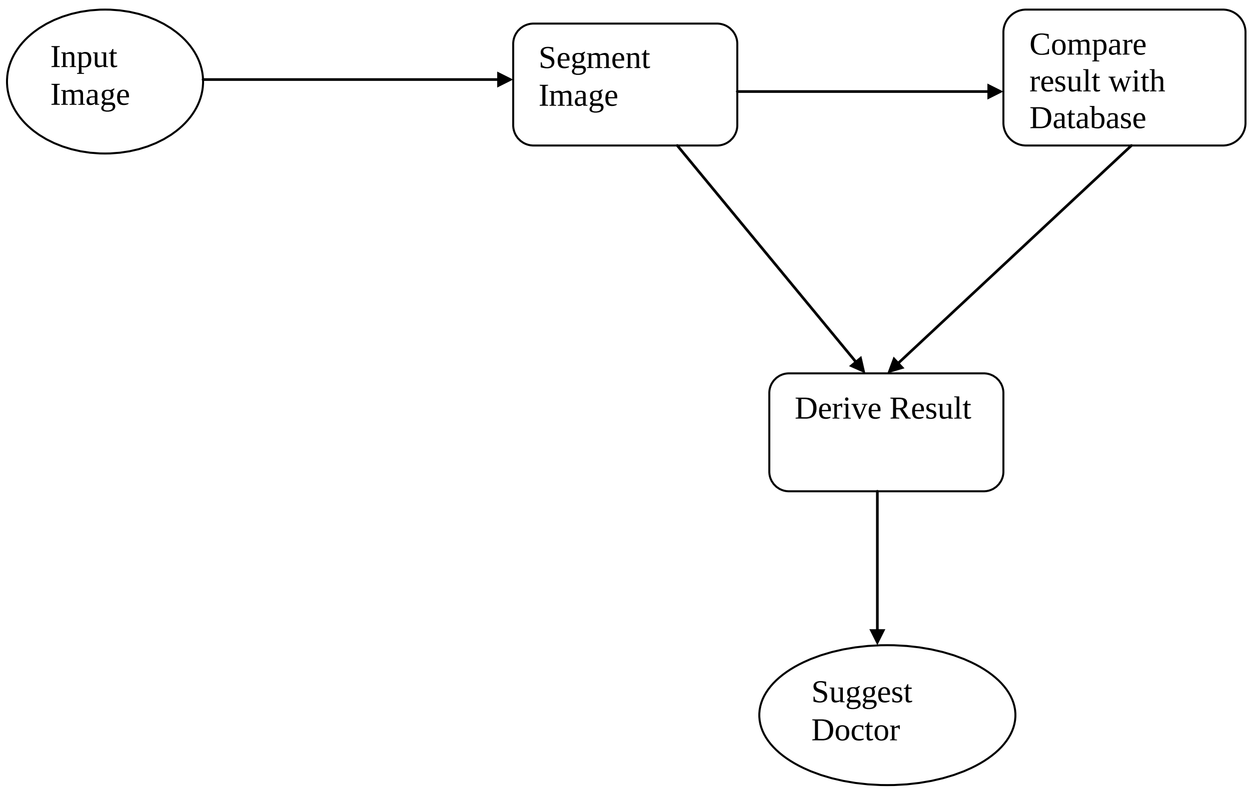


Fig 4.3 Level 1 DFD

4.2.3 Level 2:

In the level 2 DFD, the image file is scanned with the help of scanning device and is stored in histogram. It is then transformed and stored as binary code in feature extraction selection unit. Once after this, the filtered result as stored in decision support system where the decision is finalized. This again will sent the request to the database for the matched samples and at last the list of matched samples is stored in the decision support system.

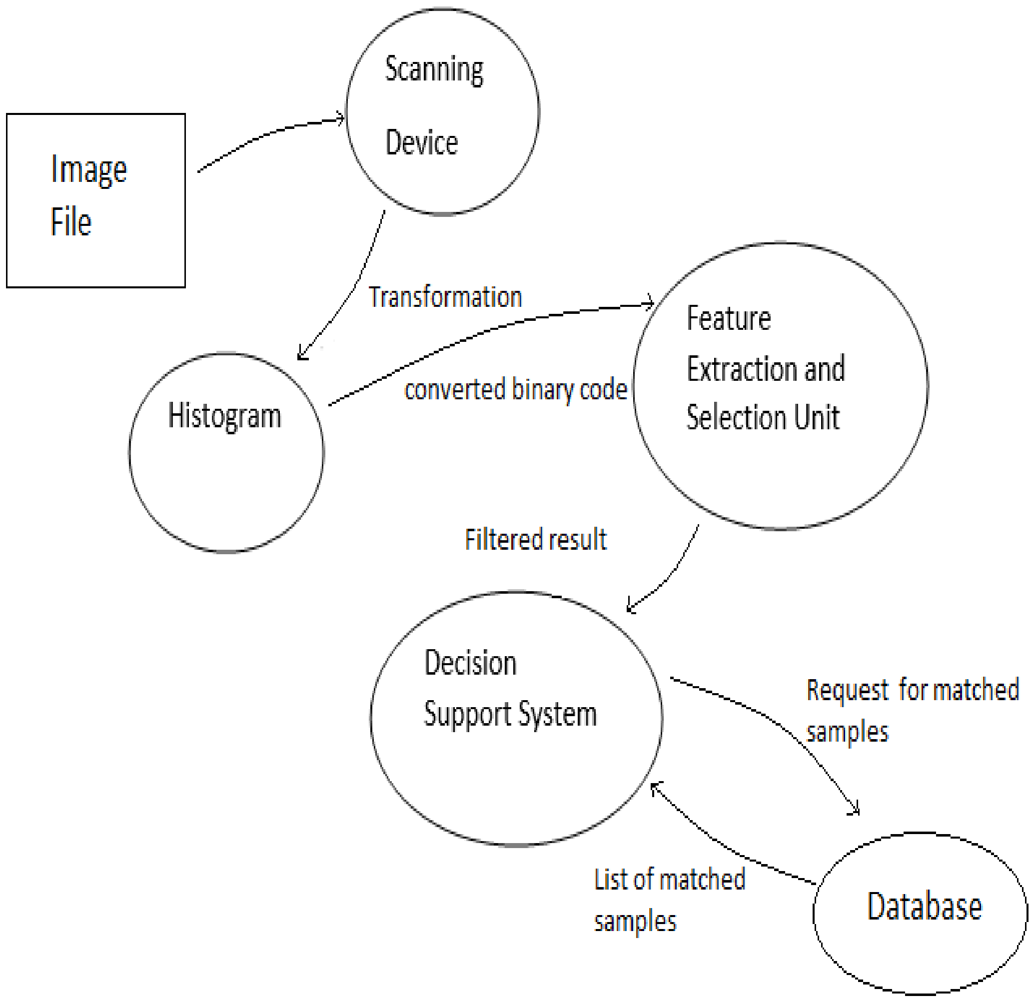


Fig 4.4 *Level 2 DFD*

4.3 UML Design:

4.3.1 Use Case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the system and depicting the specifications of a use case. A use case diagram can portray the different types of users of a system and the various ways that they interact with the system. This type of diagram is typically used in conjunction with the textual use case and will often be accompanied by other types. It is a very well-known adage that "A picture is worth a thousand words".

With regards to use case diagrams, that is exactly what they are meant to do. While a use case itself might drill into a lot of detail about every possibility, a use case diagram can help provide a higher-level view of the system. It has been said before that "Use case diagrams are the blueprints for your system". Here we used to have a mining who tries to decrypt the packet on the fly. when the packets are been transmitted by an ordinary mode they can be easily decrypted by intentional interference attack but when we use the cryptographic primitives it can’t be decrypted on the fly from source to destination. So we developed the three schemes for the secure data transmission on the vulnerable medium.

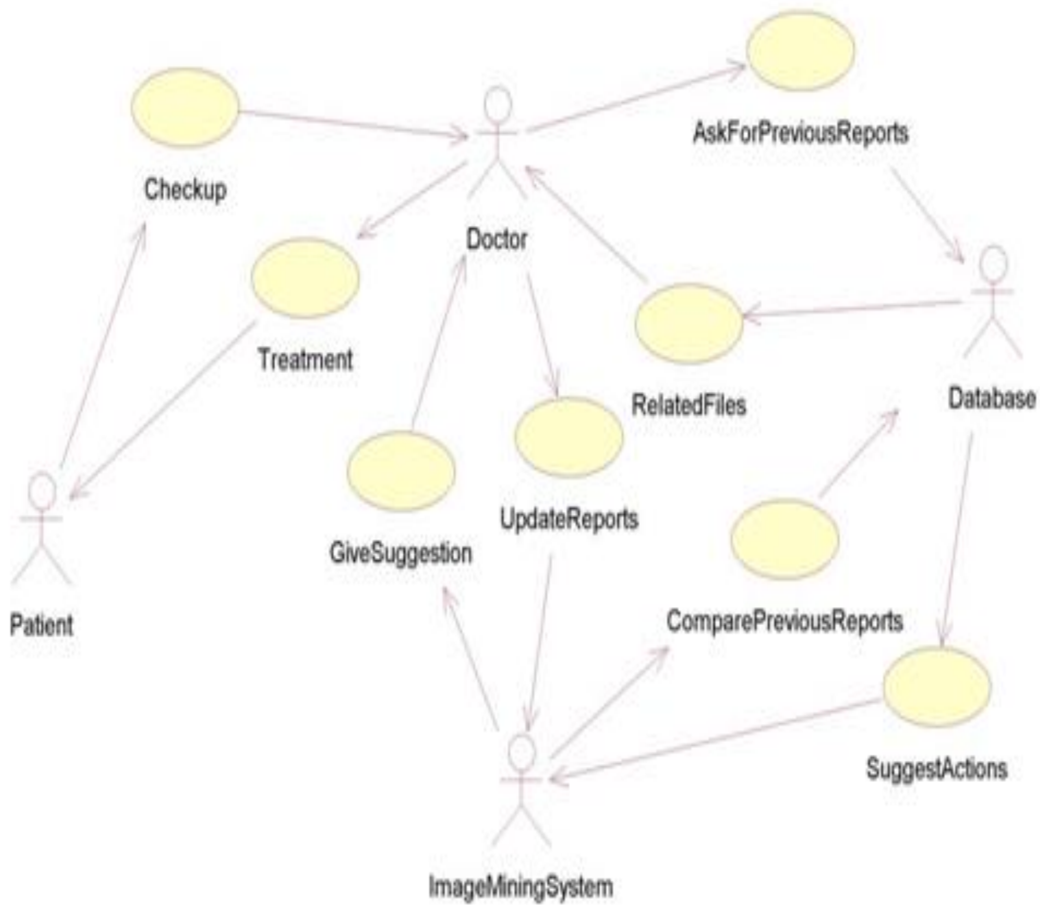


Fig 4.5 *Use Case diagram*

4.3.2 Activity Diagram

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

We can achieve the patients understanding of product by modeling the process which are to be carried over in the product development. Hence activity diagram are been used to explain the activity are been carried over by the each and every nodes in the system. Here we used to have a mining who tries to decrypt the packet on the fly. when the packets are been transmitted by an ordinary mode they can be easily decrypted by intentional interference attack but when we use the cryptographic primitives it can't be decrypted on the fly from source to destination. So we developed the three schemes for the secure data transmission on the vulnerable medium.

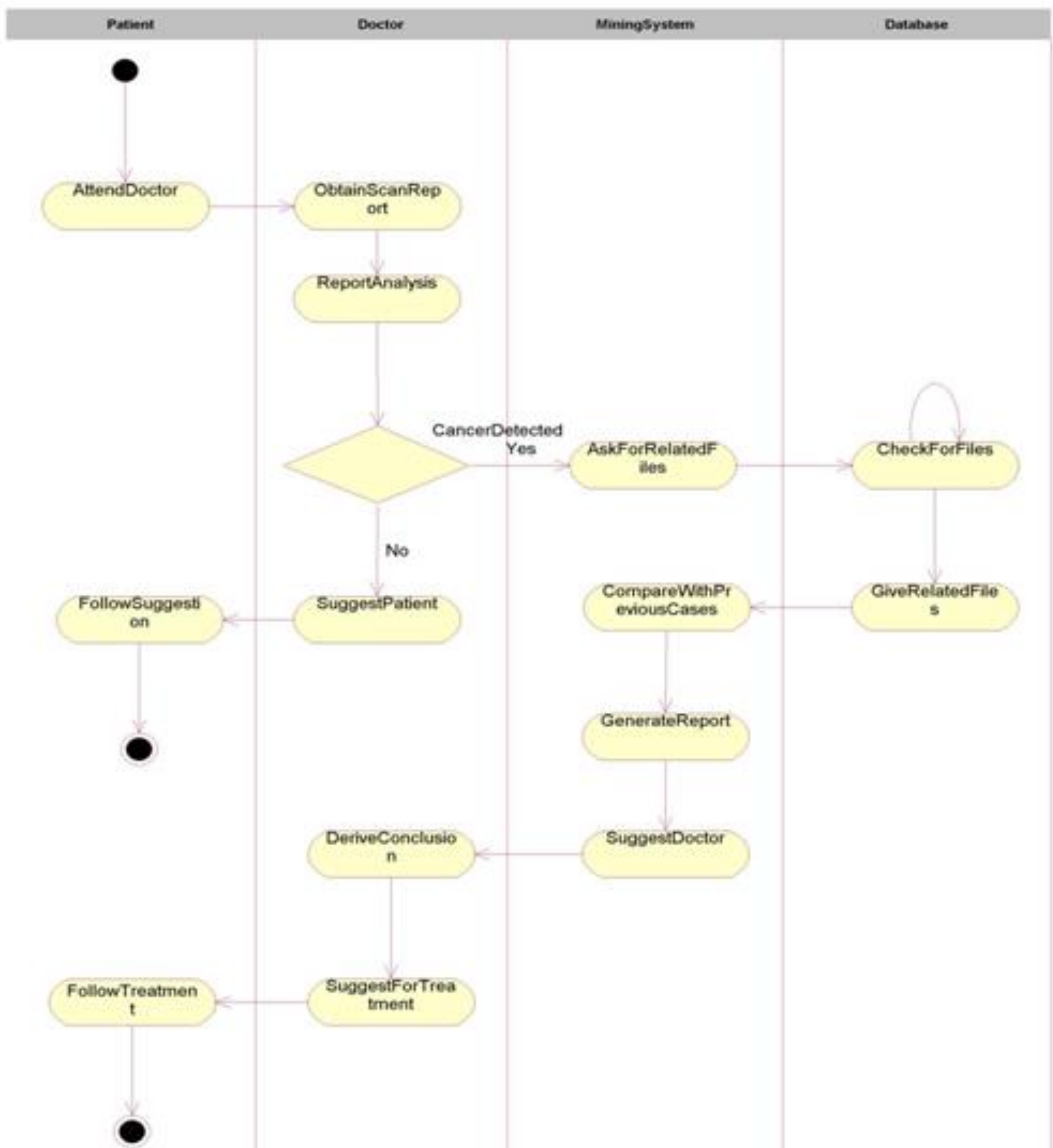


Fig 4.6 *Activity diagram*

4.3.3 Class Diagram

The class diagram is the main building block of object oriented modeling. It is used both for general conceptual modeling of the systematics of the application, and for detailed modeling translating the models into programming code. Class diagrams can also be used for data modeling. The classes in a class diagram represent both the main objects, interactions in the application and the classes to be programmed.

A class diagram describes the types of objects in the system and the various kinds of static relationships that exist among them. It is a graphical representation of a static view on declarative static elements and a central modeling technique that runs through nearly all object-oriented methods. The richest notation in UML. Here we used to have a mining who tries to decrypt the packet on the fly. when the packets are been transmitted by an ordinary mode they can be easily decrypted by intentional interference attack but when we use the cryptographic primitives it can’t be decrypted on the fly from source to destination. So we developed the three schemes for the secure data transmission on the vulnerable medium.

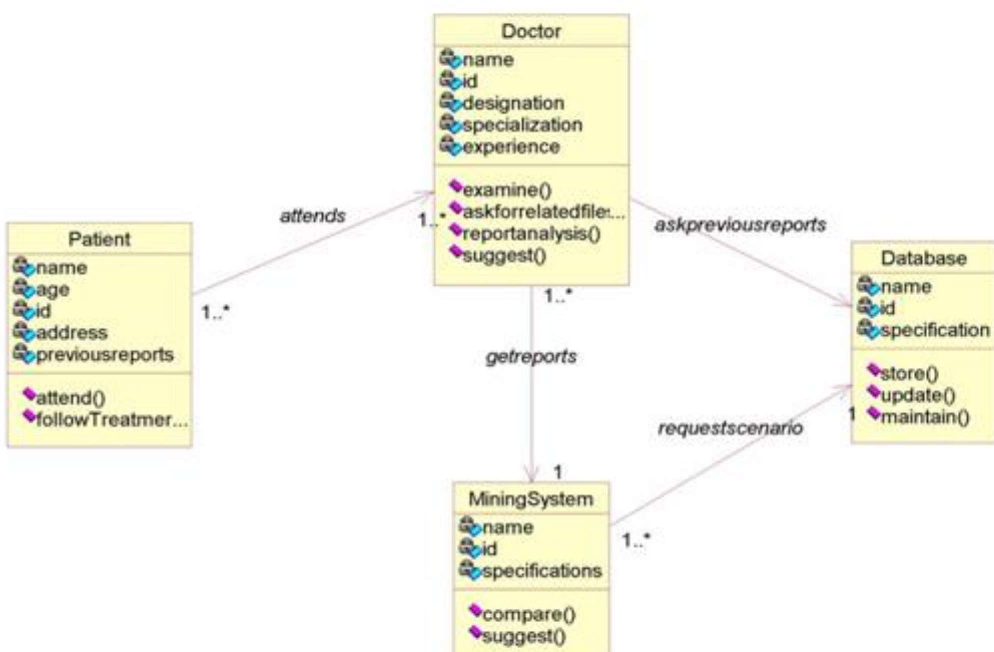


Fig 4.7 *Class diagram*

4.3.4 Sequence Diagram

A sequence diagram in a Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams typically (but not always), are associated with use case realizations in the Logical View of the system under development.

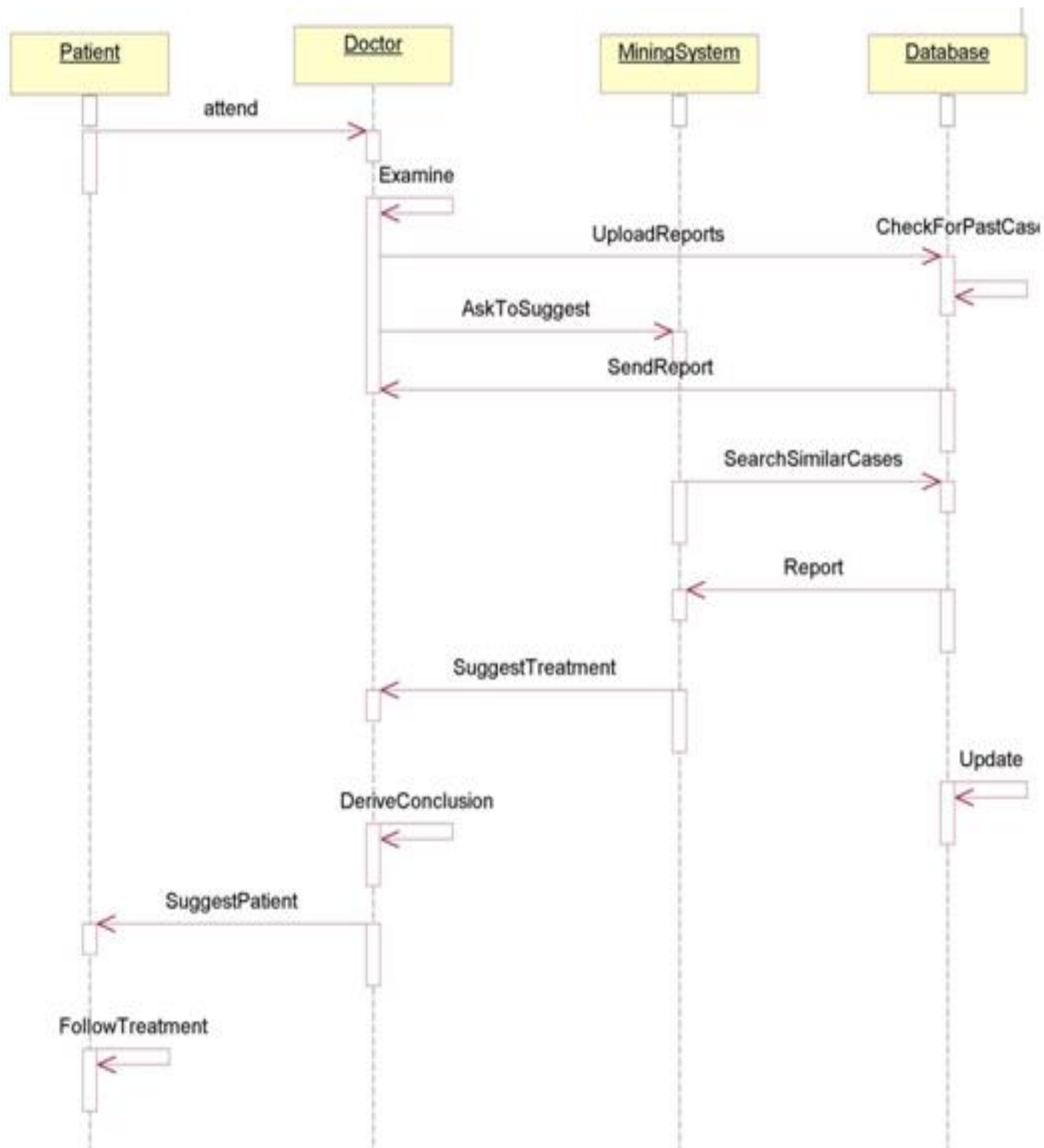


Fig 4.8 *Sequence Diagram.*

A sequence diagram shows, as parallel vertical lines (*lifelines*), different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner. Here we used to have a mining who tries to decrypt the packet on the fly. when the packets are been transmitted by an ordinary mode they can be easily decrypted by intentional interference attack but when we use the cryptographic primitives it can't be decrypted on the fly from source to destination. So we developed the three schemes for the secure data transmission on the vulnerable medium. Here we used to have a mining who tries to decrypt the packet on the fly. when the packets are been transmitted by an ordinary mode they can be easily decrypted by intentional interference attack but when we use the cryptographic primitives it can't be decrypted on the fly from source to destination. So we developed the three schemes for the secure data transmission on the vulnerable medium.

The dashed lines hanging from the boxes are called object lifelines, representing the life span of the object during the scenario being modeled. The long, thin boxes on the lifelines are activation boxes, also called method-invocation boxes, which indicate processing is being performed by the target object/class to fulfill a message. I will only draw activation boxes when I'm using a tool that natively supports them, such as a sophisticated CASE tool, and when I want to explore performance issues. Activation boxes are too awkward to draw on whiteboards or with simple drawing tools such that don't easily support them.

CHAPTER-5

SYSTEM IMPLEMENTATION

5.1 Module List.

- Input Module
- Transformation Module
- Preprocessing Module
- Feature Extraction Module
- Feature Selection Module
- Computation Module
- Report Module

5.1.1 Input Module:

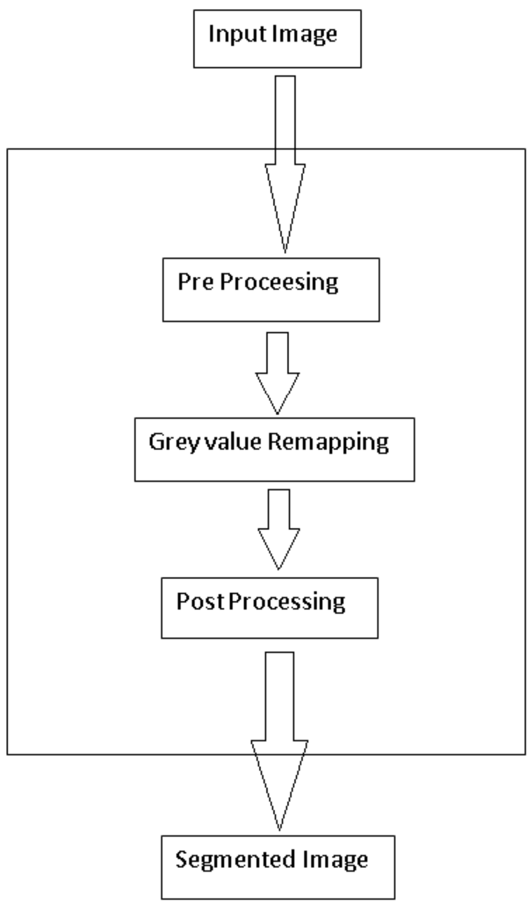
The image file is scanned with the help of scanning device and is stored in histogram. It is then transformed and stored as binary code in feature extraction selection unit. Once after this, the filtered result as stored in decision support system where the decision is finalized.

5.1.2 Transformation Module:

This again will sent the request to the database for the matched samples and at last the list of matched samples is stored in the decision support system. First category is to partition an image based on abrupt changes in intensity, such as edges in an image.Second category is based on partitioning an image into regions that are similar according to predefined criteria.

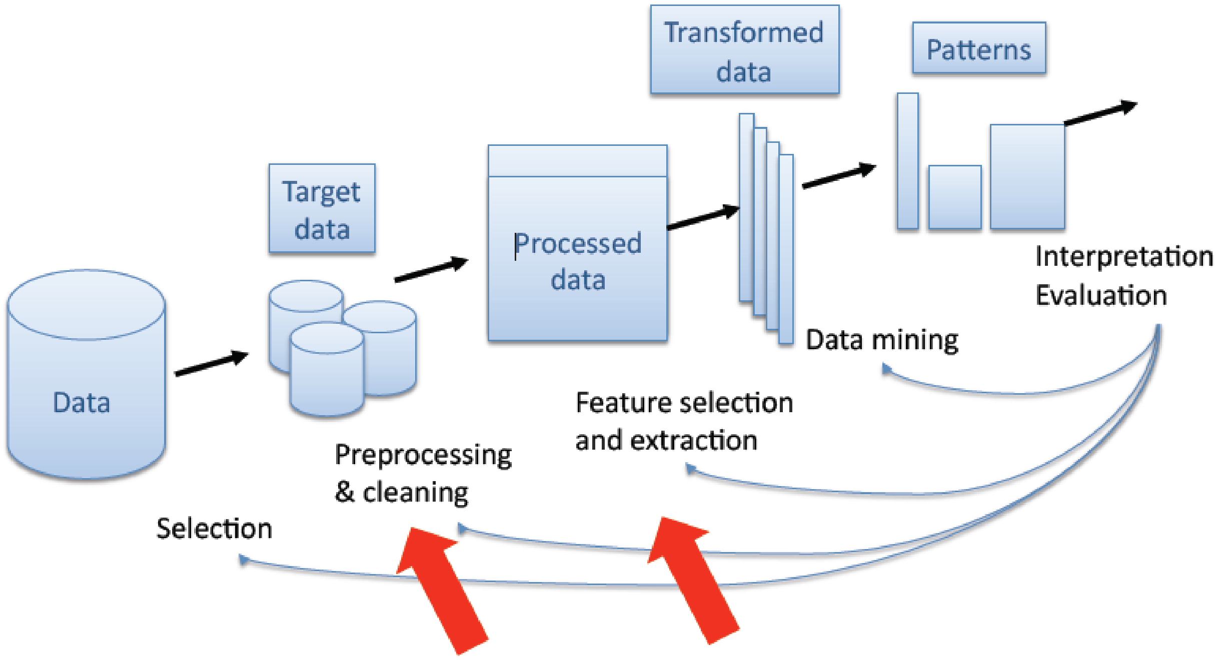
5.1.3 Preprocessing Module:

In general, images with noise reduce the efficiency of the system. Therefore, preprocessing of medical images is essential for increasing the efficiency and reducing the complexity of the CAD system.



5.1.3 Threshold method

5.1.4 Feature Extraction Module:



It is one of the important tasks to identify and extract relevant features in order to reduce the complexity of processing. Not all the features of an image are useful for rule extraction.

Some of the above features are strongly correlated with each other. A feature selection procedure is applied to select a subset of the features in order to improve the performance of the system.

In our system, we used linear technique for feature reduction called PCA. This method selects optimal features that are correlated with each other. The most difficult aspect of CAD system in feature analysis and extraction is to extract a set of useful features that should be able to explore the characteristics of the tissues at cervix.

5.1.5 Feature Selection Module:

It is one of the important tasks to identify and extract relevant features in order to reduce the complexity of processing. Not all the features of an image are useful for rule extraction. Some of the above features are strongly correlated with each other. A feature selection procedure is applied to select a subset of the features in order to improve the performance of the system. In our system, we used linear technique for feature reduction called PCA. This method selects optimal features that are correlated with each other.

5.1.6Computation Module:

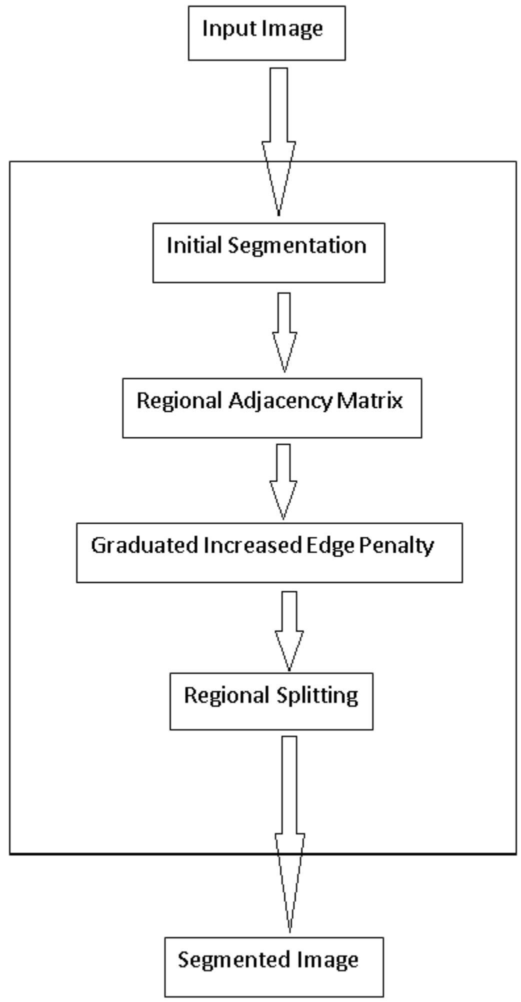
This module involves the following computations,

- Initial Segmentation
- GIEP
- Region Adjacency Graph
- The choice of Cost Function
- Region splitting

The input image is taken and is given for initial segmentation. At first an image is being read and watershed segmentation is performed on that image. This generally eliminates the plateaus defined as the uniform regions, by converting the image to a floating point representation. Here watershed segmentation is done as initial segmentation. The GIEP has two attractive features.

First, it utilizes edge information to improve the segmentation on non stationary situations. Second, it provides a simple and elegant method of simultaneously estimating model parameters and searching solutions for the MRF-based formulation.

Then Region Adjacency Graph is drawn for the segmented image. This method equivalently can be used as edge detection and result is satisfied to the topological requirement . Merging is always conducted in such a way that the distortion or cost caused by merging is minimized and there is no further restriction imposed on the shape of the final segmentation result. The choice of cost function depends on the desired purpose of segmentation. A common cost measure is sse (sum square error): where g(x,y) is the approximation function and h(x,y) is the original data.



5.1.7 Report Module:

In this module, the given image and the image data base will be referred to check whether it is in the early stage of cancer or in the advanced stage.

- Step 1 : At the beginning of the model-based region grouping stage, check each region. If that region's model fitting cost is larger than a threshold, then it is a splitting candidate.

- Step 2: At the end of merging, for each group, if its model fitting cost is larger than the threshold, then it is a splitting candidate.

- The split threshold can be obtained through statistical analysis for a set of training examples. Since the number of regions in the over-segmentation result is large typically, we only utilize the splitting operation after the model-based merging stage. If new regions occur in the model based splitting stage, then the model-based merging stage is invoked again to refine the final result.

CHAPTER-6

TESTING

6.1 Testing Objectives:

Testing is a process of executing a program with the intent of finding an error. A good test case is one that has a high probability of finding an error that is yet undiscovered. A successful test is one that uncovers a yet undiscovered error. Testing cannot show the absence of defects, it can only show that software defects are present.

6.1.1 Test Information Flow:

Information flow for testing follows a pattern. Two classes of inputs are provided to the test process. A software configuration that includes a software requirement specification, a design specification and source code. A test configuration that includes a test plan and test cases and testing tools. Tests are compared with expected results. When erroneous data are uncovered, an error is implied and debugging commences.

6.2Test Cases:

6.2.1 Outgress Routing:

S.No	Input	Transmission File	Actual Output	Expected Output
1	Image file	-	File Missing	Missing File
2	Image file	Image.jpg	File Transmitting	File Transmitting

When the node transmit data to the destination through the Outgress interface.which is a transit they used to route the packet to the destination node, if the file is unavailable in the network we used to obtain an error message that the File is missing else the file transmission rate will be displayed.

6.2.2 Ingress interface:

S.No	Input	Transmission File	Actual Output	Expected Output
1	Image file	-	File Missing	Missing File
2	Image file	Image.jpg	File Transmitting	File received Successfully

Ingress interface are at the destination node side which are been used to collect the packets and form it back to a file .When it doesn't have the receive the packets it will show the error the File missing else if data packets are received the Ingress interface it will show that file received successfully.

6.2.3 Destination Node:

S.No	Input	Transmission File	Actual Output	Expected Output
1	Image file	Image.jpg	File Missing	Missing File
2	Image file	Image.jpg	File Transmitting	File received Successfully

Destination node are been used to receive the file from the source node through intermediate interfaces. When it tries to corrupt the file and successfully corrupted means we receive the alert as the image is corrupted else we obtain the original message means we obtain message as it then we obtain an message as the file received successfully.

6.3Test Case Design:

- White Box Testing
- White Box Testing

6.3.1 White Box Testing:

White Box Testing is a test case design method that uses the control structure of the procedural design to derive test cases. Using white box testing methods, the software engineer can derive test cases that guarantee that all independent paths within a module have been exercised at least once, exercise all logical decisions on their true and false sides, execute all loops at their boundaries and within their operational bounds and exercise internal data structures to ensure their validity.

6.3.2 Black Box Testing:

Black Box Testing methods focus on the functional requirements of the software. That is, black box testing enables the software engineer to derive sets of input conditions that will fully exercise all functional requirements for a program.

CHAPTER-7

CONCLUSION & FUTURE ENHANCEMENT

7.1 Conclusion:

SVM models have similar functional form to neural networks and radial basis functions, both popular data mining techniques. However, neither of these algorithms has the well-founded theoretical approach to regularization that forms the basis of SVM. The quality of generalization and ease of training of SVM is far beyond the capacities of these more traditional methods.

SVM can model complex, real-world problems such as text and image classification, hand-writing recognition, and bioinformatics and bio sequence analysis.SVM performs well on data sets that have many attributes, even if there are very few cases on which to train the model. There is no upper limit on the number of attributes; the only constraints are those imposed by hardware. Traditional neural nets do not perform well under these circumstances.

.

7.2 Future Enhancements:

For future work, enhancements in the throughput of a Matlab using our advanced routing method. Comparisons to another Linear method highlighted the importance of the performance for both classifier methods. We note that it is straightforward to extend our SVM algorithm to the case of a larger number of simultaneous transmissions using the interference cancellation methods. Support Vector Machines (SVM) is a powerful, state-of-the-art algorithm with strong theoretical foundations based on the Vapnik-Chervonenkis theory. SVM has strong regularization properties. Regularization refers to the generalization of the model to new data.

APPENDIX 1

Main:

/* Main */

```
close all;
clear all;
clc;

A = (imread('01.jpg'));
 figure,imshow(A);

  if size(A,3)==3
    C=rgb2gray(A);
    figure,imshow(A);
end

 C(C<0.1)=0;
 s= strel('disk',8,0);
 D= ~im2bw(C);
 figure,imshow(D);
 L = bwareaopen(D,400);
 E = imclearborder(L);
 I = imfill(E,'holes');
 I = bwareaopen(I,200);
 se = strel('disk',1);
 bw = imclose(I,se);
 I = imfill(I,'holes');

 text(size(I,2),size(I,1)+15, ...
     '..', ...
```

```
    'FontSize',7,'HorizontalAlignment','right');
 text(size(I,2),size(I,1)+25, ....
    '..', ...
    'FontSize',7,'HorizontalAlignment','right');
    [B, L] = bwboundaries(I,'holes');


 hold on
 for k = 1:length(B)
   boundary = B{k};
   plot(boundary(:,2), boundary(:,1), 'w', 'LineWidth', 1)
 end
%
 stats = regionprops(L,'Area','Centroid');
 threshold = 10;

for k = 1:length(B)%
boundary = B{k};
delta_sq = diff(boundary).^2;
perimeter = sum(sqrt(sum(delta_sq,2)));
area = stats(k).Area;
Roundness = 4*pi*area/perimeter^2;
display(Roundness);
metric_string = sprintf('%2.2f',Roundness);
Diameter = sqrt(4*area/pi);
display(Diameter);
diameter = sprintf('%2.2f',Diameter);
if Roundness < threshold
centroid = stats(k).Centroid;
plot(centroid(1),centroid(2),'ko');
end
text(boundary(1,2)-10,boundary(1,1)+20,metric_string,'Color','r',...
```

```
        'FontSize',14,'FontWeight','bold');
text(boundary(1,2)-60,boundary(1,1)+2,diameter,'Color','b',...
        'FontSize',14,'FontWeight','bold');
 end

 [~, threshold] = edge(I, 'sobel');
 fudgeFactor = .5;
 BWs = edge(I,'sobel', threshold * fudgeFactor);
 se90 = strel('line', 3, 90);
 se0 = strel('line', 3, 0);
 BWsdil = imdilate(BWs, [se90 se0]);
 BWdfill = imfill(BWsdil, 'holes');
 BWnobord = imclearborder(BWdfill, 4);
 seD = strel('diamond',1);
 BWfinal = imerode(BWnobord,seD);
 BWfinal = imerode(BWfinal,seD);
 BWoutline = bwperim(BWfinal);
 Segout = A;
 Segout(BWoutline) = 255;
 load seamount x y z;

%% SVM Classfication
  A=double(A);
  copy=A;         % make a copy
  A=A(:);       % vectorize ima
  mi=min(A);      % deal with negative
  A=A-mi+1;     % and zero values
% %
  s=length(A);
  k = 5;
% %
% % % create image histogram
```

```
  m=max(A)+1;
  h=zeros(1,m);
  hc=zeros(1,m);
% %
  for i=1:s
    if(A(i)>0) h(A(i))=h(A(i))+1;
    end;
  end
  ind=find(h);
  hl=length(ind);
%
% % % initiate centroids
% %
  mu=(1:k)*m/(k+1);
%
% % % start process
% %
  while(true)
% %
    oldmu=mu;
% %   % current classification
% %
    for i=1:hl
        c=abs(ind(i)-mu);
        cc=find(c==min(c));
        hc(ind(i))=cc(1);
    end
% %
% %
    for i=1:k,
        a=find(hc==i);
        mu(i)=sum(a.*h(a))/sum(h(a));
```

```
    end
% %
   if(mu==oldmu)
        break;
    end;
% %
  end
% %
% %
  s=size(copy);
  mask=zeros(s);
  for i=1:s(1),
  for j=1:s(2),
   c=abs(copy(i,j)-mu);
   a=find(c==min(c));
   mask(i,j)=a(1);
  end
  end
% %
  mu=mu+mi-1;
  L1 = mask == 1;
  L2 = mask == 2;
  L3 = mask == 3;
  L4 = mask == 4;
  L5 = mask == 5;
% %
%   figure,imshow(L5,[]);
%   title('CLUSTER');

glcm=graycomatrix(I);
[ F ] = haralick1( glcm ,A);
```

```
figure;
scatter(x, y, 10, z);


title('SVM Classfication');
% xlabel('Longitude');
% ylabel('Latitude');
```

APPENDIX 2

SNAPSHOTS

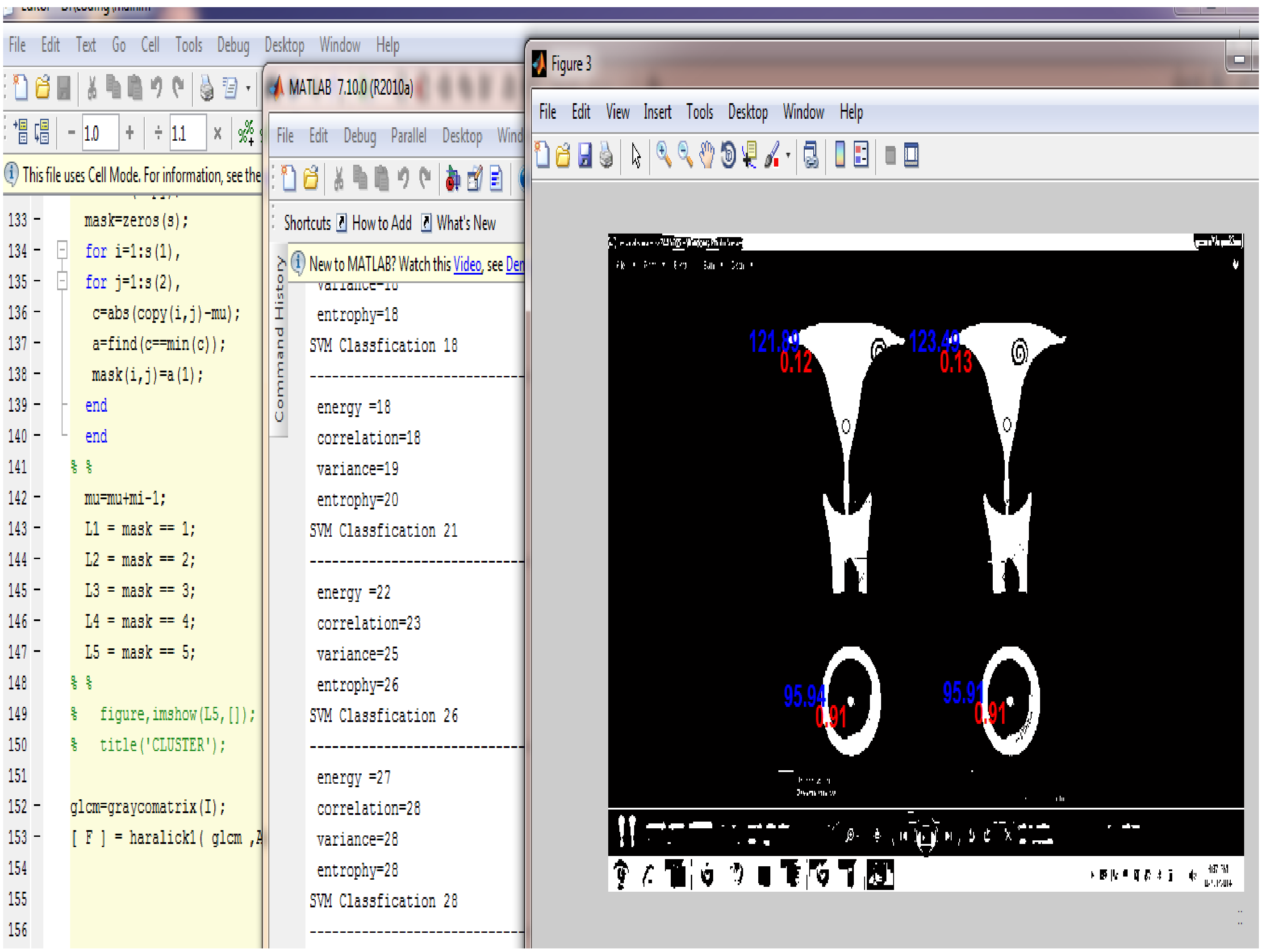


Fig A2.1

SVM CLASSIFICATION:

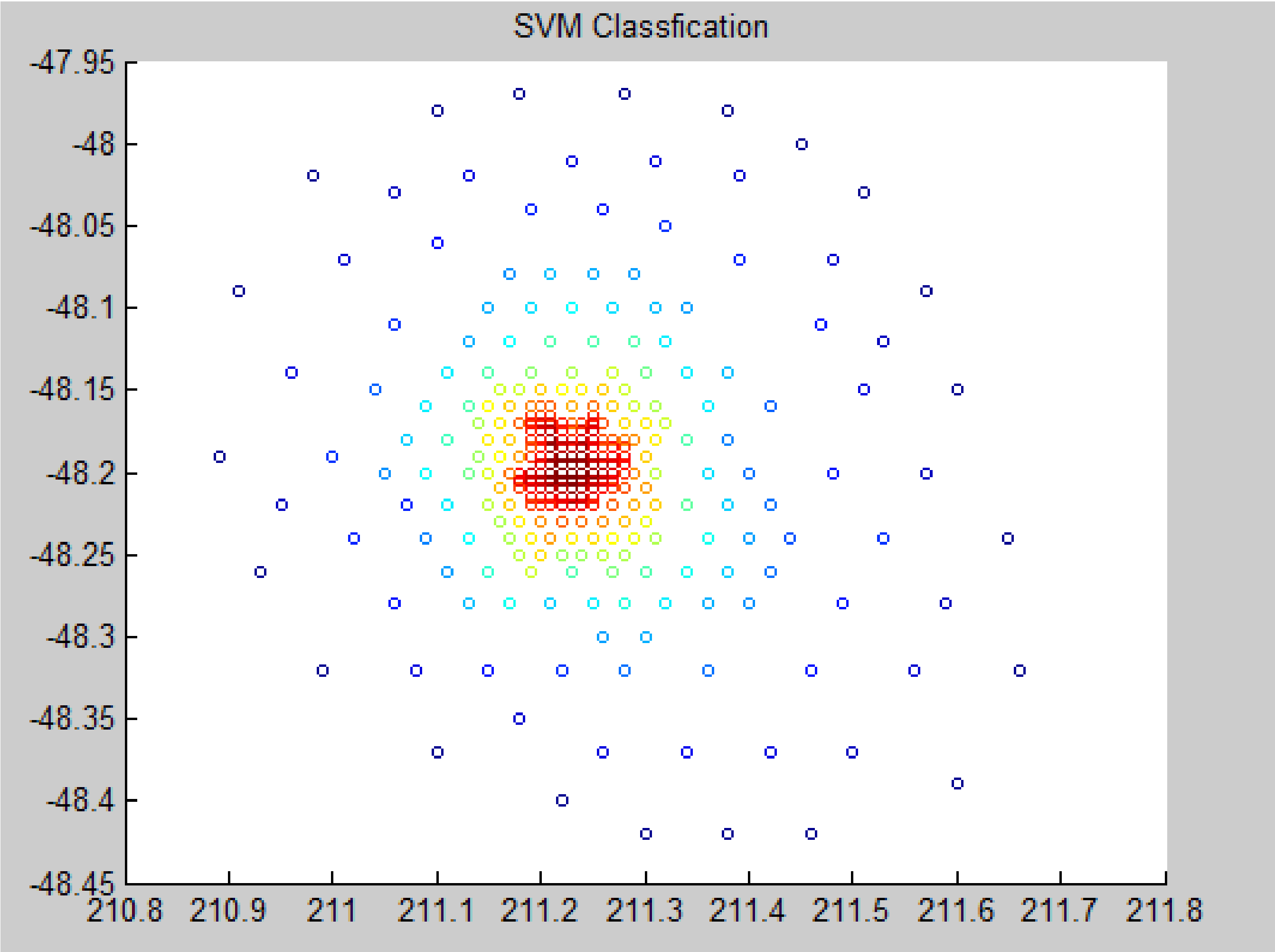


Fig A2.2

DECODING IMAGE:

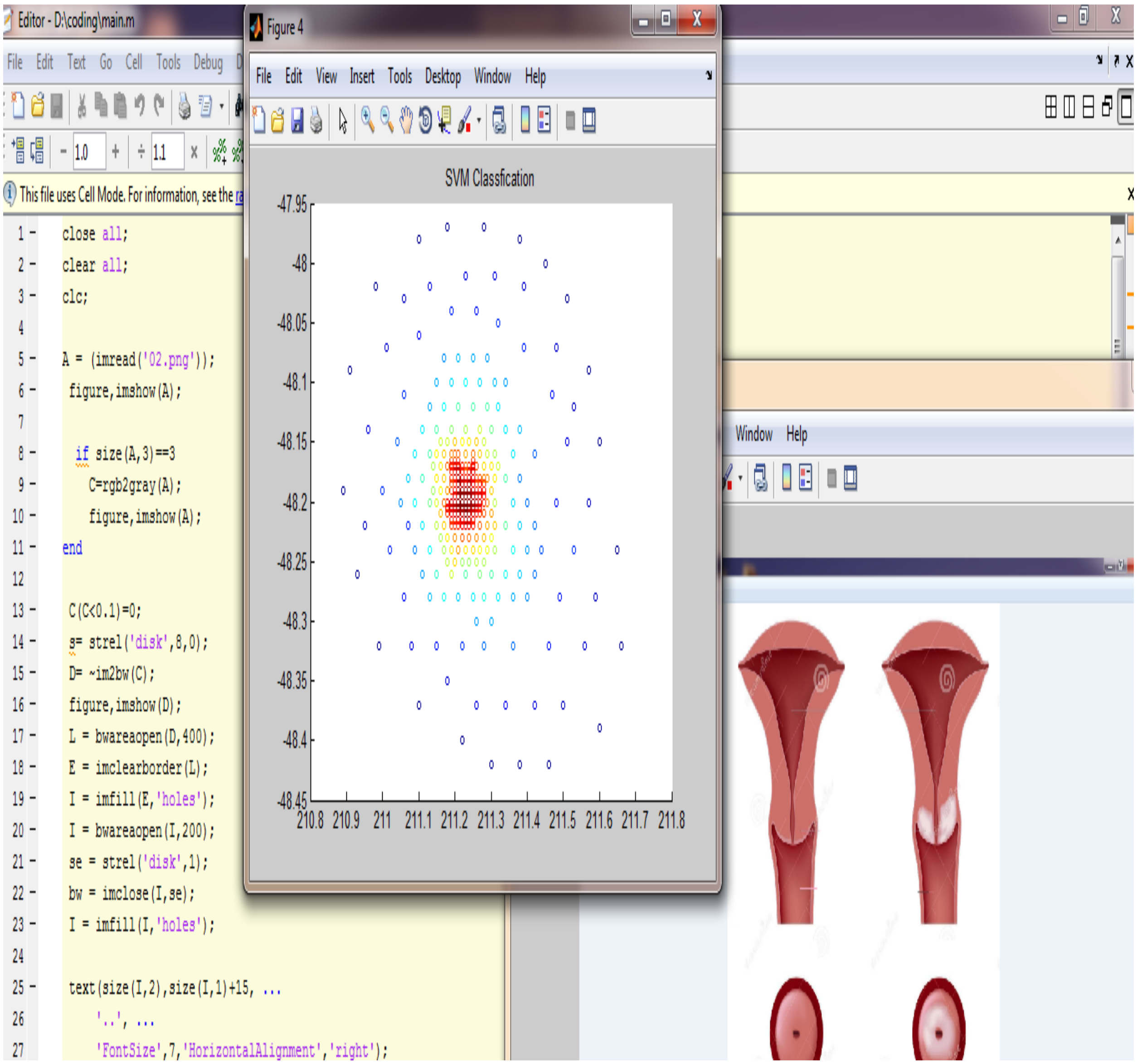


Fig A2.3

REFERENCES

1. J. Agma, M. T. Caetano, X.R. Marcela, and M. A. Paulo, An association rule-based method to support medical image diagnosis with efficiency, IEEE Trans Multimedia 10 (2008), 277–285.
2. R. Agrawal and R. Srikant, Fast algorithms for mining association rules,Proc Int Conf VLDB, Santiago, Chile, 1994, 487–499.
3. M.-L. Antonie, A. Coman, and O.R. Zaiane, Associative classifiers for medical images, LNAI 2797, MMCD, Springer- Verlag, New York (2003), 68–83.
4. I. A. Basheer and M. Hajmeer, Artificial neural networks: fundamentals, computing, design and application, J Microbiol Methods 43 (2000), 3–31.
5. T. Chan and L. Vese, Active contours without edges, IEEE Trans Image Process 10 (2001), 266–277.
6. P.G. Foschi, D. Kolippakkam, H. Liu, and A. Mandvikar, Feature extraction for image mining, Proc 8th Int. Workshop Multimedia Inf Syst Tempe, AZ, 2002, 103–109.
7. J. H. Friedman, T. Hastie, and R. Tibshirani, The elements of statistical learning, 1st ed., Springer-Verlag, New York, 2001.Guler and E. D. Ubeyli, Feature extraction from Doppler ultrasound signals for automated diagnostic systems, Comput Biol Med 35 (2005), 735–764.
8. M. Haralick, I. Dinstein, and H.K. Shanmugam, Texture features for image classification, IEEE Trans Syst Man Cybernet 3 (1973), 610–621.
9. M. C. Ince and M. Karabatak, An expert system for detection of breast cancer based on association rules and neural network, Expert Syst Appl 36 (2009), 3465–3469.