Medical Image Analysis, Archiving and Communication for better Patient Diagnosis

Sajan Bedmutha, Jinendra Jain, Shrikrishna Nimbekar

***Abstract*—System for Medical Image Archiving, Processing and Communication for Teleradiology which enables many hospitals around the globe to systemize and share their Radiology images was developed using software such as Java and MySQL. This system provides a platform for diagnosis of various kinds of diseases. This system allows radiologist to deeply study DICOM (Digital Imaging and Communication in Medicine) format images of patients and also provides a tool which helps radiologist to manipulate and get complete explanation of these pictures which ultimately results in a better diagnosis of patients.**

***Index Terms*—Radiology Images, Image Archiving, Teleradiology, Patient Diagnosis.**

I. INTRODUCTION

We are living in an era of internet where internet has become an essential part of our day to day life. Internet is showing its importance in medical field too. Patient diagnosis can be done in a faster way by using this IT revolutionary element.

Medical images plays an important role in knowing the details of human body for remedial or health science reasons. Digital Imaging and Communications in Medicine (DICOM) is a global standard for storing, distributing and processing medical images of all types.

Medical images and other medical information between computers are transformed using DICOM standard [3]. Its aim is to support the distribution and viewing of medical images from CT, MRI and other medical modalities. DICOM enables digital communication between diagnostic and therapeutic equipment and systems from various manufacturers. It has been widely adopted by hospitals and is making inroads in smaller applications like dentists and doctors' offices.

Patient's medical images are stored in a database from where data can be fetched as per requirement by the radiologist. Different operations can be performed on these images like 2D, 3D view of images, changing color of images to get proper disorder area. Also it performs comparison of these images with standard images stored in database to get exact location of fault making radiologists work quite easy.

The main means of using this system provides radiologist around the globe a platform to detect and analyze the important aspects of dangerous diseases like cancer, tumour, etc. and can also be used to carry out research to get better curing option of these diseases. For example, a study carried out in India could be further analyzed by a doctor in America at the same time in order to suggest and guide surgeon in India to quickly and proficiently take action, which results in a better diagnosis of patient, hence improving the chances of fast recovery of patient from particular disease. Trainee doctors can use this system for practical analysis of patients body and can work under experts settled in different parts of world which would not have been possible otherwise.

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II. SYSTEM ANALYSIS

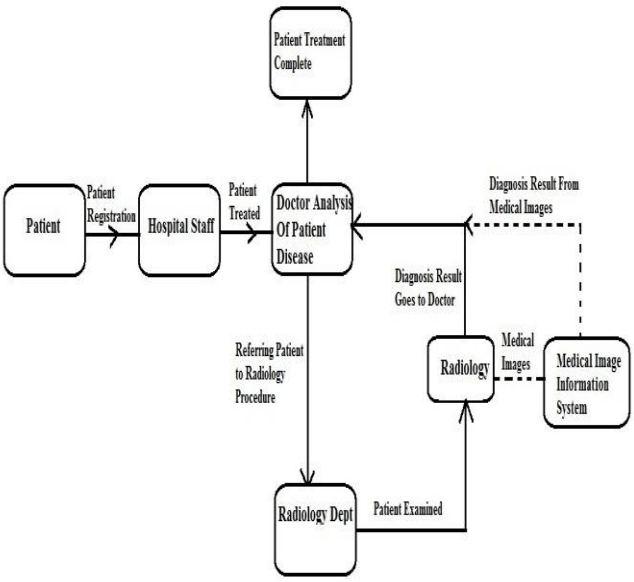


Fig.1.Typical Hospital System

Fig.1. shows the current system in hospital. In this system, patient takes admission into hospital. Doctor examines the patient and refers to radiology department if necessary [6]. If the patient needs to take second opinion and want to take valuable suggestions of doctors who are settled around the globe is quite difficult task or we can say it's quite impossible as disease needs to be cured as early as possible.

This drawback of original system is tried to cover in our system. In fig.2., a system is shown in which various doctors around the globe can interact and exchange opinion on a particular scenario of patient using internet. Because of this patient can get best possible treatment thus limiting the failure ratio.

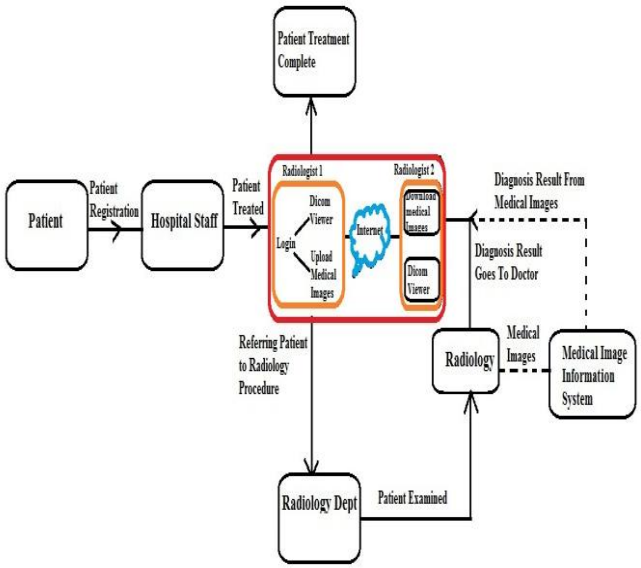


Fig.2.Modified Hospital System

Besides this system is divided into various modules:-

i.Patient Viewer.

ii.Medical Image Viewer.

iii.Medical Image Report.

Patient Viewer is a part of system that provides tool to search for particular patient information and related images (usually for study of patient) stored in a database.

Medical Image Viewer is a part of a system that views the medical image stored in .dcm format (DICOM format).Medical images provides photography of inner side of the body such as broken bones, cancer, tumours, etc.

The most famous type of medical images is an X-ray image that uses radiation to take stationary image of specific area of body [1].DICOM is a standard for handling, storing, printing and transmitting information in medical imaging.

In order to maintain more details such as ID, DOB, date, name, etc., size of file increases, because of this transferring the file takes a lot of time. To avoid this, efficient compression technique is required.

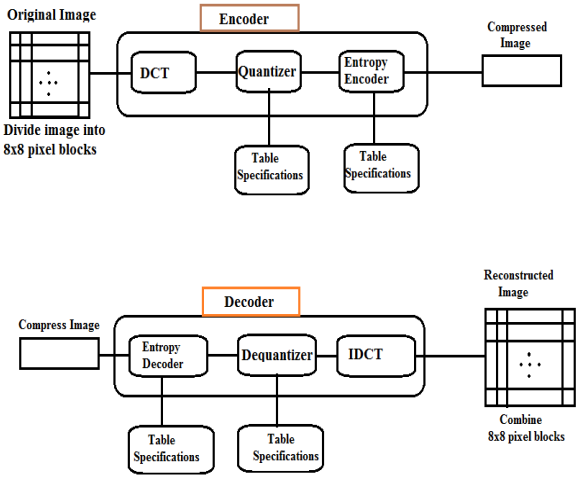


Fig.3.Encoding and Decoding of Medical Image

Above fig.3 shows the steps which are carried out for image compression. DCT (Discrete Cosine Transformation) helps to separate an image into higher frequency part and lower frequency part [2]. It is mainly used for changing the signals into elementary frequency component. The general equation for DCT is

$$f(u) = (2/N)^{1/2} + \sum_{0}^{N-1}\left(A(i).\cos\left[\frac{\pi u}{2.N}(2i+1)\right]f(i)\right) \text{ where } A(i)=\begin{cases} 1/1.415 \text{ if } i=0 \\ 1 \text{ Otherwise} \end{cases}$$

Size of the file i.e. medical image is reduced by using quantizer with proper image quality is maintained. Entropy encoder is a loseless data compression scheme that is independent of the specific characteristics of the medium. Encoder assigns a unique prefix-free code to each unique symbol that occurs in the input. This whole process is encoding process with a purpose to reduce file size which makes it easy to send a file from one place to another. In decoding process, the reverse process is carried out.

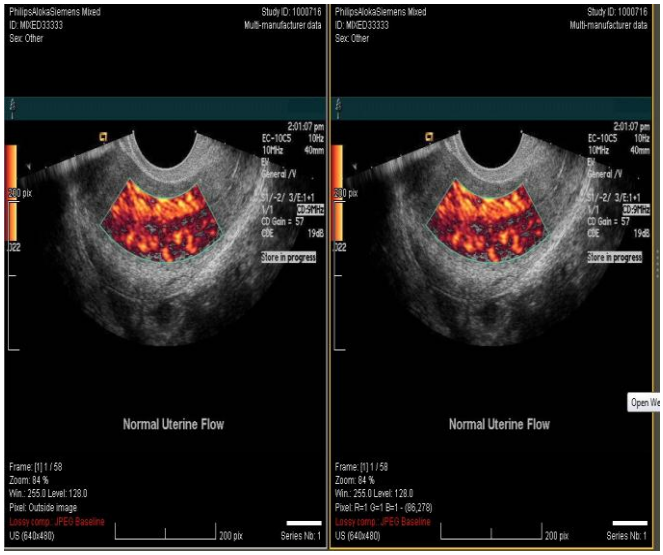
Report is a part of system which uses specific module tool to report of complete image making Doctors quick study of patient body. Report generated is directly inserted into a document where the actual diagnosis of patient is described.

This provides effective mean for any other doctor to open the report of patient, thus ensuring that best possible treatment is given to patient.

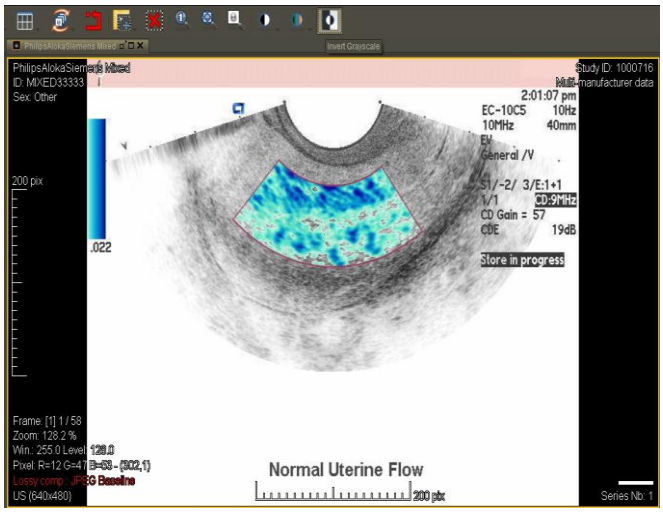
III. Results and Discussion

DICOM Viewer performs various operations on Medical images. Initially, image is captured through image capturing device, and imaging data is collected through video signals. The functions are shown in fig.4.

(a)



(b)



(c)

Figure 4. The Facilities in system such as (a) Length of any Object (b) Multi-view of DICOM object (c) Invert DICOM Image.

System detects the particle and determines its size as shown in fig.4(a).Particular area of the image can be highlighted and different colors can be applied so as to carry out efficient analysis as shown on fig.4(b).in fig.4(c),shades of the image has been changed.

IV. Conclusion and Future work

In this paper we have proposed a model which was initially goaled to provide an efficient medical treatment to patient by using Information Technology. System designed can be separated into three main parts. Firstly, to view the medical image in DICOM format , Secondly , to perform various operation on image like to view the images into various frames , Finding the length , Angle , Rotation of object and lastly to send this image over web so that doctors around the globe can put up their opinion on this. Junior Doctors can use this system to medical images with explanation.

Future research direction might consider obtaining some kind of expert database form Doctors about a particular part of body of a healthy person and to compare it with patient's o as to get exact location of treatment and reduce the doctor's work so that he can focus on much necessary part i.e. to get the possible method for treatment.

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