1.1 MOTIVATION

Research in diagnostic imaging and image processing has been gaining in prominence medical practice. Engineers are developing technologies and tools, that enable the medical practitioners to provide effective treatment. The Medical Imaging is also undergoing a profound transition from interpretation of images placed on film to reading images on high-resolution Visual Display Units. As this new trend is starting to emerge, radiologists have also started to follow electronic transfer of digital files and archives of computer files in magnetic disks, Compact Discs and Digital Versatile Discs which have replaced traditional film delivery and film storage rooms.

The Medical, Diagnostic and Surgical teams depend on a computer system that makes diagnostic images available for radiologic interpretation. This computer system transmits images to physicians whenever required and efficiently stores images for future medical or legal purposes. Computerized medical imaging generates large and data-rich electronic files. To speed up the electronic transfer and minimize computer storage space, medical images often undergo compression into smaller digital files.

The images in general and medical images in particular, contain different regions holding information of different significances. From the elaborate medical information, the doctor prefers to focus on certain selected regions of interest. So for medical purposes the diagnostically important regions of the images must be preserved at
high quality, while the rest of the image is required only in a contextual sense.

1.2 OBJECTIVE

The objective of the study is to develop a simple and efficient technique to compress the images suitably for medical use. The technique should cover both loss-less and lossy versions. The compression rate achieved by the technique is comparable with the techniques already in vogue such as JPEG. However, the technique should be simpler and more memory-efficient. It should also have the loss control facility.

The physician must be allowed to choose the diagnostically significant region either rectangular or arbitrary in shape; to apply the lossy versions to an insignificant region and loss-less version to the selected region, so that the features needed for medical diagnosis or for scientific measurement are accurately preserved, even while achieving an overall high compression in spite of allowing degradation of data in the unimportant regions.

1.3 THESIS STATEMENT

In this thesis we have proposed two simple and powerful techniques for image compression, namely:

1) Lossless Block-Based Binary Plane Technique

2) Lossy Block-Based Binary Plane Technique

Both these techniques divide the image into blocks of 3X3 size before the main process starts. At the edges if the block is not of 3X3
size, dummy rows and columns are added to make the block suitable for processing. These technique are applied individually to compress the image. The Lossless Block Based Binary Plane Technique is to reconstruct the image without any loss and to achieve a moderate compression rate. The Lossy Block Based Binary Plane Technique compresses the image with high compression rate. The loss in this technique can be controlled so as to have a compromise between the compression rate and the quality in the reconstructed images.

To achieve loss-controllable region-specific compression, both these techniques are applied on the same image based on the region of interest as identified by the Physician.

1.4 ORGANISATION OF THESIS

This thesis consists of six chapters. While the initial chapter is introductory in nature containing the thesis statement and the objectives of the studies, the second chapter deals with the literature survey of the studies on image compression. Now-a-days transmission of huge digital data has become a problem since the bandwidth is limited. Hence the study of the compression techniques is the need of the hour so as to avoid the bandwidth problem without loss of any information or data.

In Chapter three, the Lossy and Lossless Block-Based Binary Plane Techniques are explained at length with the help of relevant
flowcharts. These techniques are applied on gray scale as well as color images.

In the next chapter, the loss controllable region-specific compression is explained. The application of Lossy Block-Based Binary Plane Technique and Lossless Binary Plane Technique to control the loss in different parts of the image is explained.

The penultimate chapter deals with the results of Lossy and Lossless Block-Based Binary Plane Techniques individually and together in region-specific compression. The results are presented as tables and graphs. The appropriate metrics are also calculated.

The final chapter sums up the details of the research work carried out. The limitations of the present study have also been mentioned along with a recommendation of enhancements for future applications.