CHAPTER V

EXPERIMENT RESULTS AND DISCUSSION

The results discussed here were based on the object shape model of the heart stored in Microsoft Access database for easy retrieval.

5.1 Region of Interest

The region of interest (ROI) chosen for this study was the shape of the heart taken using magnetic resonance scanner in coronal image plane. The chosen object for modeling in the region of interest in the MR image is very general. The lack of detailed MR heart images deterred in modeling the heart structure.

The shape of the brain structure inside the skull taken in coronal plane was chosen as the object to be modeled for this study. The 5 brain images obtained were still not enough to create an accurate model. These images and the ASM model are shown in Appendix A. In the real world the number of MR images available to the medical personnel should be enough to create sufficient number of models.

5.2 Discussion on ASM Model Search

The ASM model was used to search the region of interest in the stored images. The MR images of patients were used to create the ASM model.

Figure 5.1 shows an MR object model of the heart that fits the scanned MR image. Figure 5.2 shows the sample of heart MR image that cannot fit into the model.

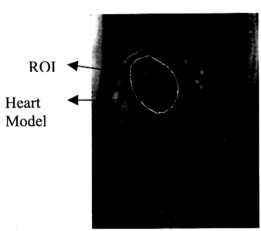

FIGURE 5.1 HEART MODEL THAT FITS THE ROI

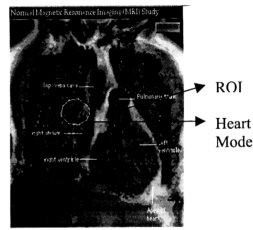

FIGURE 5.2 HEART MODEL THAT DOESN'T FIT THE ROI

5.3 Discussion on Storing MR Images and Models

MRI_DB.mdb developed using Microsoft Access database does not support the storage of images or models directly into the database. Therefore, for this study, the location of the heart model was linked to the database as shown in Appendix C. At least ten MR images were used to create the model. The model can be stored in the database once and could be referred to many times.

It is a known fact that the images need more disk space than text. Storing a model requires less space compared to storing all related images. Creating pointers in database to link the models in flat files, avoids overloading the database. Using models to search for matching images made the search process more efficient. However, retrieving models and images from separate files was inconvenient and time consuming.

5.3 Discussion on Retrieval of MR Images and Models

Active Shape Model of the heart object, the subsequent image locations and the patient information can be retrieved from the MRI_DB.mdb. To avoid retrieval problems, the locations of models must be properly recorded. This process is quite easy for the moment as the flat files consist of only 27 heart images belonging to one person and 5 brain images belonging to 5 persons. The database only keeps track of the heart and brain images location, that contributes to only 6 records in the database. The number of models created for two sets of images in this study is only two.

In real life, medical images of thousands of patients may be stored in the database contributing to thousands of database records, which will make the retrieval process slow if images were searched directly. In addition, each patient's images may be stored in different locations further slowing

down the retrieval process. However, using matching models to search for the patient records can increase the efficiency of the search algorithm.

5.4 Integrating ASM and Database search

Creating an interface to link the ASM toolkit software and the Microsoft Access database using Matlab programming is the best way to store and retrieve the matching images. However, to link these two programs together requires in depth knowledge of Matlab programming. The Matlab coding provided in the ASM tutorial does not function properly because of errors related to file extensions.

In addition, the ASM toolkit closed frequently due to some errors that caused a little bit of frustration in developing the interface. Even though the ASM search program was not integrated with Microsoft Access database, the patient information for a given MR model can still be retrieved through the ASM search function from the database.

The prototype of the image search database program and the Matlab program coding to develop the interface is shown in Appendix E. The prototype was designed to load a patient's image on the right to be searched for fitting region of interest. The loaded image can be replaced with a new MR image if there was no matching model for that image. The

grid can be turned on to see the region of interest clearly. The image can be zoomed to enlarge region of interest area for clear view. The model used for search should be loaded on the left side of the interface. The static or multi-resolution search option can be selected from the interface. *Search Now* button will search the loaded image for the matching region of interest. The matching image can be saved for later retrieval.

The matching model for a given patient's MR image should be recorded in the database. This information should then be used for diagnosis and treatment of that patient. The limitation of the created prototype was that it does not link with the database for updating the image and model information.

5.5 Chapter Summary

The MR images available for this study were the heart images taken at coronal image plane. The heart was chosen as the object in the ROI, which was used for modeling, storing and retrieving process using ASM and Microsoft Access Database. Direct storage of MR images and models were not supported by the sample database created. Pointers were created in the database to link to the images in the flat files. To avoid retrieval problems, the locations of images must be properly referenced. ASM search and database retrieval would be efficient if the programs are integrated using a common interface. The ASM program is

not stable and to modify the workings of the program and linking a database through an interface requires in depth knowledge of Matlab programming.