Standardizing DICOM File and Rendering 3-D Medical Image

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This paper provides one new approach about standardizing the DICOM files in order to communicate the nonstandard files between the different devices in the PACS system. It is well known that 3D image can offer more information than 2-D. So at last, we discuss about transforming serial images to three-dimensional image.

INTRODUCTION

While the digital imaging revolution in radiology occurs, a standard comes out with the Digital Imaging and Communications Standards in Medicine Committee. It is named as DICOM. Currently, there are many digital medical images coded by this standard. They work very well in communication and archiving. However, DICOM also allow private attributes to appear in DICOM files. Furthermore, new version displaces old one. But the retired attributes still are remained in some DICOM files. In addition, some files have not head part. For these reasons, there exist yet many DICOM files with private or retired attributes, or they are incomplete. It arose some confusion during files communicating.

Referring this problem, we develop a new method to standardize the DICOM files according to standard. At the end of this paper, we will discuss about how to display 3D image by using the approach of standardization.

METHOD

Standardizing

DICOM standard has developed for a few years (1). In this latest version, the data structure of the DICOM file is defined that a header part and the following image data consist one DICOM file. The header part is very important. It records some attributes of the image. It should be coded according to standard for the communication.

The standard DICOM file should have a fixed 128 bytes empty. Four bytes containing the character string "DICM" are followed. Then the sets of attributes are followed. There are four fields in every set: Tag, Value Representation (VR), Value length, Value field.

Data Dictionary: One part of DICOM standard (2). It defines all data sets appear in DICOM file possibly. It offers a short description of the tag, the VR of the tag, multiplicity of the tag, and whether the tag is retired.

According to the DICOM data set structure and data dictionary, our application can check and repair every DICOM file's data if it is lack of important attributes or has some retired or private attributes. After this processing, the DICOM file can be interpreted by near all devices in the medical system.

Rendering 3D Image

During reading procedure, we get the image data in the DICOM file. However, it is only the 2-D medical information. It is obviously that 3-D object can offer more information than 2-D, so it is much helpful for diagnosis of physician. In our application, we order the images and overlap the images assuming that every image's thickness is one pixel and they have the same distance. We use the thickness as the third dimension. Using the display technology, the application can rotate, zoom and look through the 3D image. The procedure is showed in figure 1.
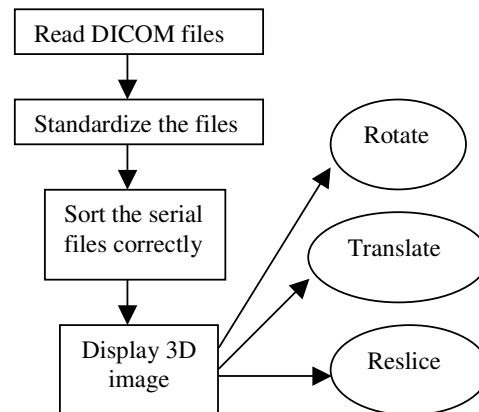

Figure 1. Procedures of displaying 3D Image

CONCLUTIONS

For the special features mentioned above, our application can interact with equipment of different retailers and display a 3-D image in order to assist the physician's diagnosis.

References

1. DICOM Basics. Otech Inc. Cap Gemini Ernst & Young, 2000
2. NEMA, 2000, Digital Imaging and Communications in Medicine, Part 1-15. NEMA Standards Publication PS3.X