Chapter 7
Medical Data Storage and Compression

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ABSTRACT

This chapter introduces medical imaging devices and its history. Further, the chapter discusses the history of the DICOM image and DICOM standard. The chapter also discusses image acquisition. Moreover, the chapter discusses the various software used for processing DICOM image. The chapter also discusses the limitations of DICOM and other medical image data formats. The basic structure of the DICOM is described in this chapter. Further, various research articles on medical image processing are discussed.

INTRODUCTION

The diagnosis of a disease plays vital role in the medical field. The digital medical imaging devices, such as X-Ray, Computer Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound, Angiography, Mammography, Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), Endoscopy, Optical Coherence Tomography, etc. are used nowadays by the physicians for diagnosing myriad diseases. Numerous researchers have been developing various algorithms and models for diagnosing diseases and status or stages of the diseases. Early diagnosis of the diseases and stages of the diseases helps early recovery and avoid casualties. These digital medical imaging devices are assisting the physicians for early diagnosis of the disease and its stage for further treatment.

In the 1970s, digital diagnostic imaging devices produces a different digital image formats. Thus, the American College of Radiology (ACR) and the National Electrical Manufactures Association (NEMA) initiated to develop a common standard for digital medical images. In 1983 they introduced a standard to communicate standard digital medical image information, develop picture archiving and communication systems (PACS) that can be interfaced with other medical and hospital systems, creation of diagnostic information databases can be shared with rest of the world for interrogations. The ACR-NEMA started with their first standard publication No. 300-1985 version 1.0, second one No.300-1988 version 2.0 and several updates made in the standards. The copyright of the DICOM standard is hold by the National Electrical Manufacturers Association (NEMA). The DICOM standards Committee partly consists of NEMA members, developed the DICOM standard.

The Digital Imaging and Communications in Medicine (DICOM) is a popularising standard for producing, displaying, storing, processing, sending, retrieving, querying, and printing information in digital medical imaging (DICOM, 2018). The DICOM standard defined a file format and a network communications protocol for data transmission. The TCP/IP is used by the communication protocol for transmitting information from one system to another system. The DICOM capable systems can send and receive DICOM files having image and patient data together in a standard DICOM format.

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The patented DICOM standard is built in medical imaging devices such as scanners, servers, workstations, printers, and network hardware from leading medical diagnostic device manufacturers such as Canon Healthcare Solutions, FUJIFILM Medical Systems U.S.A. Inc., GE Healthcare, Hitachi Healthcare Americas, Konica Minolta Medical Imaging USA Inc., Philips, Samsung Medical Devices, Siemens Healthineers, Swissray International Inc., Toshiba America Medical Systems, etc. The various devices support DICOM format clearly states the DICOM classes they support.

The DICOM standard is implemented in variety of devices as few are mentioned below (Wikipedia, 2018).

- PACS (picture archiving and communication systems)
- Image viewers and display stations
- CAD (computer-aided detection/diagnosis systems)
- 3D visualization systems
- Clinical analysis applications
- Image printers

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