Chapter XIII

3G Mobile Medical Image Viewing

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Abstract

Tele-radiology is the technology of remote medical consultation using X-ray, computed tomographic, or magnetic resonance images. It was commonly accepted by clinicians for its effectiveness in making diagnoses for patients in critical situations. Because of the huge size of data volume involved in tele-radiology (American College of Radiology [ACR], 2003), clinicians are not satisfied with the relatively slow data-transfer rate. It limits the technology to fixed-line communication between the doctor's home and his or her office. In this project, a mobile high-speed wireless medical image viewing system using a 3G (third-generation) wireless network (Collins & Smith, 2001), virtual private network, and one-time two-factor authentication (OTTFA) technologies is presented. Using this system, tele-radiology can be achieved by using a 3G PDA (personal digital assistant) phone to query, retrieve, and review the patient's record at anytime and anywhere in a secure environment. Using this technology, the patient-data availability can be improved significantly, which is crucial to timely diagnoses of patients in critical situations.

Introduction

Tele-radiology is the technology of remote medical consultation using X-ray, computed tomographic (CT), or magnetic resonance (MR) images. This technique is commonly accepted by clinicians for its effectiveness in making diagnoses for patients in critical situations. For effective implementation of tele-radiology, many technical problems including data integrity, accessibility, size of data volume, compression method, and bandwidth of linkage should be considered. Hitherto, due to the huge size of data volume involved, clinicians are not satisfied with the slow data-transfer rate. It limits the use of the technology to fixed-line communication between a doctor's office and his or her home. In this project, a mobile high-speed wireless medical image viewing system using third-generation (3G) mobile technology, a virtual private network (VPN), common gateway interfacing (CGI), dynamic JPEG (Joint Photographic Experts Group) compression, the Web, the structural query language (SQL; DuBois, 2002), digital imaging and communication in medicine (DICOM; National Electrical Manufacturers Association [NEMA], 2004), and one-time two-factor authentication (OTTFA) technologies were developed. Using this system, tele-radiology has been enhanced to a large extent; image-data query and retrieval can be transferred from a hospital data centre to any notebook personal computer (PC), or to any 3G personal digital assistant (PDA) phone at anytime and anywhere in a secure environment. Hence, the patient-data availability can be improved significantly, which is quite important for patients in critical situations.

Background

Tele-radiology involves the process of sending radiographic images from one point to another through digital standard telephone lines, wide area networks (WANs), or over a local area network (LAN). The radiographic images can be acquired either by a video-capture board such as a frame grabber or the console of a medical imaging modality. After acquisition, the images were digitally stored in a tele-radiology workstation in which the images were ready to be sent to a remote site over a network such as an Ethernet.

In the field of medical imaging, most of the images were stored in DICOM formation. DICOM is a standard that is a framework for medical imaging communication. It was developed by the American College of Radiology (ACR) and the National Electrical Manufacturers Association (Bidgood & Horii, 1992) with input from various vendors, academia, and industry groups. It is referred to as Version 3.0 because it replaces Versions 1.0 and 2.0 of the standard previously issued by ACR

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