

Development of a Kidney TeleUltrasound Consultation System

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The TeleUltrasound system was developed in

response to the absence of a digital system which enables the sharing of ultrasound images and data among radiologists, doctors, clinics, laboratories, and other medical officers who require this sort of data remotely, at any location in the country or the world.

In one form or another, telemedicine has undeniably been practiced since the past 30 years¹. In short, telemedicine may involve as simple as two health professionals discussing a case over the telephone, or as sophisticated as using the satellite technology to broadcast a consultation between providers at facilities in two countries, using video conferencing equipment².

Telemedicine has the potential to make a difference in the lives of many people³. In particular, in remote rural areas where a patient and the closest health professional can be found hundreds of miles apart⁴, telemedicine importance lies in the improvement of the medical service and in the availability of quality medicines⁵.

In emergency cases, TeleUltrasound access can mean a big difference, i.e., between life and death. In the cases where fast medical response time and specialty care are needed, the availability of this telemedicine can be very critical⁶. For example, a specialist at the North Carolina University Hospital

was able to diagnose a rural patient's hairline spinal fracture at a distance, using telemedicine video imaging. The patient's life could be saved because the treatment was done on-site without having to physically transport the patient to the specialist who was located a great distance away⁷.

In general, the TeleUltrasound system used in this project provides a Web interface with a remotely accessed .Net Solution Imaging and Diagnostic, distributed application over the Internet for accessing and viewing information, while a Structured Query Language (SQL) database is deployed for data storage management. The .Net Solution technology enables web-based distributed interface which is server- and platform-independent across a network, without requiring preinstallation and tedious networking configuration.

METHODOLOGY

The approach is generally designed using the “bottom-up” methodology. Each simplified function is first created and tested for its functionality. Integrated functions which carry out a single process are combined in a single .Net Solution file. The imaging application is designed in vb.Net language which is a Microsoft framework. The development of the complete system took approximately 6 months to reach the desired result. There are several advantages of using .Net solutions, such as the .NET Class Library provides availability to all .NET languages resulting in a consistent object model, regardless of the programming language the developer uses. Besides that, ASP.NET and the .NET Framework simplify development by separating the application logic and presentation logic which makes it easier to maintain the code. Later, the .NET Framework makes it easy to deploy applications. The application

can run at any platform using a web browser.

In this study, a large number of remote clients, offices, and home users may not have high-speed broadband connections. Especially for those located in rural areas, they may only have dial-up connections. However, joint photographic experts group (JPEG) images are used within this system. In addition to providing a smaller file size for the image, JPEG images are Internet friendly. This allows the images to be viewed from any browser or application without additional codes. DICOM format is also supported within the system; although it has JPEG lossless in it.

An open source image processing tools has been incorporated into the imaging and diagnostic application to perform basic functions respectively as follows:

1. The system provides image processing functions directly online to add the final diagnosis and submit it in a report.
2. The system is able to sort patient/physicians into groups depending on their field and status. And also search for a specific patient or group of patients. This sorting function has a great benefit in saving time and effort as well to keep track of the patient information and diagnosis.

A. System design

The system is designed using .Net solution programming technique through the following major classes _ Image Resources.Net Solution This class builds up a resource panel for images in the database, which is connected using SQL server, the class will act as a simplified user interface to allow the user to easily query an image

available in the database, and as well allow the user to retrieve certain images and patient information.

_ Patient Information.Net Solution

This class creates interactions with Patient Information, where the user can enter the patient.

Full text is available at :

<http://www.ncbi.nlm.nih.gov/pubmed/20386951>

<http://link.springer.com/article/10.1007/s10278-010-9283-8>