ON THE MOVE ULTRASOUND DIAGNOSIS USING PDA

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The situation of health care in Pakistan is below the international standards due to scarcity and unavailability of specialists. Moreover the patients do not have access to proper specialists because they live in remote areas and cannot afford the high ailment expenditures. The use of Information and communication technology in providing health care to the remote areas is getting popular in developing countries like Pakistan. One such system is deployed in Holy Family hospital Rawalpindi. This system has its sites in remote areas. Patients come to these sites and their data is automatically transferred to a server in the hospital. Doctors analyze the patient data along with live video of the patient and suggest a treatment for him/her. To use the doctors time in most optimum way, we proposed and developed a solution to view the ultrasonic images on the (Personal Digital Assistant, handheld mobile/computer) PDA screen. Doctors don’t need to be present in the lab where the system is deployed. They can view the ultrasonic images of the patients on their PDAs. Based upon their observation they can diagnose problems and suggest treatments.

OBJECTIVES:

- Accurately capture the ultrasonic image.
- Process the image to point out any abnormality in the image to assist the doctor in diagnosis.
- To view the image on the PDA screen with zooming functionality without affecting the quality of the image.
- To transmit the images to PDA without any unwanted delays.
- To enable the radiologist to measure size of different nodules in the image, using stylus.

METHODS:

We have developed an application for analyzing ultrasound images on mobile phones using J2me\CLDC1.1\MIDP2.0 platform, which can be installed on any phone with JAVA support. Although this API does not provide rich functionality for image processing, but we have implemented the general algorithms for image zooming. Initially we tried it through simple pixel replication i.e. we add 3 similar pixels for each existing pixel. But the image quality was deteriorated and the results were not acceptable to the radiologists. Later we implemented image interpolation and the quality of the magnified image improved significantly. The comparison of original ultrasound image with the image on PDA can be seen in Figure1. We take the images from hospital server to our database through internet. We use standard TCP/IP protocol to transmit the image from the database to the Doctors PDA over the GPRS. Images get noisy if there is some loss of data during electronic transmission, but we cannot afford these losses for such kind of important data. While ensuring loss-less transmission our system gets slow but in the future we intend to compress the image before transmission and decompress after receiving for better speeds.

RESULTS:

We collected data of 92 patients from the hospitals. Each patient record contains 9 ultrasound images required for comprehensive antenatal examination. We handed over the application to the
radiologists with functionality to view these images on the PDA and to compare the diagnosis with the existing system. The doctor’s feedback for diagnosis using our application is shown in Table1.

**Table 1 Doctors feedback**

<table>
<thead>
<tr>
<th>Name</th>
<th>Hospital</th>
<th>Findings</th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor1</td>
<td>Rawalpindi General Hospital (RGH)</td>
<td>Image is dark, Transmission is bit slow</td>
<td>Increase brightness. Decrease unwanted delays.</td>
</tr>
<tr>
<td>Doctor2</td>
<td>Holy family</td>
<td>Image is dark, quality is acceptable</td>
<td>Increase brightness</td>
</tr>
<tr>
<td>Doctor3</td>
<td>RGH</td>
<td>Image is dark, quality is acceptable</td>
<td>Increase brightness</td>
</tr>
<tr>
<td>Doctor4</td>
<td>Pakistan Institute of Medical Sciences (PIMS)</td>
<td>Image is dark, quality acceptable, some details are missing.</td>
<td>Increase brightness and contrast to clear the fine details on the image.</td>
</tr>
</tbody>
</table>

**CONCLUSION:**

We have developed an on-the-move ultrasound image diagnoses system for PDAs intended for the use by doctors. The results and feedback of medical experts show that mobile healthcare can be a powerful tool in diagnosing ultrasound images. In future we will improve the image quality and transmission speed of the system, along with providing the facility to measure size and shape of different objects in the image. With this problem fixed our system could play a role in saving the time of radiologists and increase their efficiency.