1) ABSTRACT

The Telemedicine system comprises of both hardware and software components at both the patient and doctor ends. A leading field for application of telemedicine is in the field of cardiology where ECG is the major tool for diagnosis. The proposed project provides an image based techniques to acquire and analyze a constant streaming of ECG signal through digital camera for image capturing. As well as data sending system based on internet network. The method captures the vital signs and parameters from the ICU monitoring machine using a webcam and transmits the image through the internet. This original image is then availed to the consulting doctor via an ANDROID cell phone. The paper proposes a method to capture, and sends the particular patient information to the specific doctor. If in case of anomaly detected in the doctor's phone, the doctor takes a respective action to recover the patient.

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2) INTRODUCTION

Tele-health and telemedicine are now becoming more engrained in the delivery of everyday health care, distance education and also health care administration. Lots of patients in underserved areas are receiving services that may not have otherwise received without travelling great distance or overcoming other transportation barriers. The services provided through telemedicine range from primary health care to the highly specialized care found in leading academic medical centre. Services are provided across the spectrum, from the youngest of patients to the fragile elderly. Tele-health systems have many applications in hospitals, clinics, nursing homes, rehabilitation hospitals, homes assisted living facilities, schools, prisons or health departments.

Tele-healthcare may be defined as the use of information technology to provide healthcare services at a distance. It includes anything like medical services at the inpatient or at the outpatient stage. What the doctors actually would like to see is constant monitoring of the vital parameters so they always know what the history is and how big the change from yesterday to today be and when you have these findings and have these data points available, then a much earlier intervention can happen for a patient. Telemedicine can be extremely advantageous for people living in isolated communities and remote regions. It is currently being applied in almost all medical domains. Patients who live in such areas can be seen by a doctor or specialist, who can provide a precise and complete examination, so that the patient need not travel the normal distances like those from conventional hospitals. New developments in mobile collaboration technology with the use of hand-held mobile devices allow healthcare professionals the ability to view, discuss and assess patient issues.

3) LITERATURE REVIEW

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4) SYSTEM ANALYSIS

4.1. EXISTING SYSTEM

The earlier system that existed introduced an ECG measurement, analysis and transmission system with a mobile phone as a base station. The system was based on a small-sized mobile ECG recording device which sends measurement data wirelessly to the mobile phone. In the mobile phone, the received data is analyzed and in cases of any abnormalities found among parts of the measurement data; it will be send to a server for the use of medical personnel simultaneously. However, because of the limits of electronics support and processing units within the mobile phone, the overall performance was hardly operated in an ideal condition. Delay in the data transmission might also disrupt the data analysis and measurement.

Another more recent method suggests direct measurement of ECG or blood pressure for the detection of arrhythmias. But these systems depend completely upon the proper operation of their sensors. So they cannot be used along with the existing cardiac sensors of the bedside monitors in ICU, also a variation in the placement of the sensors of blood flow might lead to false alarms or a critical condition being over looked.

Most of these systems uses a GSM module to generate an SMS to the doctor but does not convey the actual readings of the patient during the critical condition.

4.2. PROPOSED SYSTEM

To avoid the limitations of the earlier system, the proposed project in this paper implements the images based techniques and digitization ECG signal through digital camera for image capturing. As well as data sending system based on internet network. That is, a predefined amount of measurement data around this event is sent through the internet network.

The main aim of this project was to develop a system which captures the vital signs and parameters from the ICU monitoring machine using a webcam and make this data be available to the personal doctor who might not be present in the hospital or even in the country. The webcam will capture images from the screen of the bedside monitor at a rate of about one image every four seconds. These captured images streamed and will be constantly uploaded to the application server. ANDROID application is used to get these data on the mobile phone from the user’s server.

5) SYSTEM SPECIFICATION

5.1. SOFTWARE REQUIREMENTS:

- Operating system : Windows XP.
- Coding Language : Java 1.6
- Tool Kit : Android 2.2
- IDE : Eclipse
- Back End : MS SQL Server 2005
- Web Technology : Visual Studio..Net 2008

5.2. HARDWARE REQUIREMENTS:

- System : Pentium IV 2.4 GHz.
- Hard Disk : 80 GB.
- Monitor : 15 VGA Colour.
- Mouse : Logitech.
- Ram : 1GB.
- MOBILE : ANDROID

6) PROJECT DESCRIPTION

6.1. PROBLEM DEFINITION:

The Telemedicine system comprises of both hardware and software components at both the patient and doctor ends. A leading field for application of telemedicine is in the field of cardiology where ECG is the major tool for diagnosis. The proposed project in this paper provides an image based techniques to acquire and analyze a constant streaming of ECG signal through digital camera for image capturing. As well as data sending system based on internet network. The method captures the vital signs and parameters from the ICU monitoring machine using a webcam and transmits the image through the internet. This original image is then availed to the consulting doctor via an ANDROID cell phone. The paper proposes a method to capture, and sends the particular patient information to the specific doctor. If in case of anomaly detected in the doctor's phone, the doctor takes a respective action to recover the patient.

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ADVANTAGES

- Patient heal condition can be monitored remotely.
- The doctor can view the ECG Signal through their Android mobile phone.
- The ECG Signals are transmitted as an image. So the doctor can easily finds the abnormality of the patient.
- Less Time consuming and reduces manual work for transferring the information.

6.3. MODULES

- Patient details
- Patient Monitoring
- Web Service Interface
- Critical Event Monitoring in Mobile
- Report

6.3.1. Module:1:-PATIENT DETAILS

In this module, the patient details are stored by means of web site. Those information are patient id, name, mobile number, Date of Birth, Type of disease, emergency contacts. That information will be saved in the database of server.

6.3.2. Module:2-PATIENT MONITORING

The web cam placed in front of the ECG Machine. the Diagnostic Equipments and pathology microscope or camera provided at the patient end. Through a Telemedicine system consisting of simple computer with necessary communication systems, the medical images as well as other information of the patients can be sent to the consultant doctors, through the satellite link in the form of digital data packets.

6.3.3. Module:3-WEB SERVICE INTERFACE

The data from the web cam are collected and transmitted to the server. The digital signals are separately stored with the specific patient id in the web server. The web service interface works as an intermediate component to the web server and the mobile device. While the request receives from the doctor, the web service provides the digital signal image to the mobile application.

6.3.4. Module:4-CRITICAL EVENT MONITORING IN MOBILE

Cardiology is one of the areas in which telemedicine is showing major growth. Life threatening cardiovascular diseases, such as heart attacks, arrhythmias and strokes, are the important cause of death in the world. Prevention of cardiovascular diseases (CVD) requires early detection and diagnosis. The electrocardiogram (ECG) is the graphical representation of the electrical activity of the heart. This module provides the ECG signals to doctor's end by the request received from the doctor. The doctor can choose the patient id for receiving the ECG Signal from the web server through the web service interface. Depends on the data signals the doctor can take the necessary steps to recover the patient.

6.3.5. Module:5-REPORT

In this module, the web server provides the patients details such as the patient id, name, disease details as a report format. Also the digital signals received from the web cam and doctor details are the output.

DFD

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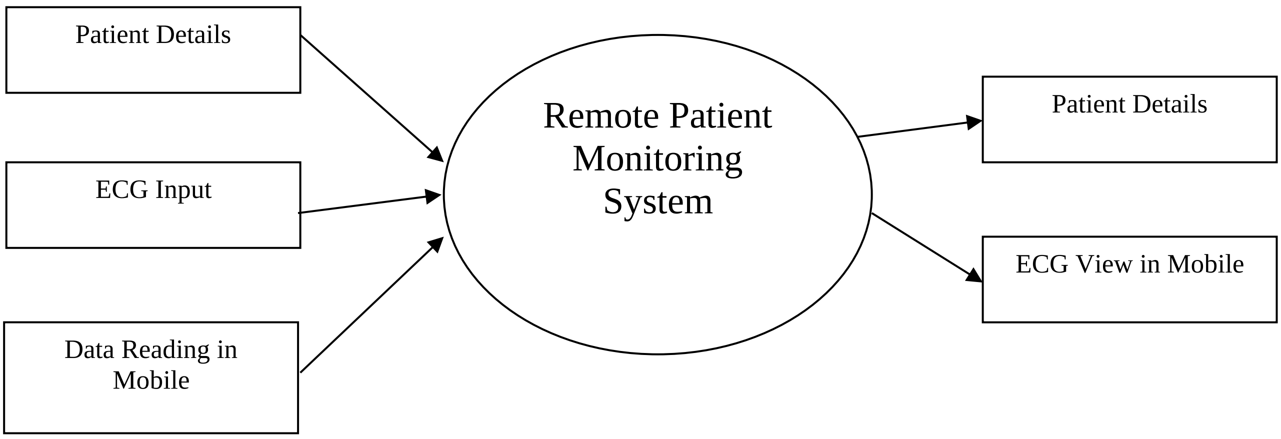

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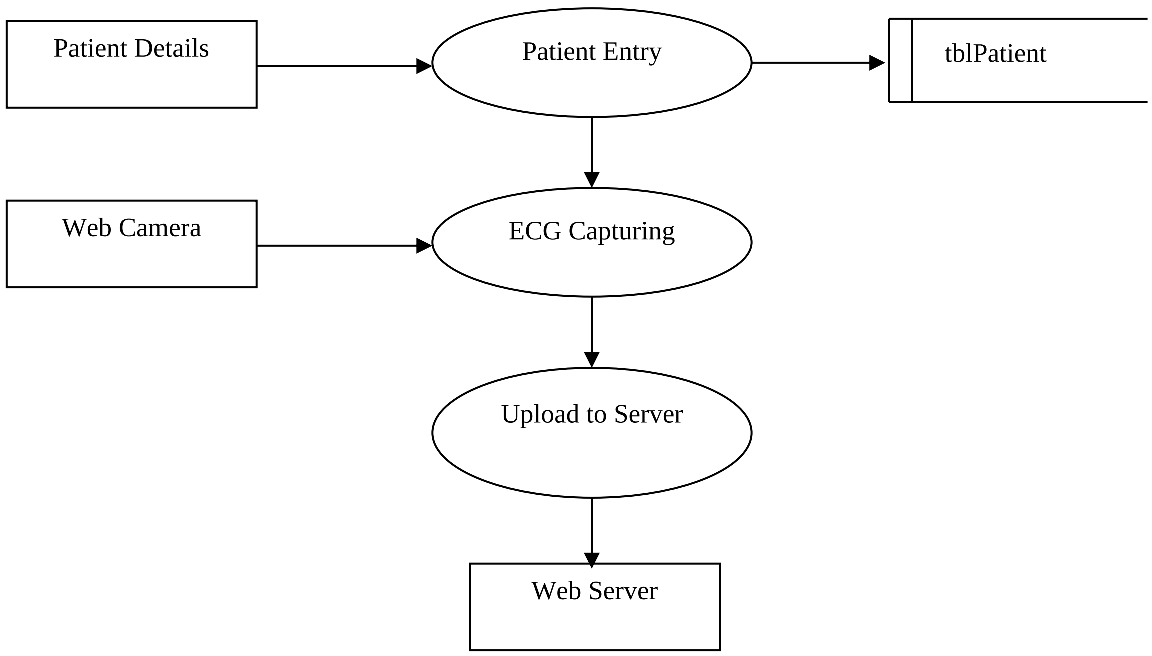
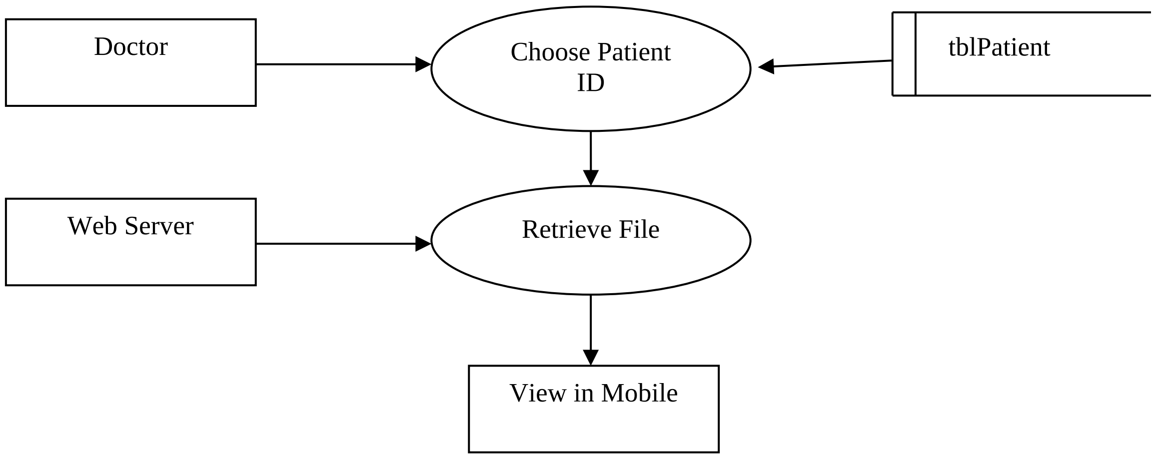


LEVEL 2



7) SYSTEM IMPLEMENTATION

INPUT DESIGN

Input design is the process of converting user-originated inputs to a computer-based format. Input design is one of the most expensive phases of the operation of computerized system and is often the major problem of a system.In the project, the input design is made in various web forms with various methods. For example, in the user creation form, the empty username and password is not allowed. The username if exists in the database, the input is considered to be invalid and is not accepted. Likewise, during the login process, the username is a must and must be available in the user list in the database. Then only login is allowed. The inputs are,

Patient Details

Doctor Details

Camera ECG Capture Details

OUTPUT DESIGN

Output design generally refers to the results and information that are generated by the system for many end-users; output is the main reason for developing the system and the basis on which they evaluate the usefulness of the application.

In the project, the patient details, the ECG captured details viewed in Android mobile.

FILE DESIGN

A file system provides the machinery to support the project tasks. At the highest level a file system is a way to organize, store, retrieve, and manage information on a permanent storage medium such as a disk. File systems manage permanent storage and form an integral part of all operating systems. There are many different approaches to the task of managing permanent storage. At one end of the spectrum are simple file systems that impose enough restrictions to inconvenience users and make using the file system difficult. In deciding what type of filing system is appropriate for a particular operating system, we must weigh the needs of the problem with the other constraints of the project. The two basic abstractions of files and directories form the basis of what a file system can operate on. There are many operations that a file system can perform on files and directories. All file systems must provide some basic level of support. Beyond the most basic file system primitives lay other features, extensions, and more sophisticated operations.

The Structure of a File is given the concept of a file, a file system may impose no structure on the file, or it may enforce a considerable amount of structure on the contents of the file. An unstructured, “raw” file, often referred to as a “stream of bytes,” literally has no structure. The file system simply records the size of the file and allows programs to read the bytes in any order or fashion that they desire. If a file system chooses to enforce a formal structure on files, it usually does so in the form of records. With the concept of records, a programmer specifies the size and format of the record, and then all I/O to that file must happen on record boundaries and be a multiple of the record length.

8) RESULTS AND DISCUSSION

8.1. EXPERIMENTAL RESULTS:

In order to compare with related approaches, we first evaluate the performance of the classifiers on data taken from subjects at rest (DS). The results are presented in Table 3 and are comparable to other existing approaches. KNN xKNN BN Precision 0.96 0.97 0.97 Recall 0.95 0.97 0.97 Table 3: Identification performance for the sitting session (DS). We randomly select 20 windows as the test dataset and the remaining data as the training dataset. Next we tested the performances of the different activity-aware and activity-unaware classifiers on the test dataset DX. Generally, the activity-aware classifiers outperformed the activity-unaware classifiers (as shown in Table 4) by being able to explain the intrasubject variability seen in the ECG signal. Among the activityaware classifiers, the KNN classifiers do not explicitly model the effects of different activity levels. Nonetheless, the simple inclusion of the additional accelerometer modality is clearly useful, as seen by the improvement in performance. We use k=1 (one neighbor) based on our results from cross-validation. The BN classifier makes better use of the accelerometer data by explicitly modeling the activities, which leads to slightly better performance numbers even with the manual activity annotations. Activity-Aware Activity-Unaware KNN xKNN BN KNN xKNN BN |h| = 2 |h| = 3 Precision 0.8243 0.8278 0.8488 0.8252 0.7855 0.7677 0.8139 Recall 0.8039 0.7925 0.8326 0.8174 0.8035 0.7987 0.8140 Table 4: Identification performance of the activity-aware classifiers against the activity-unaware classifiers. The activity-aware KNN classifiers use a concatenated feature vector of activity and ECG features. The activity-aware BN is provided supervised activity labels derived from manual annotations. An improvement is apparent even with just two activity levels. Manual annotations are inconvenient, unreliable, subjective and unsuitable for fine-grained activity clustering (beyond a small number of levels). We used activity labels derived from unsupervised activity clustering using Gaussian mixture models. Table 5 shows the performance of the Bayesian classifier based on unsupervised activity clustering. The case where |H|=1 corresponds to the activityunaware classifier. Window Identification Person Identification No. of Activity Levels True Positive Rate False Positive Rate Accuracy 1 81.39 5.65 14/17 2 77.59 5.63 15/17 3 78.67 5.65 15/17 4 79.34 5.57 15/17 5 78.03 5.52 15/17 Table 5: Identification performance for the Bayesian network classifier using unsupervised activity clustering for varying number of activity clusters. A test session consists of a sequence of ECG feature windows extracted from dataset DT. The window identification treats each feature vector as a separate test data point. The person identification decision combines results from all the windows and selects the person predicted by majority of the windows.

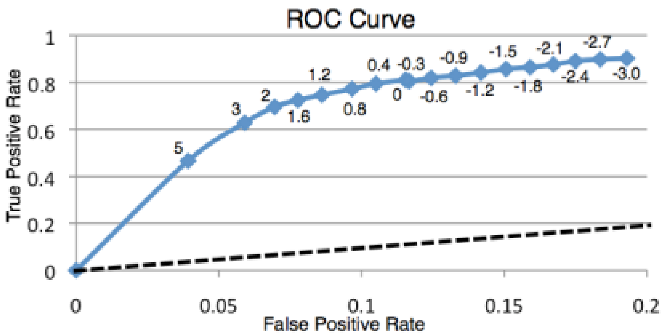


Figure 5: ROC curve for the verification model (8 imposters). The thresholds used are shown in the graph. We can see that with higher thresholds the system rejects too many legitimate users and with lower thresholds too many imposters are accepted. The dotted line shows y=x. Table 6 shows the performance of verification with varying number of imposters. Verification decisions are made according to Equation(5). We can view the false positive rate (FPR) as an indicator of the security of the system. As would be expected, FPR is reduced as more imposters were added to the pool. It should be noted that we evaluate the entire test dataset from all subjects against every combination of claimant and imposter to obtain the results shown in Table 6. When the number of imposters is large, the random sampling did not include sufficient samples from each activity and imposter combination. This resulted in an increase in false acceptances possibly due to an ill-constructed pooled dataset. With too few imposters the pooled dataset does not have enough information to begin with. Window Verification Person Verification No. of Imposters True Positive Rate False Positive Rate Accuracy 3 81.68 12.72 16/17 7 81.14 11.72 16/17 8 79.31 11.13 16/17 11 81.7 12.19 17/17 15 79.85 12.06 16/17.

9) CONCLUSION AND FUTURE ENHANCEMENTS

9.1. CONCLUSION:

The project Remote Patient Monitoring System is a telemedicine application which allows the doctor to view the patient's vital signs and parameters remotely and dynamically in real time. We propose a mobile phone based intelligent patient monitoring system with good extensibility. The image can be acquired, analyzed, transmitted and analyzed remotely in a quasi real time sense. The system allows the doctor's advice to be given to the patients even if he is not present near the patient. As a summary, the presented monitoring system will be a cost effective, flexible and robust solution supporting a unique mobile based computational platform. Also the details of the patient are not available to the doctor. Only the name and patient ID are made available along with the image.

9.2. FUTURE ENHANCEMENT:

The future scope for this project is that the notification will be send only to the doctor whom the patient consults. Here in this project we have done, the notification will be send to all the doctors who have registered in the server. That is, the alert send can be made specific. Also along with the patient name and ID. Also more patient details can be sent along with the patient name and ID.