Healthcare Services Using Android Devices

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---ABSTRACT--
Healthcare system using android OS with the help of medical expert system provides advantages to patients, enabling them to access medicinal information and support systems, irrespective of their current location and time. This paper describes a tool with which we can improve the quality of treatment for patients using mobile application. Our application, iCare, runs on several Android based devices with 3G and Wi-Fi capabilities. This application is cost effective for patients since the patient need not be present physically. This application framework provides support for terminal, application mobility and enables easier implementation. This application accepts the symptoms from the patients, processes the data, identifies the particular disease and hence provides appropriate medication using medical expert system by pattern matching techniques. The data collected from the device is evaluated using expert system which estimates the probability of severity of the disease. More the application is used by patient, the better will expert system in identify various patterns of diseases which increase the accuracy of iCare.

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I.   INTRODUCTION

Mobile healthcare applications receive more and more attention due to the ability to reshape healthcare delivery, for example, enabling self-management of patients while they pursue their daily activity .Mobile healthcare web services using Android can provide advantages to patients, enabling them to query their Symptoms and get the expert response from the Expert System in the form of identification of the disease and medications to cure the illness. Patients can access medical information and Expert system independent of their current place and time and content can be dynamically adjusted to the current context and terminal type. Mobile devices, home computers and embedded patient terminals can be utilized in healthcare services to provide delivery of information to patients at the point of need. In this way, patients can be equipped with powerful tools and support Systems that can help them in their everyday health management and patients can get more involved in decision making regarding their own health. Problems related to increasing healthcare costs and the higher demand for healthcare personnel and services can be addressed and reduced.

The proposed system, iCare, is designed to partially alleviate stress, financial burden, and workload on the doctor.

It is an application which runs on any Android version. Additionally, for healthcare applications and services usability, user-friendliness, and usefulness of the system are very important due to great spectrum of potential future users and variety of their needs and expectations from system's functionalities. Adaptation of interface elements and user interaction to different contexts of use (e.g., types of devices and their characteristics, OSs, and communication - network types) is primary requirement. The way in which mobility issues (e.g., session transfer, handoff between networks) are managed can also greatly influence usability of the system due to additional requirements for user interaction and adaptation of interface for a new context of use Application mobility as defined in enables a user to start interacting with the service using one device and transfers the session to another device automatically when a new communication channel is opened. While the session is transferred, an additional mechanism to warrant session consistency must be provided to protect storage and to avoid transfer of invalid session data. Application mobility must also be provided within an acceptable time frame. Due to the different network types that can be utilized, it is highly possible that communication can be interrupted unexpectedly and that a system must be able to save current session data and enable a user to continue a previously started session without information loss.

When the application is resumed on the same terminal over a different network or on a new terminal, a new authentication process must protect security. Because this may happen frequently, it is necessary that the renewed authentication is both user-friendly and secure. Expert systems are being increasingly used in medical environments such as hospitals, laboratories, and intensive care units, with a view to improving the quality of health care and reducing the likelihood of incorrect medical decisions. Transformation of these systems into mobile solutions would extend their benefits and facilitate their integration into medical environments.

New generations of mobile devices offer users new modes of interaction with medical expert systems.

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Our approach involves the use of a mobile client-server model employing web services in order to transfer the currently available web-based system onto an Android platform. The server is dedicated to provide an interpretive report of the obtained test results, whereas the client acts as a convenient user front-end. Communication between the client and the server is based on web services.

The patients have their user accounts on the patient support system (iCare) and can access the service from remote places or their homes, cars or offices using different types of networks (e.g. Wi-Fi, GPRS, 3G).

II.   METHODS AND DESIGN

A. Software
This application is designed on the Android software stack produced by Google. Android is an open source framework designed for mobile devices. It packages an operating system, middleware, and key programs. The Android SDK provides libraries needed to interface with the hardware at a high level and make/deploy Android applications. Application is written in Java and use SQL databases to store persistent data. We choose this platform as opposed to others because of the ability to easily thread background running processes, the polished Navigation API, and compatibility with other Android devices. Unlike dedicated systems this software is intended to integrate with the device's existing applications; iCare must share resources with other applications. To make for a pleasant integration, it runs as inconspicuously as possible while using limited resources. Only when the probability of wandering is high will the activity wake up and interrupt the patient. Based on the probability evaluation and patient's response the app can take different actions. Which allows iCare to run harmoniously on the system while minimizing memory consumption and providing ease of use to the patient.

B. Medical Expert System (MES) Design
An expert system is an artificial intelligence application that uses a Knowledge base of human expertise to aid in solving problems. The degree of problem solving is based on the quality of the data and rules obtained from the human expert. Expert systems are designed to perform at a human expert level. In practice, they will perform both well below and well above that of an individual expert. The expert system derives its answers by running the knowledge base through an inference engine, a software program that interacts with the user and processes the results from the rules and data in the knowledge base. Expert systems are used in applications such as medical diagnosis, equipment repair, investment analysis, financial, estate and insurance planning, route scheduling for delivery vehicles, contract bidding, counselling for self-service customers, production control education and training. Tasks such as: monitoring, design, control, simulation, learning support and information retrieval, among others can be done through the use of expert systems. As elaborated in the problem statement/formulation, patients with sicknesses such as minor headaches, minor stomach aches, and minor malaria need not be report to a major referral Hospital such as Ruby Hall Clinic in order to release some amount of work pressure on Medical Doctors. To solve this problem, this paper through mobile technology and cloud computing network technology proposes a Mobile Medical Expert System (MES) that has the knowledge base of diagnosis, advice and treatment of these minor sicknesses mentioned earlier. Patients would initially register as user through an interface and interact with the MES and the Medical Doctor through cloud computing, mobile technology and devices. The Medical Doctor will advise the patient through their mobile devices according to his/her interaction with the MES.

C. Symptoms Identification Mechanism

The proposed System Scenario involves the following steps:

1. Patients logs into the System with mobile device through cloud server, after registration through the Hospital Administrator.

Figure1: iCare Log in Interface

2. After logging in, the patient initially interacts with the Medical Expert System through by a Medical Diagnostics Interface on his/her mobile device.
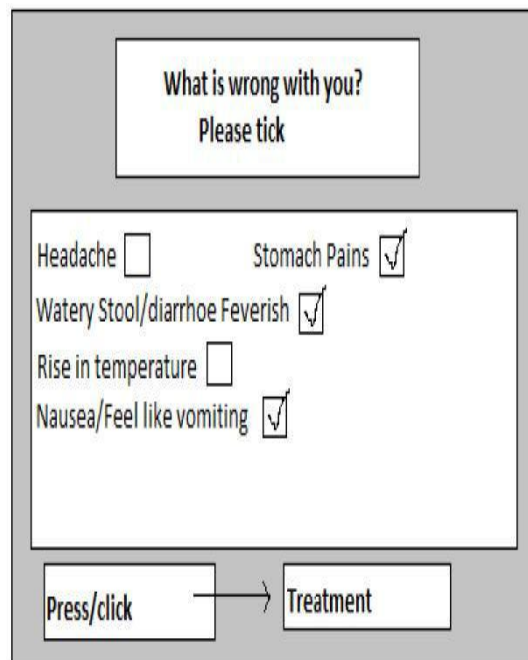
Figure 2: iCare Medical Diagnostic

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D. Prescription Mechanism:
Hence, client can easily access the database in the
1. After clicking of "Treatment", the next interface if remote places where network is not available.
the patient's iCare Prescription and Treatment advice.
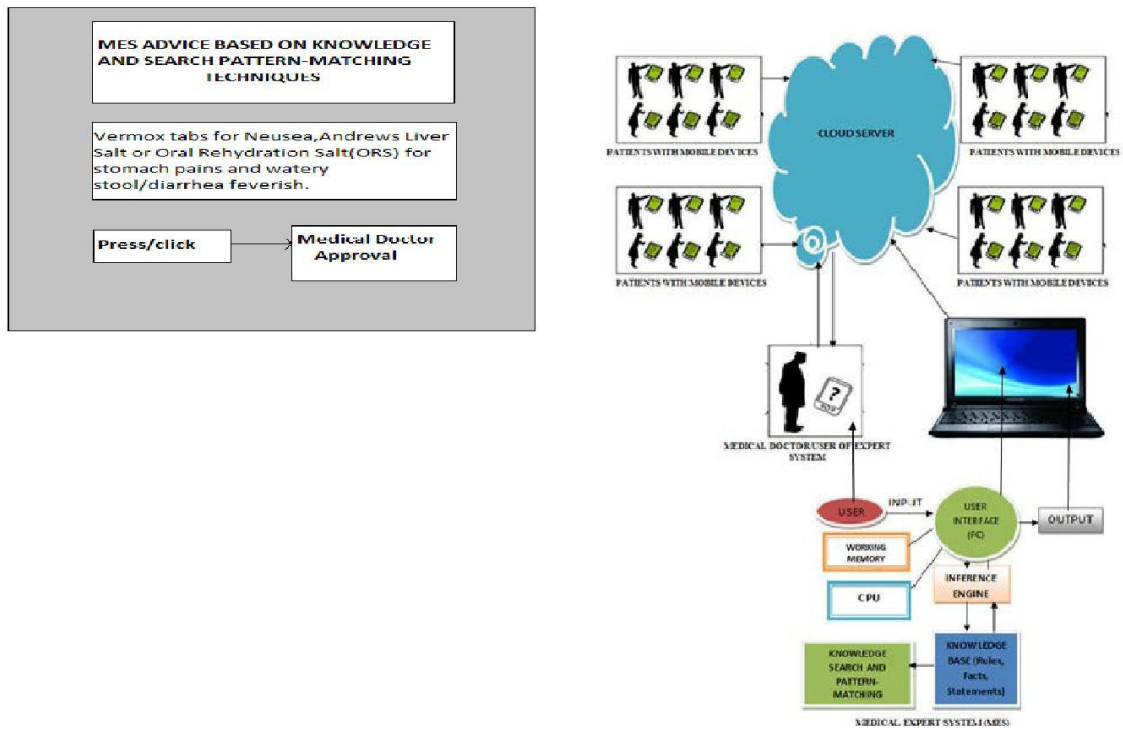
III.   FLOW DIAGRAM

Figure3: iCare Medical Treatment Advice

2. After click Medical Doctor Approval, a query of patient's diagnosis and MES (Medical Expert System) advice is sent to the Medical Doctor's mobile device for approval of MES advice or non-approval of MES advice for onward consultation of Medical Doctor physically.
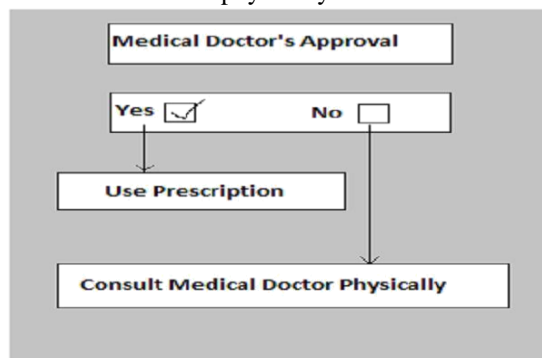

Figure 4: Medical Doctor Approval

E. Instant Messaging
Instant messages (IM) are short text messages exchanged between users that want to chat in real time. After a user signs on to IM from a mobile device, a list of Doctors (referred to as a Expert list) appears on the mobile subscriber's screen using familiar screen names. The mobile subscriber can send a message to the IM service requesting to see, with the help of special icons, who is online and available to chat. IM messages can be sent only to Doctors that are online.

F. Real-Time Database Download
This system database will be stored on cloud due to this memory required on mobile device will be less. In case of network failure, user can get the medications with the help of Database, that client has previously downloaded in the form of excel sheet.

IV. CONCLUSION

Thus our Application works for the benefits of the society and acts as VIRTUAL DOCTOR for the patients. Our application helps the user to get a modified and advanced version of the famous android application, Common Symptoms Guide. This application provides an interactive interface between the client (patient) and the server (Medical Expert System).

This paper proposed a Medical Expert System (MES) that can be used to solve problems of too many patients seeking daily medical attention. This research showed that some of these patients need not attend a major referral Hospital, because their sicknesses are minor and may not require hospital attendance. The proposed system when implemented will not only reduce patient numbers but also help Medical Doctors to speed up diagnosis and treatment of patients through the advice and interaction with a MES.

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