Remote Health Monitoring Using Social Media

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Abstract- *Remote patient monitoring (RPM), also called homecare health monitoring system, is a type of vagrant healthcare that allows a patient to use a portable medical device to accomplish a routine health checkup and send the tested data to a healthcare professional in real-time. RPM is frequently used with the aged and the chronically afflicted, two groups of people who have high levels of medical need. Data can be sent to a Doctor's social media webpage by using a web application installed on the patient's Internet-capable computer or smartphone or tablet PC, which can act as a middleware between the IoT device and the social media. In the proposed system a middleware is developing for handling the IoT sensor device's data and send messages to health care professionals or to the patient's relatives through any of the online social media networks, for example Gmail and SMS alerts. The sensed data such as heart rate, blood pressure, temperature, accelerator or GPS positions etc. are continuously collected and sent to the middleware, which is operating in a web environment and prepare messages to healthcare professionals or to the patient's relatives to monitor a patient's condition using online network. The system can also be used to respond to emergencies and accidents related to the patient and in such emergency situations, an email is sent through Gmail and an SMS alert is also sent to the Doctor's, Carer's and Family member's mobile phone.*

Keywords- Assignment problem, Best candidate method, Hungarian method.

I. INTRODUCTION

A. Internet Of Things (IOT)

The Internet-of-Things (IoT) can be defined as the appliances like TVs, smartphones,personal computers etc. can be linked together using suitable communication tools to provide various services. The IoT devices include various types of sensor devices and they are connected through a network and this will help to control different devices from remote locations. This will help to provide a variety of services too. Developing such applications and services are exactly inspiring and challenging tasks. The middleware is the software that supports the interoperability between various IoT sensor devices and controls the events that occurs spontaneously by diverse computing and communication devices. The IoT middleware has a large number of suggestions and are mostly addressed by Wireless Sensor Networks (WSNs) which is a key component of IoT. The key advantage of IoT can be defined as it can be accessed from anywhere, anytime, anyplace, any path, any network connectivity for anyone for anything and for any device.

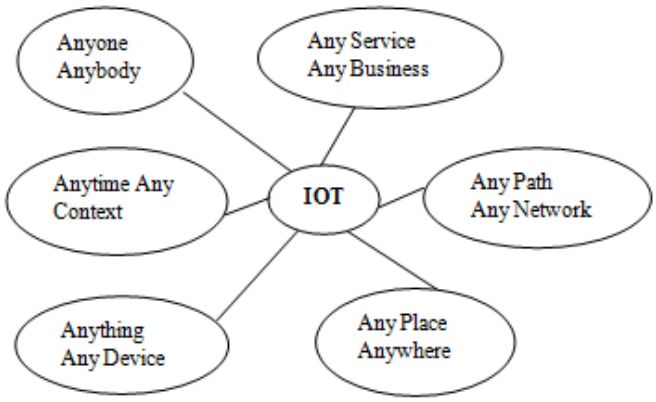


Fig.1:Definition of IOT

1) Characteristics of IoT Infrastructure

- Heterogeneous Devices
- Resource-Constrained
- Spontaneous Interaction
- Ultra Large-Scale Network and Large Number of Actions
- Vibrant Network and No Infrastructure
- Context-aware and Intelligence
- Location-conscious and Distributed

2) Characteristics of IoT Applications

- Diverse Purposes
- Real-time
- Everything-as-a-service (XaaS)
- Increased Security Attack-surface
- Confidentiality Leakage

B.Middleware in IoT

A middleware creates a software level between IoT devices and the communications devices in the network and together with their cooperation, the IoT devices will function more properly and accurately to satisfy various users. Usually a middleware provides a software layer between application software and system software. A middleware should be such that to provide heterogeneity between the different communication technologies in use, and also the system level technologies, and a middleware should support both viewpoints as necessary.

C. Types of Middleware

Middleware can be explained as a software that acts as amidway between IoT devices and the communication devices. Middleware is used in the perspective of cloud computing for cloud enablement of existing and innovative applications that can be public, hybrid, or private. For example, it is possible to turn present custom applications into Software as a Service applications with all the complicated software architecture handled by platform middleware. Middlewares can be clearly understood by specific models that will perform many cloud services based on the types of services. These examples include:

- Message Oriented Middleware
- Object Middleware
- Remote Procedure Call (Rpc) Middleware
- Database Middleware
- Transaction Middleware
- Portals
- Embedded Middleware
- Content-Centric Middleware

D. Middleware Service Requirements

Middleware service requirements for the IoT can be categorized as both functional and non-functional requirements.

1) Functional requirements

- Resource Discovery
- Resource Management
- Data Management
- Event Management
- Code Management

2) Non-functional requirements

- Scalability
- Real-time or Suitability
- Consistency and Accessibility
- Security & Privacy
- Ease-of deployment and Popularity

E.Design issues of Middleware for IoT

Building interoperable IoT services and applications requires a set of middleware components and system development and deployment tools for rapid software development. In order to avoid developing extremely focused and vertical IoT applications not able to interact with other applications, common and generic middleware services used by different application domains become necessary. One of these IoT requirements is offer means for enabling the cooperation between objects and humans and creating awareness about the surrounding (context awareness) in a fully connected environment. Context-aware systems can be defined as systems that are able to adapt their behaviour to the current context conditions without explicit user intervention.

F. Development tools for IoT Middleware

The key factor that the developers should kept in mind to create IoT systems is that there must be a proper linkage between various non-integrated tools and programming platforms. By this aim to provide an integrated tool for the developers of the IoT applications, IoTLink has been introduced as a development toolkit called IoTLink and it is based on a model driven development(MDD) approach. The IoTLink offers an easy to-use graphical interface that helps inexperienced users and developers to create IoT applications using a mashup-like style by configuring and wiring components together. The IoTLink encapsulates the complexity of communicating with various IoT devices and their services on the Internet and abstruse them as constructive objects that are accessible through different communication technologies. The model generated by
Java code, which can be extended by more experienced developers in a further phase of the development.

II. RELATEDWORK

ChonlateeKhorakhun [4] et al investigated that Remote Health Monitoring and they considerthis as an essential part of future health care systems and this will help to conduct clinical checkups inside home itself and this will improve the quality of patient care. The use of online social networks for remote health monitoring has been introduced in this paper by using the existing infrastructure where the initial costs can be reduced and fast application development is possible. Here Facebookis used as an example platform and it

is a platform that allows customer-defined applications and this makes the application more flexible. The social media platforms will arrange the services more quickly to suit different requirements of patients and health care professionals.

Stella C. Christopoulou [9] et al suggested that the healthcare domain is purpose oriented and massive research efforts are going on in this field in order to improve life quality of people. Health management cannot be done without medical knowledge and systems are spatially and functionally distributed over the network. Also, medical data will be complicated and their diversity makes their delivery inefficient. In such an environment this study suggests the implementation of vhMentor based on a solid ontological schema. The aim of the proposed system is to introduce an agent-based solution for medical data monitoringto overcome the automation deficiencies. They suffests an agent to monitor patients in remote locations and to deliver the details of the patient to health care professionals.

III. REQUIREMENTS

A. MySQL Database

MySQL is an Open Source Database Management System and it is one of the finest Relational SQL being used for developing various net-oriented software applications. MySQL AB, a Swedish company has developed, supported and marketed the MySQL database which is a relational database management system. MySQL is fast and very easy to use for many minor and major business enterprises and services. MySQL is becoming most popular because of many good reasons –

- MySQL has an open-source license and so can use without payment.
- MySQL can handle a large set of functions and are classy and powerful database packages and it is a very dominant program.
- MySQL can be operated with many languages including PHP, C, C++, JAVA, PERL etc. and it is using the format of Structured Query Language.

B. *Features of JDK*

Java can be run for many purposes and it is class-based and object-oriented concept is being used. Java is specifically designed to satisfy numerous implementation needs as possible. Java code can run on all platforms and it uses the Java Virtual Machine and so developers says that it can be write once and run anywhere (WORA). Java applications are widely used because it is independent of the running computer's architecture and design. By the calculations of 2017, Java is one of the best programming languages and it helps developers for client-server web applications. The Java syntax is similar to C and C++ in some ways, as it is derived from them, but it has less low-level facilities than both of them.

C. Suitability of the Facebook and Gmail platform

Facebook and Gmail can be easily used by everyone and they are user friendly applications. Gmail is developed by Google and users can access both on the web through mobile apps for Android and iOS and it is also free of cost.
Google's mail servers automatically scan emails for various functions, including to screen spam and malware, and to add context-sensitive posters next to emails. Gmail provides a common platform for every users to send mails across the world unaware of the recipients location. For Remote Health Monitoring it is a suitable platform to send mails to doctors, professional care takers and even to the patients family members in case of critical and normal thresholds of the patients health conditions.

As Facebook is the most widely used social media, by maintaining a Facebook page the doctors, family members and even health clinics can monitor the conditions of their patients.

IV. APPLICATION DEVELOPMENT

Remote patient monitoring (RPM) is a technology that allows monitoring of patients outside of conservative clinical locations and if the patient is at home then health checkups can be done with increased care and can decrease the healthcare delivery costs. Remote health monitoring is considered an essential part of future health care systems to aid the delivery of healthcare outside clinical sites at reduced cost, while improving quality of patient care. The use of online social networks for remote health monitoring by exploiting the existing infrastructure will help to reduce costs of frequent clinical visits and fast health monitoring is possible. Facebook and Gmail is used as an example platform: as a platform allowing user-defined applications, development is flexible and can be arranged quickly to suit different requirements of patients and health professionals. The suitability of the application is analyzed including security and privacy issues. The online social media systems could offer a suitable platform for developing certain types of remote monitoring capability.

The proposed architecture includes

- *Input device:*Sensors (Sensors in watch, shoe, clothing, mattress)are attached to the patient's body and take measurements as configured (e.g. continuously or at intervals, as required). The collected bio-data, e.g. heart-rate, temperature and blood-pressure, are then sent to the MySQL Database in the local PC or in cloud database. Here we are using a sample dataset for the processing of data
- *Local data storage*:MySQL Database provides a storage of the bio-data in tabular forms and these data can be retrieved any time using an application software.
- *Data Processing Repository*: An application software capable of uploading the data directly to the Facebook and Gmail is developed. The application can be done in such a way as to prepare different messages according to different viewpoints ie. doctor, carer, family, patient. This application is developed in Java.
- *Diagnostic application software* :The messages from the application software are sent to the required social media network ie.Facebook and Gmail.

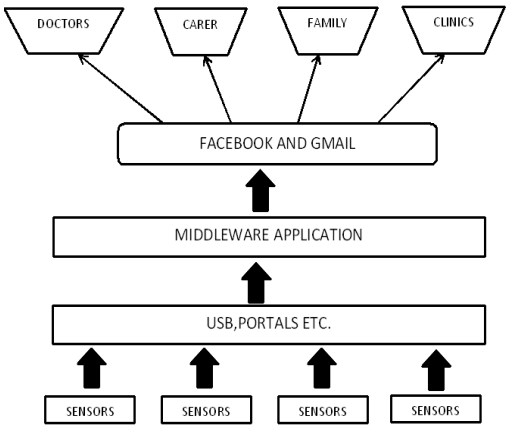
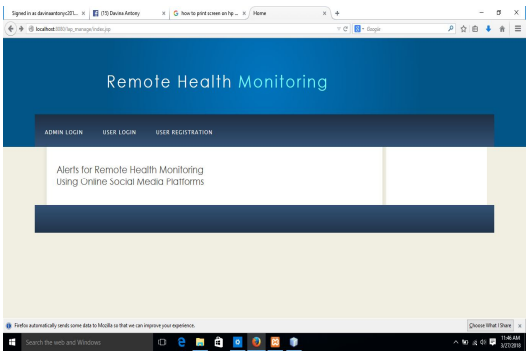


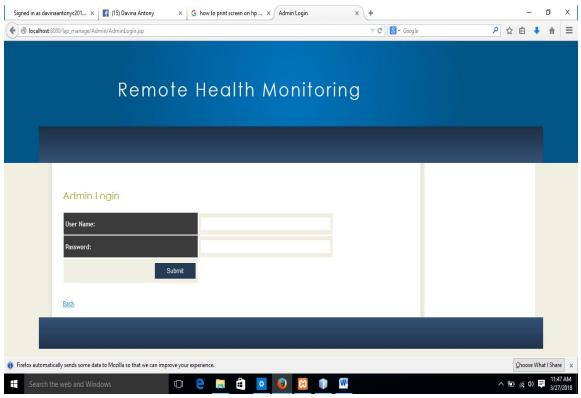
Fig.4 Architecture of the Proposed System

V. PAGES OF THE WEB APPLICATION

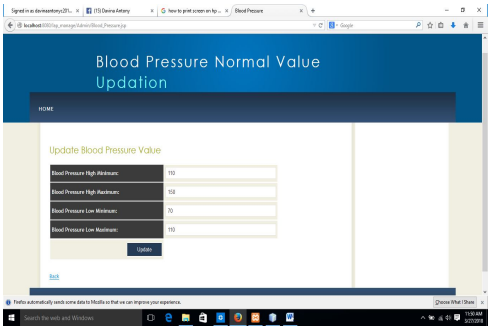
A. LOGIN PAGE



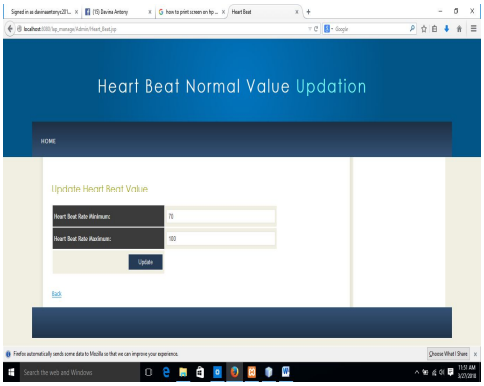
B. ADMIN LOGIN



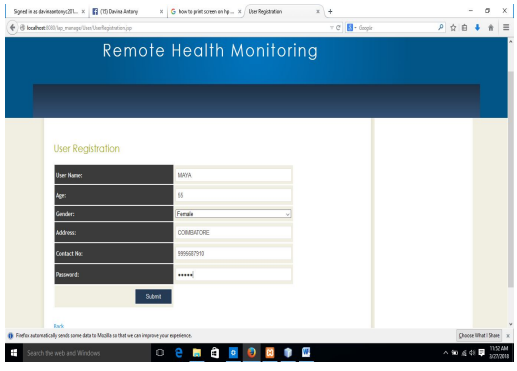
D. BLOOD PRESSURE NORMAL VALUE UPDATION



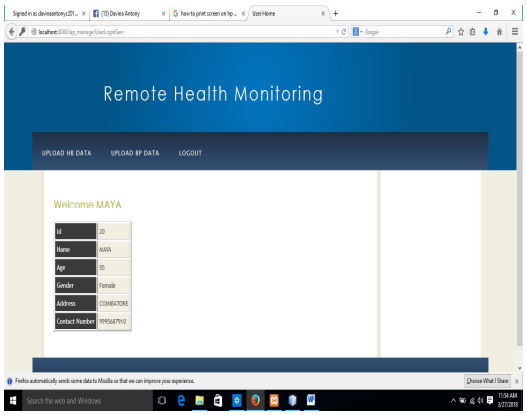
E.HEART BEAT NORMAL VALUE UPDATION



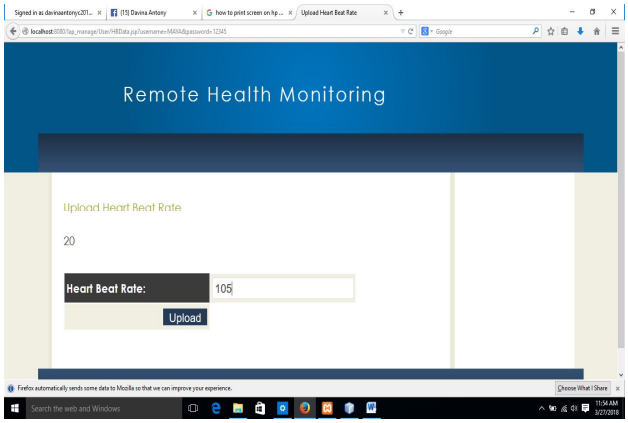
F.USER REGISTRATION



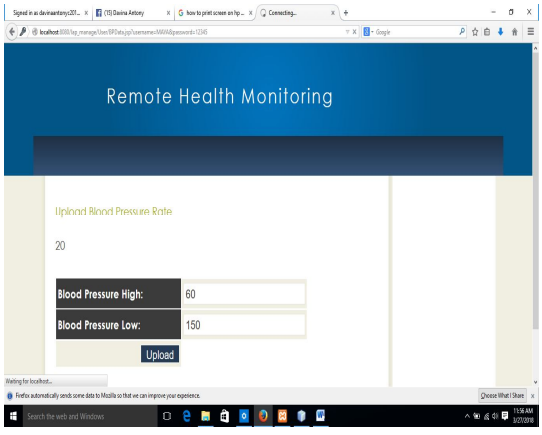
G.USER PAGE TO UPLOAD DATA



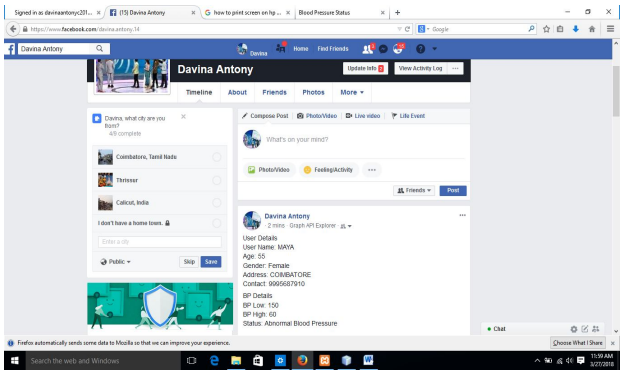
H.USER HEARTBEAT UPLOAD



I.USER BLOOD PRESSURE UPLOAD



J. PATIENT DETAILS ON FACEBOOK PAGE



V. CONCLUSION

This project has been developed for Remote Health Monitoring using a middleware in Java and sent the required messages to the doctor, care taker, family and to the patient through online social media networks and here Facebook and Gmail has taken for example. The middleware helps to upload the data from the IoT sensor devices and it will be displayed as a post in Facebook and as a mail in Gmail. The use of online social media helps to communicate the concerned persons and it helps patient's health monitoring without even clinical checkups. Also specific improvements in HEALTH management, better adherence to medication, support for "management by exception", reductions in hospitalizations, readmissions, lengths of stay and costs can also be achieved.

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