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Smart Healthcare Monitoring Using Wearable Sensors

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ABSTRACT

The majority of patients in the hospital are ambulatory and would benefit significantly from predictive and personalized monitoring systems. Such patients are well suited to having their physiological condition monitored using low- power, minimally intrusive wearable sensors. Despite data-collection systems now being manufactured are commercially being, allowing physiological data to be acquired from mobile patients, little work has been undertaken on the use of the resultant data in a principled manner for robust patient care, including predictive monitoring. Most current devices generate so many false-positive alerts that devices cannot be used for routine clinical practice. This paper explores principled machine learning approaches to interpreting large quantities of continuously acquired, multivariate physiological data, using wearable patient monitors, where the goal is to provide early warning of serious physiological determination, such that a degree of predictive care may be provided. We adopt a one class support vector machine formulation, proposing a formulation for determining the free parameters of the model using partial area under the ROC curve, a method arising from the unique requirements of performing online analysis with data from patient-worn sensors.

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I. INTRODUCTION

Wireless technology is the best solution for mass emergency situations like natural and human- included disasters and military conflict where patients' records such as previous medication history, identification and other essential information are necessary. Through wireless communication technologies Health care effectiveness in several situations is improved. Using wireless continuous medical monitoring systems, patients' information such as blood pressure, heart rate, and electrocardiogram can be sent immediately to specialize medical centre's to store and process properly. In the new generation of communication and technology, the explosive growth of electronic devices, smart phones and tablets which can be communicated physically or wirelessly has become the fundamental tool of daily life. Driven by technology advances in medical sensors, we have observed in recent years the emergence of internet. WBAN mostly uses WiFi, or UWB standard. A main application of WBAN in medical domain is computer assisted physical rehabilitation. In a health telemonitoring system, a WBAN consists of a number of lightweight miniature sensors. The next generation of connected world defines itself that the term "Internet of Things" because all the vehicles, devices, sensors, appliances and other 'things' are connected with the internet. The things or objects may include the radio-frequency identification (RFID) tag, mobile phones, sensors, actuators and much more.[2]The proposed model named as 'k- Healthcare' used 4 layers; the sensor layer, the network layer, the Internet layer and the services layer. All layers work on a platform to access patient health information using smart phone.The rest of the paper contains following sections: Section II presents the related study; Section III Presents Comparison and Contrast Analysis; Sections IV Presents Proposed System; V Presents Conclusion.

II. RELATED STUDY

WSN takes important places in medical care by using different sensing devices and e-health. There are many studies on minimizing WiFi interference by allocating

channels that are less often used or unused by WiFi devices to ZigBee sensors. Zhao et al. propose "a multi-radio tested" for the collection of wireless sensor networks. Each WPAN is assumed to use only one channel .Jara et al [6] presented their own architecture for Remote Monitoring based on loT using sensors, integration of different systems like hospital information system, services provider system,Context Management Framework Knowledge Base System's for mart rehabilitation system in loT. Fig 1 represents an application Scenario of k-Healthcare model. In the field communications, real-time localization, and embedded sensors lets us transform everyday objects into smart objects that can understand and react to their environment. The sensors measure physiological parameters such as electrocardiography (EKG), electroencephalogram (EEG), body temperature and blood pressure. These measurements are transmitted to an external data aggregation device called a coordinator via wireless communication networks, and are then sent to a health telemonitoring centre (e.g., a hospital) via the Internet. At the hospital, medical professionals monitor their patients' health parameters continuously, so that there is no need for them to visit the hospital again and again.

Automating design methodology (adm) based on ontology is presented. [3]ADM uses RFID, wi-fi, Bluetooth and cable network with ethernet and tcp/ip. The reliable and timely delivery of vital body parameters IS important for the effective operation of the patient monitoring networks. [7],[8]weihua et al[9] research on the e-health records standards , how to access and display the data which are shared by the organization.w.r.t. Network construction they also design and interface between the platform and medical establishment's. The architecture uses hl7/xml, dicom (digital imaging communication-in), adsl, wlan, 3G, wcdma, masp, ummp and uaap standards And web services.

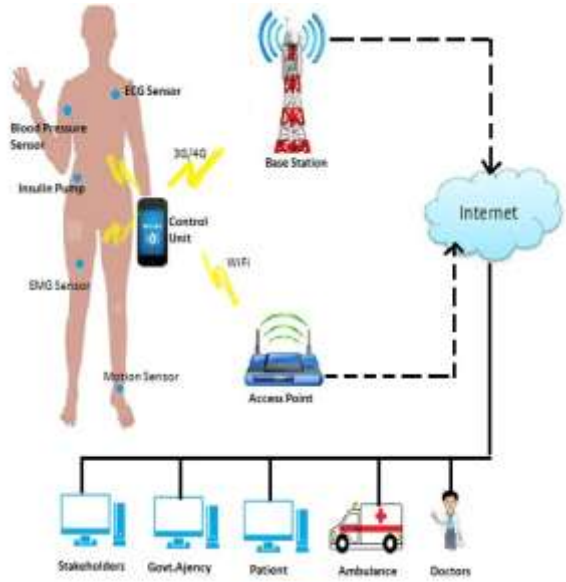

Fig1: An application Scenario of Healthcare model.

Weietal [9] presented the RMMP-HI (Remote Monitoring & Management Platform of Healthcare Information).Body sensors, a sensor Network, wireless communication modules, home gateway or mobile phone/tablet and information storage consisted in it. Platform with existing telemedicine services analysed by author. But there is no information available on how will different layers communicates with each other with the sensor, and what type of data storage is used. For emergency response service Min et al[10] present 2G-RFID based on e- Health care system. The proposed system consists of RIFD tags, WBAN, Mobile phone and Healthcare Database, Automated Services, Emergency Medical Response Service. They also explained the architecture of 2G-RIFD System for how it works and different parts of system. Yang et al.[11] implemented system using different standards and technologies like RIFD, CDM (Control Delamination Materials), Ethernet, ZigBee, Wi-Fi, Bluetooth and 3G/4G network. System involves 3 things using loT: i) Intelligent Medical Box (iMedbox) which based on open platform; ii) iMedPack intelligent pharmaceutical packaging; and iii) Bio-Patch biomedical sensor devices. The proposed system provides different services for patients like Remote handling, Medical Reminder, Intelligent Analysis.

III.COMPARISON AND CONTRAST ANALYSIS

We are going to deploy the applicable studied on of medical and healthcare. It is also noticed that provide remote monitoring and emergency aid while some of the authors explain the applications of IoT in healthcare. We proposed the model based on some parameters which are provision of emergency aid, technology used, standard followed, support for multi device and artificial intelligence implementation.

A. Emergency Aid: in the field of medical and Healthcare we are focus on data and on the provision of the support in emergencies. The system generates alarms, to inform to patient and consultants also.

B Medical Sensing: There is a long history of using sensors in medicine and public health.[12]Medical instruments used in hospitals and clinics to provide patients and their healthcare providers insight into physiological and physical health states that are critical to the detection, diagnosis, treatment, and management of ailments. Most of time modern medicine not be possible nor be cost effective for many people. Without sensors such as thermometers, blood pressure monitors, glucose monitors, EKG, PPG, EEG, and various forms of imaging sensors.802.15.4, IEEE 802.15.6, ZigBee, and WBAN etc.We can find the distance, accuracy and time to take a system using protocols to complete his work.

C. Multi device support: Using multi device support we can compare different models and Systems. RFID sensors, body sensors, smart phone sensors, tablets, and wearable devices support the efficient systems. Existing

research in IoT mostly focus on RFID sensors and external wearable sensors.

IV. PROPOSED SYSTEM

We proposed a novel framework for e-Health and m-Health which makes use of smart phone sensors and body sensors to obtain, process and transmit patient health related data to centralize storage in the cloud The k-Healtcare model proposed for efficient deployment of IoT using sensors in the field of medical and healthcareFig.2. Proposed k- Healthcare model and transmit important data related to the patients' health.

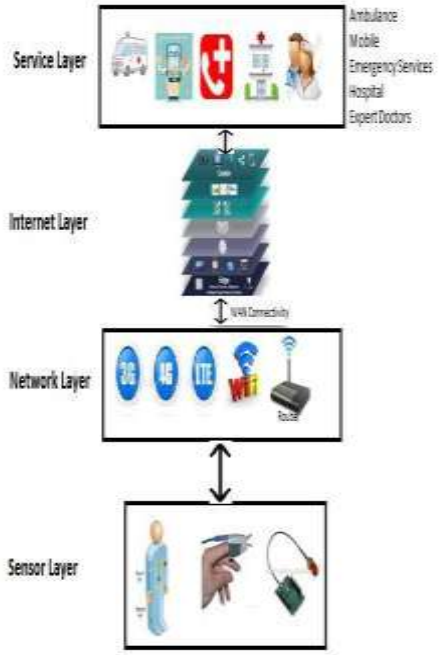

Fig. 2 Proposed k-Healthcare model It consists of four layer.

A Sensor layer is a bottom layer of model and it is a heart of the model. There are different sensors present on this layer e.g. wireless two-lead EKG, blood oxygen sensor, Smart Phone sensors. The main idea of WSN is to gather information from surroundings and pass data through the network to the centralized storage. Accelerometer, gyroscope, proximity, barometer, temperature, humidity, gesture sensors are used in the modern smartphones. In the model sensors are used to collect the information and it is passed to remote data storage for further processing. The sensors layers used in the network connection is 802.11b/g/n and IEEE 802.15.4, IEEE 802.15.6, ZigBee etc.

B. Network Layer

The Network layer plays the key role in communication to connect the devices with WAN using different protocols (TCP/IP), technologies and standards like 3G, 4G, ADSL, DSLAM,LTE(Long Term Evolution) LTE is developed by the Third Generation Partnership Project (3GPP), an industry trade group. It is a 4G wireless broadband technology. The device which is used as a sensor sends data to a connected device e.g.: RFID reader, smart phone, which is connected to the internet or via Ethernet/Wi-Fi, then the device sends the data to the server for further processing and updating the database.

C. Internet Layer

This layer provides the functionality of data storage and management. For this purpose, we use the cloud storage. The data is stored in logical pools which is the facility provided by cloud storage. The physical storage may be one server or multiple servers, typically owned and managed by a hosting company. The cloud provides different services and algorithms on demand like cloud storage, cloud data store, cloud SQL, BigQuery, RESTful services for iOS, Android, JavaScript and machine learning algorithms.

D. Services Layer

On this layer it gives direct access of data to professional medical facilities and stakeholders such as doctors, emergency centres, hospitals, and medicine supply chains. With the help of this layer The doctor can easily manage the patients, view the medication history, and provide remote support in case of emergency.

V. CONCLUSION

The coexisting ZigBee based WBANs overlaps the 802.11 overlaps wifi channels, which delays the Zigbee packets due to interface. To overcome this problem, we have proposed an adaptive load control algorithm that controls only the WiFi traffic created from delay-tolerant applications dynamically with the aim of guaranteeing that the delays experienced by ZigBee sensors do not exceed the maximum tolerable delay period. The remote services provided by m-health and e-health are different, such as prevention and diagnosis against disease, risk assessment, monitoring patient health, education and treatment to users. For this reason e-Health and m-Health is being widely accepted in the society. The development of state of the art tools and technologies of WSNs can be really beneficial for e-Health and m-Health.

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