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A Survey on Internet of Things for Healthcare and Medication Management

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ABSTRACT

A robust health monitoring system, that is quick and intelligent enough to monitor the patient automatically using IoT that collects the status information through these systems which would include patient's heart rate and sends an emergency alert to patient's doctor with his current status and full medical information. This would help the doctor to monitor his patient from anywhere and alsothe patient send his health status directly without visiting to the hospital. The model can be deployed at various hospitals and medical institutes. The system uses smart sensors that generates raw data information collected from sensor and send it to a database server where the data can be further analyzed and statistically maintained to be used by the medical experts. Maintaining a database server is a must to track the previous medical record of the patient providing a better and improved examining.

Keywords : RTC, RFID, IoT, I-Home Health Care.

I. INTRODUCTION

The ageing population worldwide is constantly increasing, both in urban and regional areas. There is a need for IoT-based remote health monitoring systems that take care of the health of elder people without compromise their convenience and preferences of staying at home. However, such systems may generate large amounts of data. The key challenge addressed in this paper is to transmit healthcare data efficiently within the limit of the existing network infrastructure, especially in remote areas.

An efficient remote health monitoring system is needed as it offers healthcare providers the ability to always monitor the behaviours and well being of the aged people. At the same time, the system give them the convenience and peace of living in their own house, knowing that they will get helps immediately when they want. The expected system should perform tasks such as detecting and preventing the accidents and transmitting body parameters to the processing place. Body parameter range from non-time-critical information such as periodic check of heart rate, blood pressure, body temperature, blood glucose level to time-critical information such as ECG signal.

Medical care and health care represent one of the most attractive application areas for the IoT . The IoT has the potential to give rise to many medical applications such as remote health monitoring, chronic diseases, and elderly care. Compliance with treatment and medication at home and by healthcare providers is another important prospective application. Therefore, various medical devices, sensors, and diagnostic devices can be viewed as smart devices or objects constituting a core part of the IoT.

IoT-based healthcare services are expected to reduce expenses and increase the quality of life, and enrich the user's experience. From the perspective of healthcare providers, the IoT has the potential to reduce device downtime through remote provision. In this regard, this paper contributes by Classifying existing IoT-based healthcare network studies into three trends and presenting a summary ofeach.

II. METHODS AND MATERIAL

The architecture of iHome is shown in Fig. 1. It consists of three main things: 1) smart medical service; 2) medication management; and 3) cloud integration

1) Smart medical service

When the finger is placed on its sensor it measure the heart beat per second. Received signals at Raspberry pi are sent to computer for analyzing.Through the raspberry pi, the sensor readings are received and it can be displayed by monitor. If the patient’s abnormal heart condition has not recovered within a certain time period, e.g., 10 min, the iMedBox will automatically send out a text message to the doctor describing the situation. The doctor will then decide whether or not to contact the patient’s relatives or deliver the case to an emergency center.

Heartbeat sensor
How fit you are

Heart rate varies between individuals. At rest, an adult man has an average pulse of 72 per minute. Athletes normally have a lower pulse rate than less active people. Children have a higher heart rate (approximately 90 beats per minute), but also show large variations. The heart rate rises during exercises and returns slowly to the rest regularity after exercise. The rate at which the pulsate returns to normal can be used as an indication of fitness.

2) Medication Management

If the patient take the medicine in wrong time or the patient take too much medicine or too little medicine , it will cause the severe health issue to the patients. Real-time monitoring and analyzing vital signs to early-detection.It will helps to doctors and family members to Checking whether they are following their prescribed treatment on time by Real Time Clock (RTC) and RFID tags,which are connected to the raspberry and sends SMS to the patients and their corresponding doctors and family members if there is any abnormal behavior occurred.It will Improve the user experience and service efficiency.

3) Cloud Integration

The heart beat sensor readings and timing history will be stored on the cloud storage for reference.By this ,the doctor can see the full sensor readings and timings history of patients and check they are taking a medicine on time and whether they are following the prescribed medicine at anywhere anytime by cloud storage.

III. RESULTS AND DISCUSSION

1) Overview

Based on the recorded ECG signal from Bio-Patch, a heart rate variability analysis can be performed and the user’s heart rate information can be extracted, on the regular basis. Once a unremitting abnormal heart rate is detected, the iMedBox will trigger an alarm. If the patient’s abnormal heart condition has not recovered within a certain time period, e.g., 10 min, the iMedBox will automatically send out a text message to the doctor describing the situation. The doctor will then decide whether or not to contact the patient’s relatives or deliver the case to an emergency center. The IoT healthcare network or the IoT network for health care is one of the vital elements of the IoT. It supports access to the IoT as a backbone, facilitates the transmission and reception of medical data, and enables the use of healthcare adapted communications.As shown in Fig 1, visualizes a scenario in which a patient's health vitals are captured using portable sensors and medical devices attached to his or her body. Captured data are then analyzed and stored and maintained, and stored data from various sensors and machines become useful for aggregation.

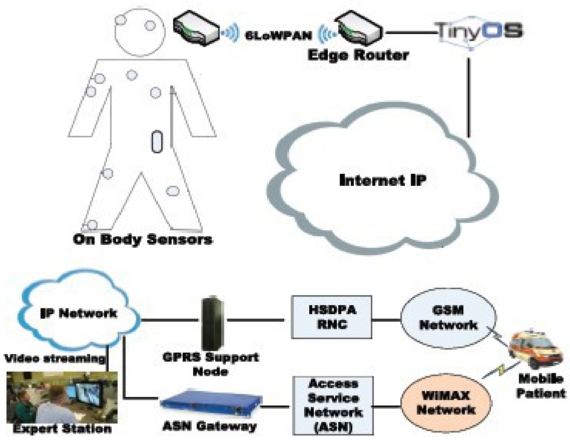

Figure 1. Remote monitoring in wearables and personalized health care.

Based on analyses and aggregation, care givers can monitor patients from any location and respond accordingly.

2) Related Work

Geng Yang et al (2014) an intelligent home based platform, and iHome Health IoT, is proposed and implemented. In particular, the platform involves enhanced connectivity with an open-platform based intelligent medicine box and interchangeability for the integration of devices and services intelligent medical packaging (iMedPack) with communication capability enabled by radio-frequency identification (RFID) and actuation capabilities enabled by functional materials and a flexible and wearable bio medical sensor device enabled by the up to date inkjet printing technology and system-on-chip.

Pescosolido et al (2016)present an instance of a cloud-based web server which relies on a "home system" for the collection of information from heterogeneous set of devices, providing a high level description of the proposed architectural model, of the induced opportunities from the market perspective, and of how it could be used by service providers and healthcare applications developers including details on how the web server Application Programming Interfaces (API) is implemented in our instance.

Hassanalieragh et al (2015) facilitate an development in the practice of medicine, from the current post facto diagnose-and-treat reactive paradigm, to a proactive framework for prognosis of diseases at an incipient stage, coupled with prevention, and overall management of health instead of disease, then enable personalization of treatment and management options targeted particularly to the specific circumstances and needs of the individual, and finally help reduce the cost of health care while simultaneously improving outcomes. In this paper, author highlight the opportunities and challenges for IoT in realizing this vision of the future of health care.

Byung Mun Lee (2014) propose the requirements for the design of the healthcare model to be offered on the open IoT platform as the healthcare service are provided to users or patients an open IoT platform was proposed. The platform is designed as a selfmanagement model for unrelieved (chronic) diseases, but the architecture can be extended to have remote health monitoring capabilities.

Fengou et al (2013) proposed an architecture of the e-Health telemonitoring system, which has several components performing data collection, data interpretation and data management. The author expanded the ETSI/Parlay architecture with new service capability features as well as sensor, profiling, and security mechanisms. The proposed framework helps to the seamless integration, within the e-Health service structure, of diverse facilities provided by both the underlying computing infrastructure and communication as well as the patient's bio and context sensor networks.

David Lake et al (2013) the data-centric IoT viewpoint is highlighted asthe authors explicitly described the data flow from sensors to intermediate gateways and hubs and eventually to cloud based data stores. They proposed an architecture and framework that supports the development and providing the solutions. The authors have further identified core principles and industry bodies where eHealth-M2MIoT standardization is in progress.

Charalampos Doukas et al (2012) presents a platform based on Cloud Computing for mobile and wearable healthcare sensors management, demonstrating this way the IoT paradigm applied on pervasive healthcare. Author developed a Cloud-based system that manages the sensor data. The wearable textile sensors collect biosignals from the user (like heart rate, ECG, oxygen saturation and temperature etc), motion data (throughout accelerometers) and contextual data (like location, ambient temperature, activity status, etc.)

Wei Zhao et al (2011) proposed a combination of internet technology and Technology on IOT integrates the physical world and imaginary space on a shared platform to reduce the constraints of imaginary space and provide intricate, diverse, and advanced services focusing on the people, which have not been achieved [1]. The potential direction for the integration of Internet technology and technology on IOT, the technology of body sensor network and information services are suggested. This paper analyze the possibility and related issues of provided that advanced services for human health management in the real world and research direction of medical technology on IOT.

Robert S. H. Istepanian et al (2011) introduce a new amalgamated concept of Internet of m-health Things (m-IoT). m-IoT is a new concept that matches the functionalities of IoT and m-health for a new and innovative future applications. In principle m-IoT introduce a new healthcare connectivity paradigm for future Internet based healthcare services that interconnects IP-based communication technologies such as 6LoWPAN with emerging 4G networks. In this paper we will present a general m-IoT architecture based on 6LoWPAN technology for measurement of body temperature as an example for healthcare application.

Jaraet al (2010) presents how IoT technology is applied in a pharmaceutical system to examine drugs inorder to detect the Adverse Drugs Reaction (ADR), harmful effects of pharmaceutical excipients, complications, allergies, and contraindications related with liver and renal defects, and harmful side effects during pregnancy. Thereby, the system provides an enhanced approach assisting physicians in drug prescribing and clinical decisions. The solution presented is based on barcode identification technologies and, NFC (Near Field Communication) which have been integrated in common devices such as smart-phones, PDAs and Pcs.
Abdellah Chehri et al (2010) the authors described an overall system design of e-Health application with focus on the interaction between several components of the system such asBody Sensor Network (BSN), Zigbee, smart house and medical call center. The author evaluates smart sensor network architecture for e-health applications. This architecture based on the multiple complementary wireless communications access networks between the patient and the system, through WiMax, UMTS, and the Internet.

Deng Dazhi proposed a system based on the foundation of coal mine enterprises integrated production automation control system, coal mine project should create the basic electromechanical equipment and operating conditions database, then use GIS visualization electronic equipment management system to information manage and visually monitor the electromechanical equipments, consequently formulate a assessment on the health status of the electromechanical equipments, and finally tracking the weaknesses and potential risks in these equipments and perform mandatory maintenance.

IV.CONCLUSION

AddIn general, An IoT-based intelligent home-centric healthcare platform (iHome system), which seamlessly connects the smart sensors attached to human body for monitoring for daily medication management. The idea of this project is to reduce the headache of patient to visit to doctor every time he need to check his heart beat rate. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in the emergency scenario as much as possible.

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