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IOT AND CLOUD COMPUTING TO MONITOR CHONIC DISEASES

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ABSTRACT

This paper investigates the role of IoT and cloud computing to monitor chronic diseases. In this paper a model is suggested that uses these technologies in monitoring chronic diseases. It supplements people with technology which enables people to live healthier lives. The model consists of IOT sensors, Micro-Controllers, protocols and Cloud. IoT sensors collect data about the health parameters. This data is Analog in form which is processed by the micro controller. It is further send to the cloud where algorithms are applied to detect the chronic diseases. Finally protocols are used to activate sensors for sending alerts.

Keywords: IoT, Cloud Computing, Micro-Controller, Protocols.

I. INTRODUCTION

Internet of Things is the unification of devices that are networked together. They capture real time information and analysis gathered information. Cloud computing offers services that can be accessed anywhere across the globe with the help of an internet connection. We can say that IoT get benefit from the virtually unlimited capabilities and resources of Cloud and on the other hand the cloud can gain from IoT by dealing with things in real world and for delivering variety of new services in a distributed and dynamic manner [1]. In this paper a model is suggested that uses these technologies in monitoring chronic diseases. It supplements people with technology which enables people to live healthier lives.

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II. MODEL FOR MONITORING CHRONIC DISEASES

This paper propose a model that not only collect and monitor consistently data, but are able to respond, alert and inform in real time for clinical decision support. The IoT setup consists of smart sensors, micro-controllers, networks and ubiquitous devices. Model is made up of the following components [2]:

2.1. Sensors

Sensors are used to monitor the basic vital signs of people such as temperature or weight. They are also used to alert such as buzzer or light sensor. The data collected and analysed by sensors is in Analog form.

2.2. Micro-controller

They receive Analog data and convert it into Digital form. It also controls all the devices and sensors.

2.3. Protocols

Different IoT devices are connected by protocols. They are required for real time communication.

2.4. Cloud Computing

Cloud computing can be utilized for storing IoT data remotely, and this extends the scope of IoT solutions to deal with real world things in a more distributed and dynamic manner [3]. Data storage on the cloud enables decision algorithms, to detect anomalies, and build in triggers to send warnings or alerts. Protocols are used for triggering action after monitoring. M2M protocol send signal back to patient's home, reminding them about medical activity that needs to be conducted.

III. ARCHITECTURE OF MODEL

Architecture of the healthcare system consists of two units named Local Unit (LU) and Cloud Unit (CU).

3.1. Local Unit(LU)

It consist of two sensors named joint pulse and SpO2 sensor, enable real time monitoring of three vital psychological signs[4] . Heart rate in the units of beats per minute (bpm), Blood oxygen level (SpO2) in the units of percent and the body temperature in the units of degree Centigrade. Fig. 1 shows the architecture of local unit.

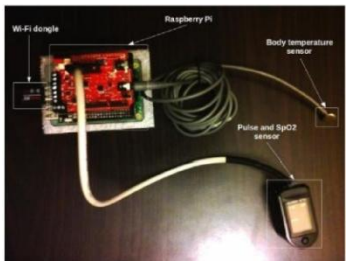

Fig 1: Local Unit

Body temperature is amongst those vital signals with high importance due to its casual relationship with a number of diseases, as well as adopted way of following a course of treatments by physicians. On average, the core body temperature is being reported to be 98.6 °C with 0.9 °C variance during the day. Pulse oximetry is a non-invasive solution for indicating the arterial oxygen saturation level in blood haemoglobin. Pulse oximetry is a prompt technique to indicate the patient's need for supplemental oxygen when their SpO2 level is indicated out of the normal range of 95 to 99 percent [5].

Raspberry Pi is a micro controller used to connect with sensors. It is the core of the Local Unit (LU) which controls the operation of the sensors and assures continuous recording of the vital signals. LU then sends the data packet to the CU. The communication between LU and CU is done with the help of protocols. MQTT is designed as an extremely lightweight protocol [6]. It is useful for connections with remote locations where a small code footprint is required and/or network bandwidth is at a premium.

3.2 Cloud Unit (CU)

It is provides with umbrella of IBM Blue Mix. Blue Mix is the IBM cloud platform, enriched with tools and solutions for rapid and efficient prototyping of cloud based applications [7] such as the smart health care platform. Fig 2 shows the cloud unit architecture.

Fig 2: Control Unit

Main elements of the smart health care platform's CU are:

IBM Watson IoT Platform: It is being utilized for device connectivity, information management, and risk management for safe and secured connection with the Local Unit.

IBM Watson IoT Platform Analytics Real-It is utilized to monitor and conceptualize data from the local unit. It visualizes what's happening in the operation of LU's, as well as respond through automated actions. Automated actions are calling the associated individuals, sending text messages, and/ or activating an actuator in case of abnormality detection in health status send by LU.

IBM Gravitant: It is being employed for decision analysis for hybrid cloud as an extra optional layer being added to the prototype platform.

IBM Cloud Orchestrator is being utilized to accelerate the CU management such as metering, usage, accounting, monitoring and capacity management in the smart health-care platform.

IBM UrbanCode is being utilized for building and deploying the applications such as worldwide web and mobile access to the clinical documentations.

IV. CONCLUSION AND FUTURE WORK

This article focused on solutions using IoT for health care, and proposed a model for it. The model collects data of basic vital psychological signs of patient and analyse it with decision algorithms. In case of any anomalies in analysed data the call or text message is sent to the relative of patient. The aim of this research is to improve patient experience when living independently, while engaging relatives and caregivers through a low cost cloud based services.

The future work involves testing this framework in an actual bed in AAL living environments, as well as with pressure sensors, which would be measure movements. This testing will show the usability, utility and quality of such approach in the real world. Security of patient data is another major issue. All the health data are

considered to be the personal private data and those data should need security. Like confidentiality, integrity, authority should be preserved in the case of medical data.

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