An Analysis on Internet of Things (IoT) for Smart Healthcare

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Abstract - The rapid evolution in the numbers of devices is connected to the Internet of Things and the increase of data. Internet of Things (IoT) refers to identifying a physical object through internet. The term Internet of Things is the concept of uniting computers and networks to monitor and control devices has been around for years. Any object can be connected in internet and it can be accessible from anywhere in the world using internet. Internet of things (IoT) is a fast growing user friendly technology which allows everything to be connected together and also allows effective communication between connected things. Intelligent devices of IoT like Radio-Frequency Identification (RFID) tags, smart sensors, and smart dust are connected on large network with unique accessibility. IoT exchanges data in small seconds and also it consumes less power. It makes human life comfortable and builds a smarter world. This paper provides an overview on the role of Internet of Things in smart healthcare management.
Keywords: Devices, Internet of Things, Healthcare, Human, Life, Large, Network

I. INTRODUCTION

In 1990's communication between computers was termed as electronic data transfer. The computers that transferred data formed a network and were categorized as Local Area Network (LAN), Metropolitan Area Network (MAN) and Wide Area Network (WAN). In this WAN Internet was used which was connecting of several computer for communication around the world. Then external peripheral devices were connected to internet and instructions are given to devices. But IoT makes the devices to think and act according to the user's needs. It is predicted that by 2020, 50 billion devices will be connected with trillion node network. In various places smart things / devices are been implemented in real time applications using RFID. For agriculture smart irrigation system, smart health care system, smart dust in battle field, smart grid for power consumptions are been implemented. Wildlife is monitored using multimedia sensor networks. To prevent the world from natural disaster these sensor networks are implemented under the ground, sea, forest and bank of rivers.

IoT can make the world smart in every way. It can provide a smart healthcare, homes, building, cities, transportation, and monitoring system, Rajguru *et al* [10].

IoT can handle any type of simple and intelligent device. The device has the capability to capture data, store data, process data, and sense data and uniquely be accessible. IoT can be used in healthcare applications a device that will allow doctors perform surgery and simultaneously monitor a patient's vital signs using google glass or simulator lab test and react to changes, Dalyah *et al* [8].

It can provide can analyse the collected health-care data to determine any health conditions or anomalies, Moeen Hassanalieragh *et al* [9]. It uses body temperature, heart rate, pulse oximeter oxygen saturation, blood pressure, and electrocardiogram. Fitbit wristband is a wearable device that tracks steps, distance and calories burned during the day and sleep quality at night.

II. INTERNET OF THINGS

IoT refers to the concept that the internet is no longer just a global network for people to communicate to one another using computers. It is also platform for devices to communicate electronically with the word around. By embedding short-Range mobile transceivers into a wide array of additional gadgets and everyday items, enabling new forms of communicate between people and things, and between things themselves. IoT can be leveraged in the cases of clinical, remote and infant monitoring.

Clinical care is used by Hospitalized patients whose physiological status requires close attention can constantly monitored using IoT-driven, non-invasive monitoring. It replaces the process of having a health professional come by at regular intervals. Remote monitoring can be used to securely capture patient health data from a variety of sensors. Infant monitors sends parents real-time information on their baby's breathing, skin temperature, sleeping positions, and activity level to his/her parents smartphones.

III. RELATED WORKS

This paper, explores a deep review on the recent advances in IoT healthcare system. IoT technologies that pertain to smart sensors for health care applications for enabling healthier ways of life. These applications include wearable and body sensors, advanced pervasive healthcare systems, and the data analytics required to inform these devices. IoT and data analytics are increasingly gaining popularity for the next generation of e-Health and m-Health services. IoT in healthcare is expected to grow high by 2022. The general architectural elements need for healthcare IoT systems (Health-IoT), has three main components, Farahani *et al* [1] : i) body area sensor network, ii) Internet connected smart

gateways, also known as Fog layer [2], or a local access network, and iii) cloud and big data support.

Ammae *et al* [5], presents an unobtrusive detection of body movements during sleep using Wi-Fi received signal strength with model adaptation technique, and a method for sensing the body movements. Adame *et al* [4], present an IoT hybrid monitoring system which integrates RFID and WSN technologies to track the location of healthcare assets and the location and health of patients (using an active wristband monitoring skin temperature, heart-rate and movement). Woo *et al* [6], focus on the important issue of fault-tolerant health data services. Rahmani *et al* [2], presents a smart e-Health gateway at the edge of the network in Fog-assisted system architecture. This Gateway is capable of offering several features such as local storage, real-time local data processing, embedded data mining, etc. In addition, it tackles many emerging issues in ubiquitous healthcare systems such as mobility, energy efficiency, scalability, and reliability issue Rahmani *et al* [7].

A gateway is as IoT-based Early Warning Score (EWS) health monitoring. Data generated from sensors attached to users is made available to doctors, family giving them the ability to check the subjects vital signs from anywhere at any time as well as performing intelligent decision making to assist healthcare Azimi, Mighali *et al* [3,11] workers. Internet of Things (IoT) in medicine and healthcare provides a systematic review of IoT architecture for eHealth and mHealth, Rahmani [2].

IV. HEALTHCARE DEVICES OF INTERNET OF THINGS

Internet of Things (IOT) is one of the most exciting and fastest growing domains of analytics technology today. There are billions of devices in use the world over, Whizlabs [12], which all connect to cloud services and this integration helps make our lives a lot easier. Things are connected to share their experience. Things are taken and added with the ability that is sense and commununicate, interact, and control.

1. *Health360:* Health360 was able to improve engagement, especially remote care for chronic patients, improve staff efficiency and reduce costs by correctly identifying and doing away with unnecessary trips.

2. *Weka Health Solutions:* Vaccinations are one of the most essential branches of medicine the world over, to help eradicate countless diseases. If not stored at the right temperature, vaccines can be completely destroyed.

3. *Roche:* IOT technology is being used extensively in IVD (In Vitro Diagnostics), an essential component of healthcare delivery. By tapping into the technology, clinicians are better placed to detect diseases, determine

the underlying causes, monitor patient progress and improve overall outcomes.

4. *Ralph Lauren Polotech Shirt:* Instead of use wearable technology on their wrists to track the metrics of a workout. A shirt is created that serves the same purpose and could spark a change in wearable fitness tech. The shirt monitors basic biometric details such as heart rate, calories burnt, distance covered, which is all transmitted to a paired iPhone app, allowing athletes to gain access to the information.

5. *Owlet:* It monitors the baby's oxygen levels and heart rate. The parent is notified immediately via the integrated mobile app. This can help parents get some rest, while ensuring that their child is safe and sound.

6. *MyMDBand:* The wearable bracelet provides consolidated medical information about anyone, which can be accessed just by scanning a QR code. In case of an emergency, someone attending to the afflicted person can gain immediate access to their medical history.

7. *Breathometer:* Oral hygiene is something any human being needs to be particular about. Despite being regular with brushing and rinsing the mouth, there may still be undetected bacteria left behind in the mouth. It connects to a smartphone app and conducts a thorough analysis of the mouth within seconds.

8. *Mimo Monitor:* Parents are always understandably concerned about their baby's safety, even when it is asleep. A constant track of the baby's sleeping positions, breathing patterns, wake and sleep times etc.

V. FUTURE HEALTHCARE – A PROPOSED MODEL

After reviewing a wide range of existing IoT health care systems, several necessities for design of such systems become superficial. Each of these papers underlines the use of sensors for monitoring patient health. All wearable sensors are important to their respective systems. Additionally repairing or replacing externally wearable nodes would be simple when compared to implanted sensors or vision based sensors installed at home. Medical information of the patient must be stored for future use so that the Doctors can know the medical history for further machine learning as the records are stored on the databases. Even cloud storage can be used to store data by providing accessibility for doctors without compromising on security. In case of emergency the record can be downloaded and the present Doctor can view the patient's history and treat accordingly.

Machine learning can be used to identify the improvement of patient health and predict the rehabilitated. A model using machine learning and IoT can be proposed to monitor and manage the chronic disease at any location using a wrist band. Machine learning can help to predict which treatment can be given to the patient according to the health condition.

VI. CONCLUSION

IOT devices collect such abundance amount of data. It cannot be stored on the tables and run queries on them it has to be depicted them in real them so intelligent decisions can be made right then and there. IOT devices collect data and the system has to analysis it. Devices are smarter to a level that can measure information to a faster space and faster scale and if this information all comes to a particular system which cannot scale up to manage all those data it is of no use. Big data is a collection or accumulation of data that take a step forward what is IoT which can be a future for this paper. IoT devices make a good collection point for useful data and receiving point for packet servers for actuating something giving feedback to the user. Machine learning also can be done using weka tools. These tools and frameworks can be used to make sense of the excess of data that are got everyday hour, minute, second or millisecond. Information's that are collected must be processed efficiently.

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