A Survey on Wearable Internet of Things (IoT) Devices and its Benefits

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Abstract- IoT wearable devices allow non– invading uninterrupted observing of physiological constraints that assist in constant monitoring of fitness and capability of health. Wearable devices are in forms of belts and wrist-bands. IoT applications are used as an application for health and lifestyle monitoring systems and wearable electronics. IoT has come across into numerous technological fields in a faster way. IoT wearable medical devices are emerging to help the affected patients suffering from chronic diseases. Healthcare monitoring, earlier diagnose, personalized treatment is a capable approach of wearable devices. Medical wearable device is a supportable, maintainable and cost-effective advancement in the field of IT. This paper provides the survey on the futures of wearable IoT in healthcare applications.

Keywords - Devices healthcare, monitoring, Internet.

I. INTRODUCTION

Internet of Things (IoT) is an amalgamation of hardware and software technology that produces trillions of data through connecting multiple devices and sensors with the cloud and making sense of data with intelligent tools [1]. IoT device can be anything, if it can transmit and receive data over the cloud and designed to process unique task.

IoT is promptly adopted by the Healthcare industry. Integrating IoT features into medical devices will significantly improve the quality and effectiveness of service, bringing especially high value for the elderly, patients with chronic conditions, and those requiring constant supervision. According to survey estimate, spending on the Healthcare IoT solutions will reach a staggering in few trillions by 2025 and, hopefully, will set the stage for highly personalized, accessible, and on-time healthcare services for everyone [2]. The increasingly aging population and prevalence of chronic diseases have been observed in many countries, which increase great burden for the health care system over recent few decades. With the technology innovation in IT and biomedical engineering, more and more advanced wearable medical technologies and products are emerging and coming to use by the public. Since wearable medical is deemed as one of the most promising approaches for healthcare monitoring, early diagnose and personalized treatment, wearable medical devices will contribute to the development of more cost-effective and sustainable healthcare system.

IoT in Healthcare is a heterogeneous computing, wirelessly communicating system of apps and devices that connects patients and health providers to diagnose, monitor, track and store vital statistics and medical information. Few IoT Healthcare devices are BP monitors, Glucose monitors, ECG monitors, Pulse oximeters, Sensors embedded in medical equipment, dispensing systems, surgical robots and device implants and wearable technology device [3].

II. WEARABLE IOT DEVICES

Wearable IoT devices allow non-invasive and uninterrupted checking of physiological parameters that aid in continuous health and fitness monitoring. Wearable devices are in forms of belts and wrist-bands. IOT applications are used as an application for health and lifestyle monitoring systems and wearable electronics. The efficiency of data processing is achieved by various smart wristwear, hearables, and smart glasses is gradually dispelling inert skepticism among the public and is getting closer to where wearable's will bring exceptional value to the lives.

Internet of Things (IoT) refers to controlling of physical objects through internet. IoT has entered into various technological fields in a speedy manner. It has been predicted that by 2020 there will be around 60 billion objects linked to Internet. IoT makes the object smarter, saves money and time. Expansion of internet services is Internet of Things (IoT), which tends to be the new revolution on the Internet. IoT connects everything at all times and smart human life is possible as object, machines and people communicate together using this technology. Wireless Sensor Network (WSN) and Radio Frequency Identification (RFID) [7], Wi-Fi, and Bluetooth are connected to the internet for allowing the objects communicate in a secured manner. IoT aided equipment's shares information on the condition of equipment, environment, software and machines. This technology can make the world smart in every way. It can provide a

smart healthcare, homes, building, cities, transportation, and monitoring system [10].

III. NEED OF IOMT IN CONTINUOUS HEALTH MONITORING

Internet of Medical Things (IoMT) is known as healthcare IoT it is the collection of medical devices and applications that links to healthcare IT systems through online computer networks. Medical devices equipped with Wi-Fi allow the machine-to-machine communication that is the basis of IoMT. IoMT devices link to cloud platforms such as Amazon Web Services, on which captured data can be stored and analyzed. IoMT include remote patient monitoring of people with chronic or long-term conditions; tracking patient medication orders and the location of patients admitted to hospitals; and patients' wearable mHealth devices, which can send information to caregivers. Infusion pumps that connect to analytics dashboards and hospital beds rigged with sensors that measure patients' vital signs are medical devices that can be converted to or deployed as IoMT technology [4].

This can be explained with an example suppose if there is a patient at home on constant life support where his status is being checked to a health monitoring system present on the cloud. Let's say at a point there is certain issue with respect to his health. Let say that there is some irregularity with his heart beat or his blood pressure is low, there is some fluid being developed and so far. Now what happens is since this system on the cloud is connected to a hospital as well this information would get passed on to the hospital as well there in what would happen is that they would get the complete details with respect to the patient and the important information with respect to the current situation of the patient as well. It is made aware with respect what issue exactly is the patient is facing as well as enable them to dispatch an ambulance immediately to bring the patient to the hospital. Meanwhile once the patient has been picked up and brought back to the hospital there could be medicines, prescriptions, there could also be an operation theatre, made ready in case of emergency there will be doctors stand by who have complete history of the patient. Who have the complete details of the present condition of the patient as well. So, this intend brings in a lot of transparency and reduces a lot of effort and time involved with respect to this. Same thing let's take today's scenario there has to be someone monitoring this patient's health and if there is a fluctuation they need to call the hospital they need to call request for an ambulance and mean while once the ambulance is here they take the patient and they are back into the hospital then again there needs to be a lot of check-ups that need to be done because the doctors are not fully aware again there

is a lot of test that need to be done in certain lead a lot of delay as well in certain emergency cases as such. If a system can do this then this is exactly where our future lies in and what we are definitely move forward to. Expanding interdependence of humans to interact, contribute and collaborate to different things around us to interact, contribute and collaborate building proper.

Benefits of IoMT leads to efficient resource utilization, minimize human effort, saves time, development of AI through IoT, and Improves security. IoT lets achieve the true potential of technology connect various things to the IoT platform. Device virtualization, High Speed Messaging, Endpoint Management, analyses the data collected and use it to build Business Intelligence. Stream Processing, Data Enrichment, Event Store, Integrate, Enterprise connectivity, Rest APIs, Command and Control, Send messages to devices from enterprise and mobile apps, independent of device connectivity.

IV. WEARABLE ELECTRONICS

Wearable electronics such as wearable gadgets like smart watches, smart glasses, wristbands, etc., and fashion electronics with electronics integrated in clothing and accessories like Google Glass or Moto 360 smart watch provides various functions and features to assist humans in daily activities and making us lead healthy lifestyles [8]. Smart watches that run mobile operating systems such as android provide enhanced functionality beyond just timekeeping. With smart watches, the users can search the internet, play audio, video files, make calls with or without paired mobile phones, play games and use various kinds of mobile applications.

Smart glasses allow users to take photos and record video, get map directions, check flight status, and search the internet by using voice commands. Smart shoes monitor the walking or running speeds and jumps with the help of embedded sensors and it can be paired with smart phones to visualize the data. Smart wristbands can track the daily exercise and calories burnt. Wearable IoT devices allow non-invasive and uninterrupted fitness observing of physical parameters. These wearable devices can be in form of belts and wrist-bands. The wearable devices form a type of wireless sensor networks called body area networks in which the measurements from a number of wearable devices are continuous sent to master node such as smart-phone which then sends the data to a server or a cloud-based back-end for analysis and archiving.

Health-care providers can analyse the collected health-care data to determine any health conditions

or anomalies [9]. Commonly uses body sensors include: body temperature, heart rate, pulse oximeter oxygen saturation, blood pressure, electrocardiogram (ECG), and movement with accelerometer, and electroencephalogram (EEG). An ubiquitous mobility approach for body sensor networks in health-care. A wearable ubiquitous health-care monitoring system is presented that uses integrated electrocardiogram, (ECG), accelerometer and oxygen saturation sensor. Fitbit wristband is a wearable device that tracks steps, distance and calories burned during the day and sleep quality at night.

V. IOT SERVICES AND SECURITY

Immediate medical attention especially during times of medical emergency and natural disasters can be provided to the patient. No need for waiting in long queues to see a physician. It eliminates the need to physically go to a medical facility. IoT reduces the distance barriers. It reduced documentation and paperwork. It is cost effective. The growth in IoT space will extensively reduce insurance premiums and potentially reduce the time a patient has to be away from work [5]. Healthcare provisions to everyone can be provided beyond geographical barriers. Better communication to the primary care doctor and specialist happens at the same time can be given because everyone is virtually present in the same room during diagnosis. It can expand to different health service providers [6]. The security of sensitive data such as protected health information regulated under the Health Insurance Portability and Accountability Act that passes through the IoMT for healthcare providers.

VI. CONCLUSION

The remote health monitoring system is useful in healthcare industry where the patients can be monitored and helped form any part of the world. IoT provides services to the patient to get the experts' advice from different geographical locations. The doctors can track device location and send their opinion in less time. Internet on Medical things is improvements over healthcare industry people have started using IoT to manage the health requirements. Wearable IoT devices are used in keeping their regular appointments, changes in their health like blood pressure, glucose level, blood count level etc. All the records are maintained electronically and securely.

REFERENCES

[1] Zanella A, Bui N, Castellani A, Vangelista L, Zorzi M, "Internet of Things for Smart Cities", IEEE Internet Things J 2014; Vol. 1, issue 1, pp.22-32.

[2] Bauer H, Patel M, Veira J, "The Internet of Things: Sizingup the Opportunity [Internet]", New York (NY): McKinsey & Company; c2016 [cited at 2016 Jul 1]. Available from: http://www.mckinsey.com/industries/high-tech/our-insights/the-internet-of-things-sizing-up- theopportunity.

[3] Centers for Disease Control and Prevention. Lifestyle Change Program Details [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; c2016 [cited at 2016 Jul 1]. Available from:http://www.cdc.gov/diabetes/prevention/lifestyle-program/experience/index.html.

[4] HereIsMyData [Internet]. Nijmegen: Radboud University Medical Center; c2015 [cited at 2016 Jul 1]. Available from: http://www.hereismydata.com/.

[5] Cognizant Report Reaping the Benefits of the Internet of Things. Retrievedfromhttp://www.cognizant.com/InsightsWhitepapers/Reaping-the-Benefits-of-the Internet- of-Things.pdf

[6] J.Gubbi,R. Buyya, S. Marusic,M.Palaniswami, "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions Future Generation Computer Systems", Vol. 29, Issue 7, Sept 2013, pp.1645–1660.

[7] Yogita Pundir, Nancy Sharma, Dr. Yaduvir Singh, "Internet of Things (IoT) : Challenges and Future Directions", International Journal of Advanced Research in Computer and Communication Engineering, Vol.5, Issue 3, March 2016, pp.960-964.

[8] Dalyah Y. Al-Jamal, Maryam H. Eshtaiwi, Liyakathunisa Syed, "IOT Based Process Model for Heart Monitoring Process", World Academy of Science, Engineering and Technology, International Journal of Computer and Systems Engineering, Vol:11, No:6, 2017, pp.783-788.

[9] Moeen Hassanalieragh, Alex Page, Tolga Soyata, Gaurav Sharma, Mehmet Akta, Gonzalo Mateos, Burak Kantarci Silvana Andreescu, "Health Monitoring and Management Using Internet-of-Things (IoT) Sensing with Cloud-based Processing: Opportunities and Challenges", IEEE Computer Society, DOI 10.1109/SCC.2015.47, 2015 pp.285-2982

[10] S. Rajguru, S. Kinhekar & S. Pati, "Analysis of Internet of Things in a Smart Environment", Vol. 4. Issue 4, Apr 2015, pp. 40-43.