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Healthcare Applications in IoT

By Md Sanju Islam, Fozilatoon Humaira & Dr. Fernaz Narin Nur

Notre Dame University

Abstract- IoT is a blessing in the field of information and technology. It is developing and deploying day by day. It is working for our betterment in the section of home, environment, retail, security, factory, industry, agriculture, education, energy, healthcare and so on. In the healthcare section, it has applications, technologies, benefits and also challenges with the four-step architecture. As the world is aging with its uprising population, there is not enough opportunity for all to get healthcare. I think Health is the most expensive property one can own. So in the absence of sufficient and quality healthcare, IoT can manufacture the best utilization of its capacity to play a vital role in creating a better world for all of us. This paper represents the basic concept of IoT in the healthcare field.

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Healthcare Applications in IoT

Md Sanju Islam ^α, Foziltoon Humaira ^ο & Dr. Fernaz Narin Nur ^ρ

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I. INTRODUCTION

IoT (Internet of Things) is a process of process that means all the electronic devices are connected with each other in a local area, forming a system. Further this system will connect to build up a bigger system. IoT is a concept or technology which aims to connect all the devices to the internet and help them communicate with each other using the internet as a medium. If we can connect any device to the internet it can be considered as an element for IoT. Some application areas of the Internet of Things are Home Automation, Healthcare, Agriculture, Transportation, Manufacturing, and Environment [1].

Before being on the era of IoT, a patient had to communicate with his doctor through visits, telephone, and text interactions. The doctors or hospitals could not monitor patient's health continuously and give advice accordingly, as there was no way to direct interactions all the time. But IoT has solved this problem by making remote monitoring possible in the healthcare field. It has the potential to keep the patient safe and healthy. It has also increased patient's engagement and satisfaction. As the interactions with the doctor has become more efficient, and trouble-free than earlier days. IoT is making a revolutionary transformation in the healthcare sector. The rest of the paper is arranged as follows: in Sec II, we have discussed the architecture, technologies of IoT based Healthcare system and in sec III, we have talked about the benefits and challenges of IoT in Healthcare sector. In sec IV, we have gone through

those above with the comparison table as a difference and with sec V, we have concluded the paper.

II. TECHNOLOGIES USED IN HEALTHCARE

IoT has a four-step architecture in Healthcare. All the stages are interconnected with each other:

Step 1(Devices): In the first step there will be devices (interconnected) which include sensors, monitors, camera systems etc. that will collect the data.

Step 2(Data Aggregation and Pre-processing): In the second step there will be analog data from the interconnected devices which need to be in total and translated into the digital form.

Step 3(Data Storage): If the data is in total and digital form, it will be moved to the data center or cloud.

Step 4(Data Analysis): Final data is examined with the records and further decisions are made [6].

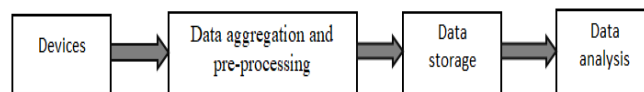


Fig. 1: Four-step architecture

There is a wide range of technologies in the field of healthcare in IoT. Advanced solutions have a deep strong effect on the fast growth of IoT. IoT healthcare solutions are supported by industrial science. Some technologies that can increase the IoT based healthcare services: Ultra-Low Power Sensing, IoT Processors, Cloud Computing, Grid Computing, Big Data, Communication Networks, and Wearable [2].

III. IOT BENEFITS AND CHALLENGES IN HEALTHCARE

By using IoT in the field of healthcare, we will be so much benefited that we can not describe in some words. But we can make an eye on some outstanding benefits of IoT in Healthcare. Such as Improved Treatment Outcomes, Cost Reduction, Faster Disease Diagnosis, Better Disease Management, Proactive Treatment, Improved Management of Drugs and Equipment, Enhanced Patient Experience, Simultaneous reporting and monitoring, End-to-end connectivity and affordability, Data assortment and analysis, Tracking and alerts, Remote medical assistance, Error Reduction [7] [6] [5]. Everything in the world has some difficulties

Author $\alpha\rho\rho$: Department of Computer Science and Engineering, Notre Dame University Bangladesh, Dhaka, Bangladesh.
e-mails: sanjusilam30@gmail.com, h.fafpa21@gmail.com, fernaznur@gmail.com

in their way. As like everything IoT based healthcare services have various challenges that come from the sensors, communication networks and central servers. Some of the main challenges of IoT healthcare devices: Data security and privacy, Integration: multiple devices and protocols, Data overload and accuracy, cost, Energy Consumption of IoT Healthcare Device, Communication Network, Data Storage, and Continuous Monitoring [2] [5].

IV. RELATED WORKS

IoT is an element of the future internet. By reading some correspondent papers, we have got some ideas on IoT in the Healthcare sector. IoT applications in Healthcare can be in a single condition or clustered condition.

Single condition applications such as Glucose Level Sensing, Electrocardiogram Monitoring, Blood Pressure Monitoring, Oxygen Saturation Monitoring, Body Temperature Monitoring. And clustered condition applications such as: Rehabilitation System, Medication Management, Wheelchair Management, Imminent Healthcare, Smartphone Healthcare Solutions [3].

Table 1

Applications	Comparative Paper
Hearables, Ingestible sensors, Moodables, Computer vision technology, Healthcare charting	[5]
Glucose Level Sensing, Electrocardiogram Monitoring, Blood Pressure Monitoring, Oxygen Saturation Monitoring	[2]
Implantable Glucose Monitoring Systems, Activity Trackers During Cancer Treatment, Heart Monitors with Reporting, Medical Alert Systems, Ingestible Sensors, Medication Dispensers, Wireless Sensors, Trackable Inhalers, Wearables to Fight Depression, Connected Contact Lenses, Location Services	[8]
Interoperability/Data Management, Hospital Operations, Remote Patient Care	[9]

V. CONCLUSION

The rising technology Internet of Things is changing the lives by connecting limitless devices. In the near future IoT has a remarkable effect. There will be a net of IoT connecting worldwide devices. It will bring the nations closer. It will help to connect people and get information anytime and anywhere in the world. Health is one of the most important things for the human beings. We should monitor the health of the patients at all times. This paper puts the light on a survey of the healthcare applications regarding IoT. We are exploring IoT applications and here we also are working for additional insights. We also, studying the problems of many healthcare discussions.

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