

IoT Application in Healthcare system

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ABSTRACT

The Internet of Things is a methodology towards making an existence where all things, people, and services are interconnected with one another through the Internet and can connect and work together with one another to contribute towards collection, storage, exchange and monitoring of data. In the advancement of healthcare monitoring systems, the Internet of Things has become a vital factor. The goal of an effective IoT healthcare system is to provide remote monitoring of patient health conditions in real time, to avoid critical patient conditions and to improve the quality of life through intelligent IoT environments. This paper deals with the Internet of Things (IoT) and its applications in the healthcare. The main objective of this paper is to simplify the concept of IoT and aware the reader to the present trends used in IoT healthcare.

Keywords: Internet of things (IoT), IoT technology, medical applications, smart devices

INTRODUCTION

Internet of thing (IoT) is a framework for interconnecting edge computer devices sensors smart phones and cloud computing platform for seamless interaction (Wortmann & Flüchter (2015). IoT means "The internet of things" means interconnection of thing-to-thing to internet that is also called as networks of sensors which are embedded with sensor, software, electronics devices and network connectivity that help to retrieve and exchange the information. In IoT there is advanced connectivity among the electronic device and system. In that all things are connected to the internet with strong connectivity that gives machine-to-machine relation means they can exchange the information and they can communicate without human interaction or without human instruction. In last few year IoT is very popular and spreads widely in the world, due to its advance technology it can control the almost surrounding objects with computerized them parking sensors, weather checking mobile, healthcare application.

Internet of things is network of interconnected electronic computing devices, mechanical object that are provide unique identification and ability to transfer data over the network without human to computer interaction. In IoT all the devices are connected to the internet they are classified into mainly three types which are as follows.

- Devices are used for collecting information and send it.
- Devices that are received the information and take action on it.
- Devices that are perform both operations

The internet of things (IoT) is also called sensors of network. It is a communication of devices with help of internet.

Recently, personalized & connected health reformed the attention trade, where a person with effort will monitor & tracks his health with IoT smart sensible wearable. Now patients will capture their health records on mobile applications as IoT wearable devices has incorporated itself creating it a major facilitate as shown in Fig-1. The newest registrations predict that the National Health Service (NHS) of Great Britain will conserve just about seven billion pounds annually, reducing visits to the hospital (Alam & Hamida, 2014).

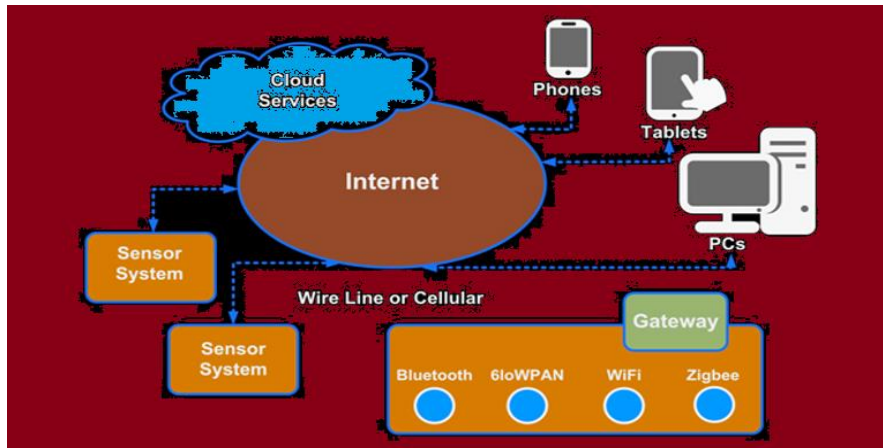


Figure1: Working of IoT wearable devices

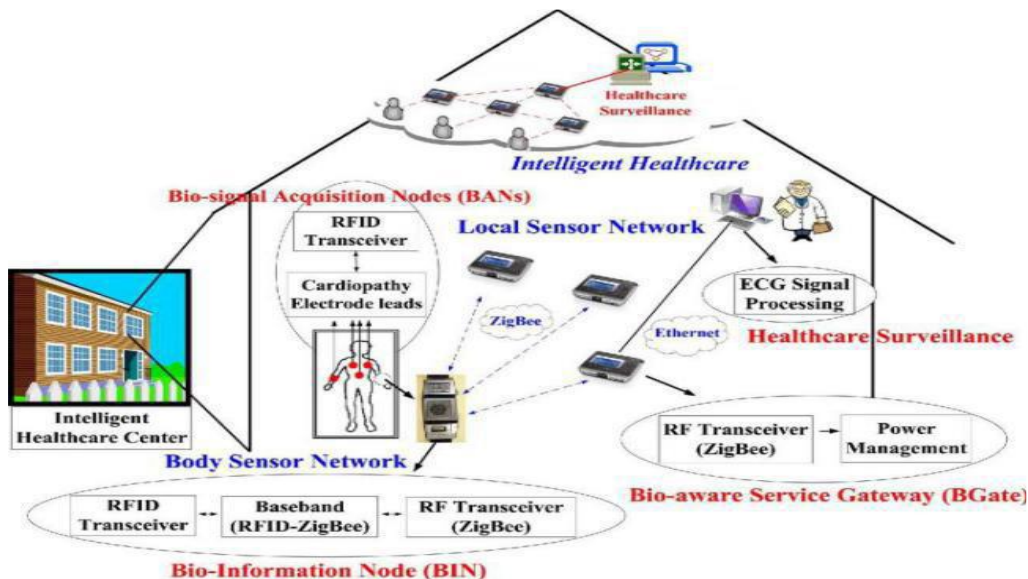


Figure 2: Architecture of Intelligent Healthcare Network

INTELLIGENT HEALTHCARE NETWORK

One of the main features of the Internet is the Intelligent Healthcare Network, called "IoThNet", shown in fig.-2 (Madhu and Kanagotari (2017)). It is mainly used for the sending and receiving of information.

Following are some important terms used in Intelligent Healthcare Network:

A. Topology in IoThNet

The way of arranging nodes (devices) is called topology. Where the positioning of various components, devices of IoThNet that smartly inspects on set of protocol for collecting information. Sensor and medical devices is working together to receive medical information from the patient (Alam & Hamida (2014),Islam et al, (2015)).

B. Architecture of IoThNet

IoThNet is IoT network for healthcare is a functioning organization for presenting blueprint of "IoThNet". It shows the however working processor of intelligence healthcare network receive the information & monitor using medical service getaway & healthcare surveillance to the main "IoThNet" Data center.

IoT TECHNOLOGIES FOR HEALTHCARE

In Healthcare systems, to use IoT, we require various electronic devices and number of technologies for collects data from various object, for medical sensors, cloud computing, Wi-Fi, Radio Frequency Identification (RFID), Bluetooth etc.

A. Radio-Frequency Identification (RFID)

RFID technology is radio frequency identification technology. It is used for identification of objects and collects data automatically. In this case RFID is used for collect information of object. RFID consist of three components namely RFID reader, RFID card, RFTD tag that compute with specific database created. RFID card allows the transfer of data from the card to reader over distance about 10 meters depending upon card used. Here information is transfer using radio waves and many number of tags read simultaneously. RFID technology has already found usage in person identification shopping malls finding lost pets etc. Madhu and Kanagotari (2017)).

B. Medical Sensors

The sensor is used to identify monitor or treat the diseases in medical domain are known as medical sensor. Sensor means small devices used for collect and sense data or information. Medical sensor perform vital role in part of IoT in medical system. They are gather data location, blood pressure, Oximeter, Glucometer, Electrocardiogram sensor, ECG etc.

C. Cloud Computing

Cloud computing means on demand availability resources data and information distributed over multiple location from central server. Cloud computing perform important role in IoT in Healthcare system. Data and information send and received over the cloud network. It provides Internet services and enabling users to perform common operation.

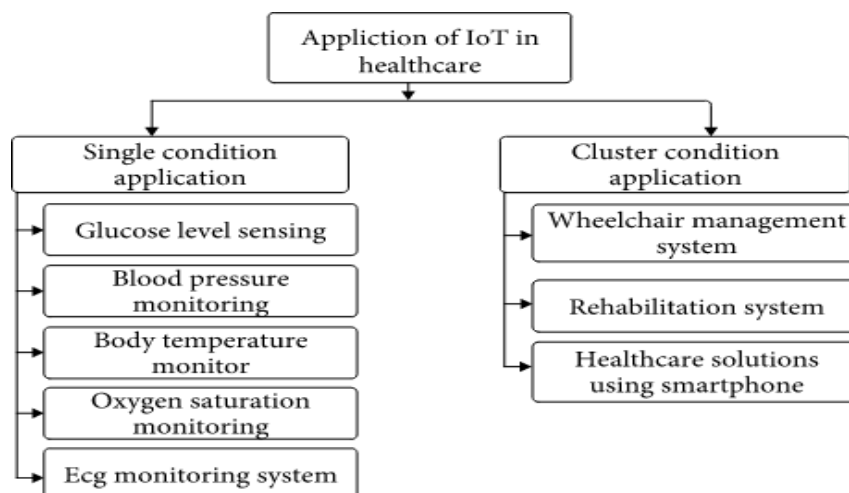


Figure 3. Application of IoT in healthcare (Pawar and Ghumabre, 2016)

APPLICATION OF IoT IN HEALTHCARE

Healthcare IoT devices is fastest growing sector in IoT market value for this sector is increasing which some time called the Internet of Medical Things (IoMT). The combination of IoT with medical sector improves the quality of life by controlling real-time illness and user interaction. Applications used in the medical sector based IoT can be generalized into two conditions types: Single Condition and Clustered Condition, as shown in following fig-3:

1) Single Condition Application:

Single condition application is used for particular or selective disease.

a) Glucose Level Monitoring

Glucose level monitoring is not easy but using IoT application it can done. Some of diabetes patients need to regularly checkup of glucose in his blood. The use of mobile application keeps the eye on the diabetic patients. Glucose monitoring devices eliminate the need to keep records manually, and they can alert patients when glucose levels are problematic (Sreekanth & Nitha (2016).

b) ECG Monitoring

The Electrocardiography (ECG) is used for analyzing the electrical activity of the heart using IoT sensor it use to check the functions and status of hearts. Using mobile application it's providing regular information to doctor as well as patients itself. Patient did not go to hospital without emergency, using this advance technology we save the time as well as health assurance (Sahal et al, 2019).

c) Monitoring the blood pressure

Blood pressure monitoring is important function in human body the patient suffering from blood pressure when the blood flow pumping out from heart is not normal rate. PPT method is used to estimate blood pressure along with the heart rate on small device result will display on mobile. Now days, various Internet of medical things devices based devices capable for blood pressure measuring.

d) Body Temperature Monitoring

In corona virus pandemic most widely used application is smart thermometer it used to monitor human body temperature using appropriate methods. The accurate body

temperature is obtained with accurate measurements. An inaccurate measurement leads to incorrect treatment it may harmful to patient (McCallum & Higgins (2012).

2. Clustered Condition Application

Clustered condition application used to find more than one illness at time. It's capability to address more than one illness simultaneously.

a) Rehabilitation system for human being

A rehabilitation system not only resides to be a place for the needy, but it also changes your lifestyle for good, thereby IoT aims to mitigate issues relevant to the growing population and health expert unavailability. The Body Sensor Network (BSN) is proposed to create a strategy and reconstruct medical resources according to patients 'requirements quickly and automatically (Sahal *et al.*, 2019).

b) Management in Medication system

In the past, patients facing problem for their daily check-ups and even taking their prescribed medicines on time (Khanna & Misra, 2014). Eventually, doctors found problems to search out improved medication for chronic diseases like HIV, cancer, etc. and provided low technology facilities like reminders through messages and mails to patients. Evolution of IoT with medical devices contributed in reducing the medical adherence downside. Currently patients understand that their activities area unit being caterpillar-tracked in each single moment and there's a continual examination of their habits.

c) Management of wheelchair

A smart chair is an automatic chair specifically designed for impaired kinsmen. The motions of the chair square measure connected through Bluetooth with the Raspberry Pi processor that encompasses a WLAN network connected to the cloud (Khanna & Misra, 2014). A processed system has been started to watch the patients through sensors to live integral pointers and sends the info to a standby doctor across the WLAN network. It permits the user to enhance his quality and quality of life (Sahal et al, 2019).

CONCLUSION

Internet of Things perform important role in Healthcares system it providing facility to used machine for human

purpose or for taking decision. IoT devices provide Intelligence in machine for work that more efficiently than a human for IoT application in healthcare system. Various electronic devices use in IoT for communication, data collections, identification and various sensors are used for sense data collected. This makes complex healthcare system in simple way. IoT in healthcare system make change way of treatment tradition way to modern way using smart devices and sensors. IoT smart devices with healthcare system has promoted in living a better quality of life. IoT application in healthcare system perform important role in our life.

Conflicts of interest: The authors stated that no conflicts of interest.

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