

SMART WATCH BASED ON IOT FOR HEALTH MONITORING

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Abstract

The Internet of Things (IoT) has large applications in the healthcare field. Increasing concern of public health day to day there is a need to monitor various health parameters on a daily basis, maintaining good health is very important for every human being. This research paper discusses a portable, integrated, & convenient solution smart watch for monitoring various health parameters such as body temperature, level of oxygen in blood, movement, walking, calories burnt, pulse rate and many more important health parameters on a daily basis. The proposed device is designed with the help of various sensors to measure these parameters remotely with the help of GSM module. These sensors are connected to a microcontroller which transmits data wirelessly via GSM module on the user's smart phone or IP address to which devices are assigned. The output obtained from various sensors are stored in the database to which device is assigned, over a period of time. After successful completion of various parameter measurements, the output results are compared with the threshold for each parameter. If the compared results are not as satisfactory, then a summary with confirmed symptoms is displayed on user mobile. This summary can be uploaded on the cloud for consulting a remote doctor.

Keywords: Health monitoring, IoT, Microcontroller, Smart watch, Sensor, GSM module, Applications.

I. INTRODUCTION

Recent advances in the field of technology have prompted the researchers to claim that people have entered a new era, "an era of technological revolution". The emergence of ICT (information and communication technologies) involving computers, software, telecommunications, etc. has a significant effect on a society's functioning. Innovation in the area of digital space and the recent launch of the IoT (Internet of Things) has made it possible to transform day-to-day operations with the help of technology over the past few decades. In many industrial sectors, such as smart cities, smart transportation, smart parking, smart

construction, irrigation and agricultural systems, medical and even individual fitness sectors, IoT has been introduced. Increased utilization of smart devices such as smart phones, smart televisions and other smart electric appliances, smart watches etc. have enabled the IoT to reach a new level of advancement [1]. These smart devices are generally embedded with sensors and actuators and are capable of establishing a two way connection with the nearby compatible devices or networks via wireless protocols such as Bluetooth, NFC, Wi-Fi etc.

One of the key applications of these smart devices is in the healthcare sector, where exercise can be tracked on a regular basis with the aid of wearable devices such as smart watches, smart bands in terms of physical activity, pulse, sleep data, etc. These devices collect near-real-time data while worn, allowing continuous physical activity tracking. Not only are these devices readily accessible, they are often user-friendly, which has been an additional benefit with the increased use of these gadgets. In addition, these devices can allow contact between patients; family members and warning messages can be sent to family members and health care providers in case of emergencies [1]. Like every other smart device, the smart watch is integrated with sensors such as accelerometers, gyroscopes, optical sensors, touch sensors, ambient light sensors, etc. These sensors can record a broad range of physical activities such as step count, sleep data, movements, postures, pulses, body temperature, etc. It is possible to use this reported data to assess a patient's wellbeing. In addition to that, one can set a target by using these devices that he/she can want to accomplish the workout or physical activity well in advance and to do it by keeping track of all the events. For example, if a person wants to walk 2 km per day for a distance, the same can be set as a target in the watch. The sensors in the watch will record the activity and once the goal is reached, a notification will be sent to the connected device. The purpose of this article is to present a review on the characterization of smart watch application in health monitoring and also to identify the challenges in the use of smart watch in everyday life as well as a reliable device for health monitoring.

Wearable IoT often termed as smart watches, helps us in monitoring our health. It contains various sensors like Gyroscopes, Accelerometers, optical sensors, oximetry sensors, light sensors, wireless sensors and others. Like every other smart device, the smart watch is integrated with sensors such as accelerometers, gyroscopes, optical sensors, touch sensors, ambient light sensors, etc. These sensors can record a broad range of physical activities such as step count, sleep data, movements, postures, pulses, body temperature, etc. It is possible to use this reported data to assess a patient's wellbeing [2]. In addition to that, one can set a target by using these devices if they want to accomplish the workout or physical activity well in advance and to do it by keeping track of all the events. For example, if a person wants to walk 2 km per day for a distance, the same can be set as a target in the watch. There are so many other sensors in smart watches designed in the same way. The next step is data abstraction and data representation once the data is obtained (sensed by using a specific sensor). Such operating systems for smart watches are: Wear OS, Android, AsteroidOS, Sailfish OS, watchOS, Tizen,

Ubuntu Touch. The linux-based operating systems are Tizen and Sailfish OS. Android OS is also used in smart watches.

Due to their simple usability, economical aspect and benefits over conventional mechanical watches, the use of these devices has increased significantly over the past few years. The following are the few limitations that are responsible for less adaptability of these devices, considering all the benefits:

1. Limited battery power
2. Interference/signal noise: There is a possibility that the noise generated by these devices can interfere with the sensor data. In addition that when a number of sensors are working simultaneously, there is a possibility of such interference.
3. Accuracy: In case of co-dependent sensors such as gyroscope and accelerometer, (data obtained from gyroscope and accelerometer can be used to analyses posture detection of the user), absence of real time data from one type of sensor or malfunctioning of one sensor may lead to incorrect results.
4. Watch placement: Proper positioning of the device is required in order to ensure that the data collected is accurate. The sensors embedded in smart watches will work efficiently only when the watch is in contact with the skin. Improper placement of the device may lead to incorrect results.
5. Latency: Since these devices are employed for health monitoring, absence of real-time data can be troublesome. For instance, if there is any kind of delay in communicating with the cloud, the alert message in case of emergency may not be sent on time.
6. Security and privacy: Data security, accuracy are major challenges which have to be addressed properly while designing a smart watch [3].

The Internet of things (IoT) is the interconnection of various devices, sensors, applications, & network connectivity which improve these various devices to collect & transfer information. The determining features of the IoT in healthcare systems is the continuous observation of patients by checking different parameters & providing better results of patient history such as continuous monitoring. Many smart watch devices are equipped with various medical sensors that are present in the ICUs these days [4]. There will be some moment where the doctor couldn't be notified on the right time when there is an emergency, instead of monitoring 24 hours. In sharing the information there might be some difficulty with the doctors related to that specific disease & the problems with relatives & family members. The technology that improves these characteristics is already available. It is not reachable to every person in developing countries such as India due to it not being cost efficient and accessible [5].

A smart watch is an electronics device which appears as a wristwatch and is attached like a band around the wrist. In the last decade, pocket watches replaced the wristwatch as a more suitable device to get at real time information quickly. Thus, smart watches are the most

popular wearable devices, there are various models which are cost efficient already easily available in the market. To display time generally people use wrist watches, people used to wear wrist watches on their wrist which can do more things. Nowadays People can use multiple functions of their smart phones without taking their mobile out of their purses or pockets, which includes tracking and communicating their health status with other people. Instead of all these functions smart watches have been exhibited to be practical & helpful in promoting disease management, wellness , biomedical conditions & behaviors monitoring, in today's society all benefits are important where they have to maintain good health & cutting down costs of healthcare which are in the mind of people [6].

II. CONCLUSION & DISCUSSION

Nowadays People can use multiple functions of their smart phones without taking their mobile out of their purses or pockets, which includes tracking and communicating their health status with other people. Instead of all these functions smart watches have been exhibited to be practical & helpful in promoting disease management, wellness , biomedical conditions & behaviors monitoring, in today's society all benefits are important where they have to maintain good health & cutting down costs of healthcare which are in the mind of people. Privacy and security are important challenges which can be resolved, benefits and efficiency from the device still outweigh the concerns, as long as people use them.

The main aim of this paper can be characterized as following:

1. Gather the real-time medical information about a patient or healthy person via IoT.
2. Classification & Processing information gathered regarding the patient.
3. To interpret and predict any disease or disorder in the preliminary stage itself by data mining techniques, this technique is used to forecast the disease nature & its types or any unwanted changes for which the proposed system was designed. Hence the disease or disorder identified by using the existing idea.
4. To provide IoT based solutions regarding healthcare at anytime and anywhere remotely.

III. REFERENCES

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