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Patient Health Monitoring System

Introduction

The term IoT is formed from two words Internet and Things, Internet means a medium that is used for communicating with other devices and Things means physical devices. Internet of Things is a collection of devices, different types of sensors, software and network that are connected to each other to perform certain tasks. It helps to make any task automated and its main purpose is to make our task easier. (Burgess, 2018)

The Internet of Things is developing rapidly in the field of healthcare helping to provide improved medical services and facilities to patients. Internet of Things medical devices are helping healthcare providers to look after their patients even outside their hospital or clinic remotely. The home monitoring system makes it easier for the patient and doctor to keep track of the patient's health and also saves the patient's time and money. (Meola, 2023)

The Patient Health Monitoring System aims to solve the problem of going to hospitals or clinics for routine checkups as it can be time consuming and costly as well. It also addresses the lack of medical facilities and equipment mostly in rural areas where the doctors and other medical professionals are in very limited quantity. This type of system can help for real-time monitoring of patients with chronic diseases. The Patient Health Monitoring System is a device that is used to measure the body vitals of a person using different sensors and transmit the collected data to its web server which can then be remotely accessed by the doctor. The doctor will examine the data collected by the sensors and monitor their patient remotely without the need for the patient to travel to the clinic. This type of system can also be very beneficial in an outbreak of a virus such as COVID 19. During that time many people were having different symptoms of the virus, getting different diseases and much more was going on. The world was completely shut down for the general public because of COVID 19 at times like this we can use the Patient Health Monitoring System to monitor or measure body vitals of someone without the need of them

going outside. In this way both the public and medical professionals are safe and contribute to a healthy lifestyle. (Khan, 2022)

Application of Health Monitoring System

The Patient Health Monitoring System is an Internet of Things device that helps in making people's life easier. The main goal of this device is to collect data of the person or patient using different sensors and the collected data is sent to the doctor to review and in this way the doctor can keep monitoring their patient without the need for the patient to travel to the clinic or hospital. The doctor can add a prescription for the patient based on the collected data. This device can reduce the number of times a person has to visit their doctor and it can help to save cost as well. The Patient Health Monitoring System measures different body vitals of a person such as body temperature, blood pressures, heart rate, blood oxygen level using different sensors. The collected data are transmitted to the MCU or the main controller of the system that sends the data to the doctor or to its web server. The data can be accessed remotely making it easier to monitor the patient over a long distance. (M. Pravin Savaridass, 2021)

Patient Health Monitoring System allows health workers to remotely measure body vitals of patients without the need of them visiting the hospital. This can be very good for elderly patients for whom travelling can be difficult and tough. The data collected by the sensors measures different things from the patient's body and the collected data is uploaded to the systems web server which can be accessed from anywhere by the doctor allowing them to remotely monitor the patient. Since the system is using the cloud to store and display the collected data it can be used to monitor the patient in real time remotely which saves a lot of time, energy and money for the patient. With the use of different sensors, we can write algorithms that can help us detect any unusual activity in the patient's body. This can help to detect any emergencies in their early stage. (Suliman Abdulmalek, 2022)

History

Since the beginning of mankind different measures have been used to measure the body vitals of people. In 1625, Santorio of Venice and his friend Galileo published methods for measuring

body temperature using a spirit thermometer and timing the pulse rate of the body using a pendulum. Their findings were ignored at that time but later in 1707 Sir John Floyer published “Pulse-Watch” which enlightened the pulse rate. In 1852, Ludwig Taube published the first ever plotted course of fever in a patient and with this respiratory rate was added to the human vital signs. The standard vital signs that were to be monitored by medical professionals at that time were heart rate, respiratory rate and body temperature. The fourth vital sign was added to the list in 1896 when the first ever “sphygmomanometer” was introduced to the medical world. Later in 1903, Willem Einthoven invented the strong galvanometer that can measure ECG of a human body and this invention won him the 1924 Nobel Peace Prize in physiology. (e2aglen, 2017)

With the help and growth of technology, patient monitoring systems were also being developed and improved year by year that helped medical professionals to monitor all four vital signs of a human body i.e. heart rate, respiratory rate, body temperature and blood pressure at once.

Challenges

Patient health monitoring systems are contributing to make the life of people easier and helping them to maintain a healthy lifestyle. They are helpful in reducing the health care costs and managing different diseases easily. Since a patient health monitoring system is a digital device there is risk for data loss and theft. The system might be costly to buy at the beginning as it used different sensors and devices to make the system. It also decreases the communication between the patient and the doctor in person. There are different sensors being used in patient health monitoring systems and they might stop working due to different reasons and there might be interruption in the connection with the network which can raise problems in real time monitoring. If the system is poorly designed and implemented it can give medical errors which can result in negative impact to the patient’s health. The data is stored in the cloud and transferred to the medical professional using the internet and since the data is travelling in cyberspace malicious actors might try to get access to the system to manipulate the data and violate the patient’s legal rights. (Niloofer Mohammadzadeh, 2014)

Current Scenario

Chronic illnesses have been around since an early age. Different diseases such as heart disease, stroke, cancer, chronic respiratory diseases and diabetes are examples of chronic illness. These diseases have taken the lives of many people throughout the world. These diseases are mainly seen in countries with low and middle income compared to high-income countries. According to the World Health Organization, around 17.9 million people die from cardiovascular diseases, 5.5 million people die from stroke and 7.6 million people die from high blood pressure. Chronic diseases are very different from each other and their symptoms and treatment are also different in terms of each other. These diseases need to be detected in their early stage and treatment should be started as they might even end a patient's life if not treated early. (Organization, 2005)

The advancement in 5G technology can be used in patient health monitoring systems to provide a seamless and fast connection to help in real time health monitoring. The development of wearable health monitoring devices has been a huge success in today's world as they are small and cost efficient as well. These wearable health techs can offer continuous data collection for different health parameters. The study of detection and imaging systems indicates a thorough approach to health monitoring systems which can involve technologies like imaging for diagnostics or sensors for detecting any health markers that cannot be seen through naked eyes. These are some of the critical challenges that arise in the patient health monitoring system and that need to be taken into account for successful implementation of the system. (Ahmed Hany Dalloul, 2023)

Future

The first remote health monitoring system was a home blood pressure measurement device that cuffs around the arm, then the user needs to tap a button the cuff starts to tighten and after 30 seconds the cuff relaxes and the device shows the blood pressure on a little screen and that was it for this device. There were no connections with the internet to send the collected data to the doctor or any extra sensors. (Anthony L. Komaroff, 2022)

The future of the patient health monitoring system seems very promising with the advancements in technology that is playing a very big role in this system. As we advance in technology the health monitoring system will also try to be more compact embedded with multiple sensors providing

continuous monitoring of various body vitals. The user experience of today's patient health monitoring system is good but with the advancement in technology the user experience will also keep on improving making the interface easy to use for elderly people and others with less knowledge of technology. There could also be expansion in measuring parameters. As of now the patient health monitoring system only measures traditional body vitals like blood pressure, heart rate, blood oxygen level but later on in future we might be able to monitor and measure blood chemicals, organ function and other relevant biomarkers. This can help to monitor the patient's body in depth enhancing the remote monitoring process. There are many artificial intelligence engines being developed these days and with the help of artificial intelligence and machine learning to analyze the data collected by the sensors and identify any unusual pattern in the patient's body. The nature of data collected is very sensitive so it needs to be protected to protect patient's data and protect their privacy. (Anthony L. Komaroff, 2022)

Conclusion

In conclusion, the Patient Health Monitoring System has increased the capacity of the Internet of Things (IoT) and emerged as a solution in the world of healthcare. The system's main goal is to make people's lives easier and provide them a healthy life. The Patient Health Monitoring System significantly decreases the need to visit your doctor in person for routine checkups which saves cost and time. It provides real-time monitoring of patients suffering with chronic diseases and provides health monitoring in rural areas with lack of medical facilities. The Patient Health Monitoring System allows medical professionals to remotely monitor patients from the comfort of their home which enhances the efficiency of health services and also reduces the burden on patients. The doctors can make decisions and prescribe treatments and medicines to the patient by analyzing their body vitals without the need for physical consultations.

The Patient Health Monitoring System represents a crucial step towards achieving remote, efficient and personalized healthcare. The system will continue to evolve with the advancement in technology contributing to the well-being of the people. We should also consider the ethical and privacy concerns that come along with the Patient Health Monitoring System and keep on

improving the security of this system to ensure the successful implementation and acceptance of the Patient Health Monitoring System.

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