

SYNOPSIS

Report on

Remote Patient Monitoring using IOT, Cloud Computing And AI

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ABSTRACT

Healthcare is a fleetly evolving field of technologies and services. Remote case monitoring has expanded the reach of traditional clinical practice by removing geographical walls as well as clinical limitations. The nonstop advancement of technology and capability has affected healthcare and brought drug, first into our homes and decreasingly into our pockets. Iot fitness tracking systems save your frequent visits to doctors and meetings among victims and medical experts. The future of remote health fits into a consumer world that expects high quality, instant access, and substantiated health propositions. As the demand for individualized drug rises, further bias are released to capture vital signs, well- being criteria , and background data.

In the once decade, many experts have extensively proposed remote case operation to cover cases suffering from several conditions similar as heart complaint, nervous system complaint, blood pressure, body temperature, habitual complaint, diabetes, and fattiness. Cloud Computing is a complex technology conforming of a remote servers that acts as a remote access gateway and connects smart detectors and smart devices with an IoT conception. AI is a unique decision-making approach that uses deep learning(DL) methodologies in conjunction with cloud data sets.

In the clinical setting, this could allow real- time monitoring and pre-emptive doctor/patient interactions to prevent adverse incidents.

This study provides an overview of recent advances in remote healthcare and monitoring in both contact and non-contact styles.

Keywords: IOT, Remote Patient Monitoring, Artificial Intelligence, Cloud Computing in Healthcare

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Introduction

Health is always a major concern in every growth the human race is advancing in terms of technology. Like the recent covid-19 virus attack that has ruined the frugality of countries to an extent is an illustration how health care has come of major significance. In similar areas where the epidemic is spread, it's always a better idea to cover these cases using remote health monitoring technology. So, Internet of Things(IoT) founded health monitoring system is the current result for it.

Remote Patient Monitoring arrangement empowers observation of cases outside of customary clinical settings(e.g., at home), which expands access to human being services offices at bring down charges. The core ideal of this design is the design and fulfilment of a smart case health shadowing system that uses Detectors to track patient health and uses internet to inform their loved bones in case of any issues. The aim of developing monitoring systems is to reduce health care costs by reducing physician office visits, hospitalizations, and individual testing procedure. Each of our bodies utilizes temperature and also pulse acknowledging to read understanding good. The detectors are linked to a microcontroller to track the status which is therefore connived to a LCD screen and also remote association with have the capacity to exchange alarms. If framework finds any sudden changes in understanding heartbeat or body temperature, the framework consequently alarms the client about the patient's status over IOT and furthermore indicates subtle elements of pulse and temperature of patient live in the web. In this manner IOT set up tolerant wellbeing following framework viably utilizes web to screen quiet good measures and extra persists time.

Proposed System:

The implementation of the proposed system involves a three-tier architecture of various technologies coupled together to achieve the goals of the system. The tiers of the proposed system are the patient tier, cloud tier, and physician/specialist tier. The three-level system architecture of the proposed system is described as follows.

A) **Patient Tier:** -The patient tier consists of the patient itself and IoT modules. The IoT module consists of a set of biomedical sensors that measure key data (heart rate, oxygen saturation, body temperature, etc.) and a WiFi-based microcontroller that processes this sensitive data, encrypts it using the AES algorithm, and transmits it directly to the cloud database via Wi-Fi.

The MAX30102 is a high-sensitivity pulse oximeter used to measure heart rate and oxygen saturation. The DS18B20 sensor is used to measure body temperature. This sensor is connected to the ESP8266 NodeMCU microcontroller to control the entire system and provide processing and transmission functions . The ESP8266 NodeMCU is an emerging IoT device capable of small size, low cost, offline Wi-Fi module, fast processing speed and offline application execution.

B) **Cloud Tier:** - The cloud layer serves to provide a secure place for personal health data. The cloud receives confidential data from the patient layer and stores it in an encrypted format, making the system more resistant to external attacks as well as internal attacks that can be launched by the cloud service provider itself. The cloud tier is not charged for data processing but passes the data as-is to the next tier.

C) **Physician/Specialist Tier:** - This layer allows professionals in trusted medical centers to monitor and track critical patient data in real time. This allows professionals to predict unusual activity and prescribe preventive measures to prevent emergencies. A backend

mechanism is used to extract and decrypt the received data and forward it to the dashboard.



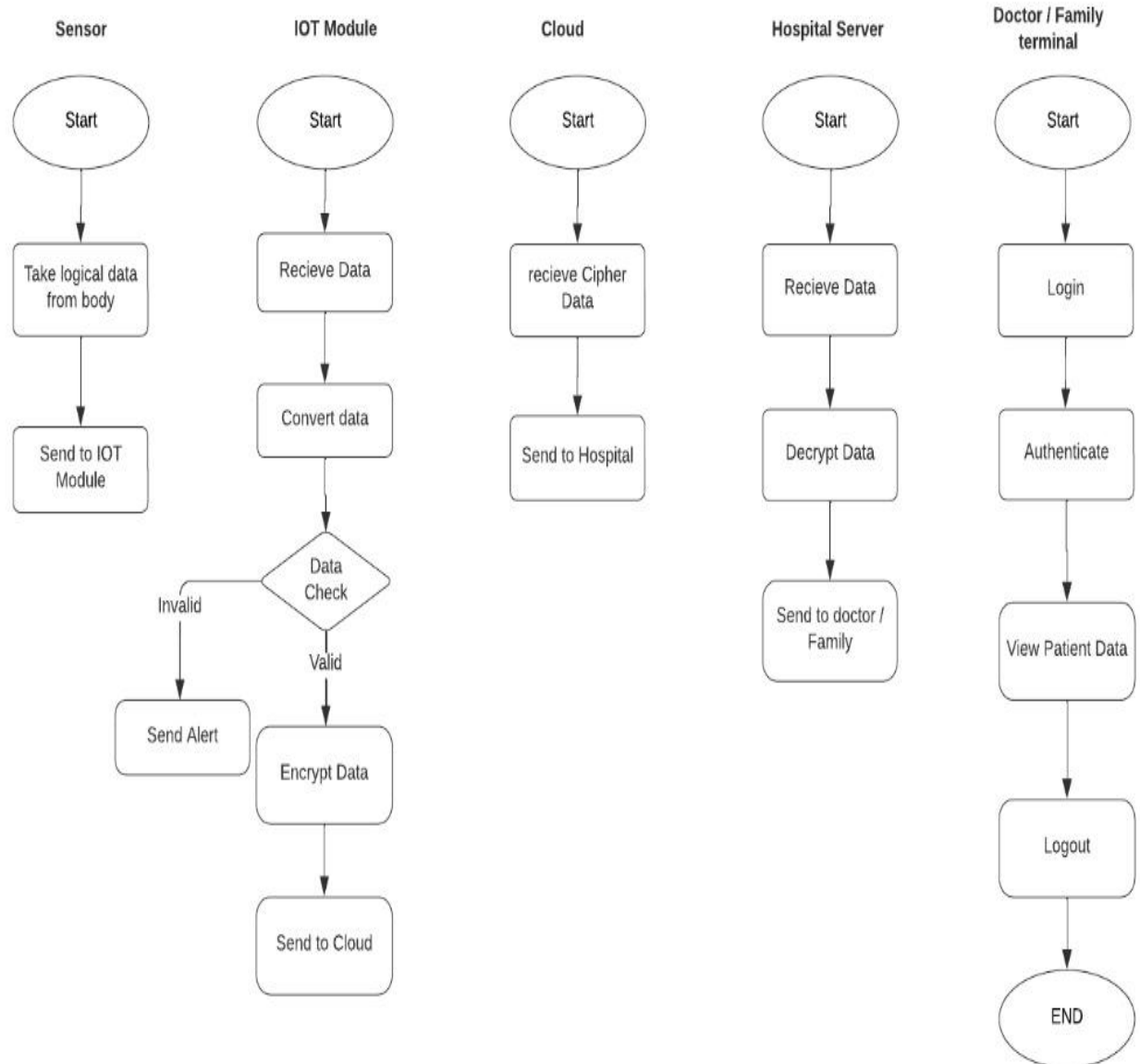
Types of the performer involve in remote health monitoring system :-

- **Patient performer** :- They are the main players in the system, where health is the main concern, the system has to deal with. The patient should be provided with an Android mobile device that can tracks the patient's location (using the built-in GPS receiver) and vital signs (obtained from medical sensors) and a special application containing information about the patient's health and location. The mobile device processes the collected health data, stores it locally and periodically transmits it to the server.
- **Doctor performer** :- They use an Android mobile device to inquire about the current patient's vital signs. A medical record ID must be registered in the system. When a patient has an emergency, the doctor is notified with a server-initiated alarm message. You can also inquire about a patient's health status through their online service.

- **System Administrator** :- The system works as an automated as possible; although the system administrator in some cases is needed to change the workflow or take a decision when there is need for human interaction.

System workflow :-

The system workflow of the remote health monitoring system starts with the sensor parts. These sensors are embedded with the wearable devices using contactless and non-contactless method to the body part. These sensors sense the body part and generates the reading on the wearable devices, so it is called as taking the logical data from the body or the readings from the body. Then these readings are sent to the IoT part which receives the data from the body and convert the data into understandable form and then data is being checked whether it is valid data or non-valid data. If it is non-valid data, then send an alert to the device or the person that the data is invalid and if it is valid data then data is to be encrypted so that any third person can't be able to access that data to make interchange in them and then after encryption the data is to be send to the cloud. Cloud servers are located in data centres all over the world. On the cloud the data are received in the form of encrypted data and the hospital server is having access to the data on the cloud. The hospital server retrieves the data from the cloud and decrypt the data as the data which is retrieve is encrypted and then through that the doctor and family member can be easily accessible to the reading so that further precaution can be given by the doctor, and it can followed by the patient so that he/she can live happy life. The following figure shows the how system works. The below figure shows the workflow of the system.

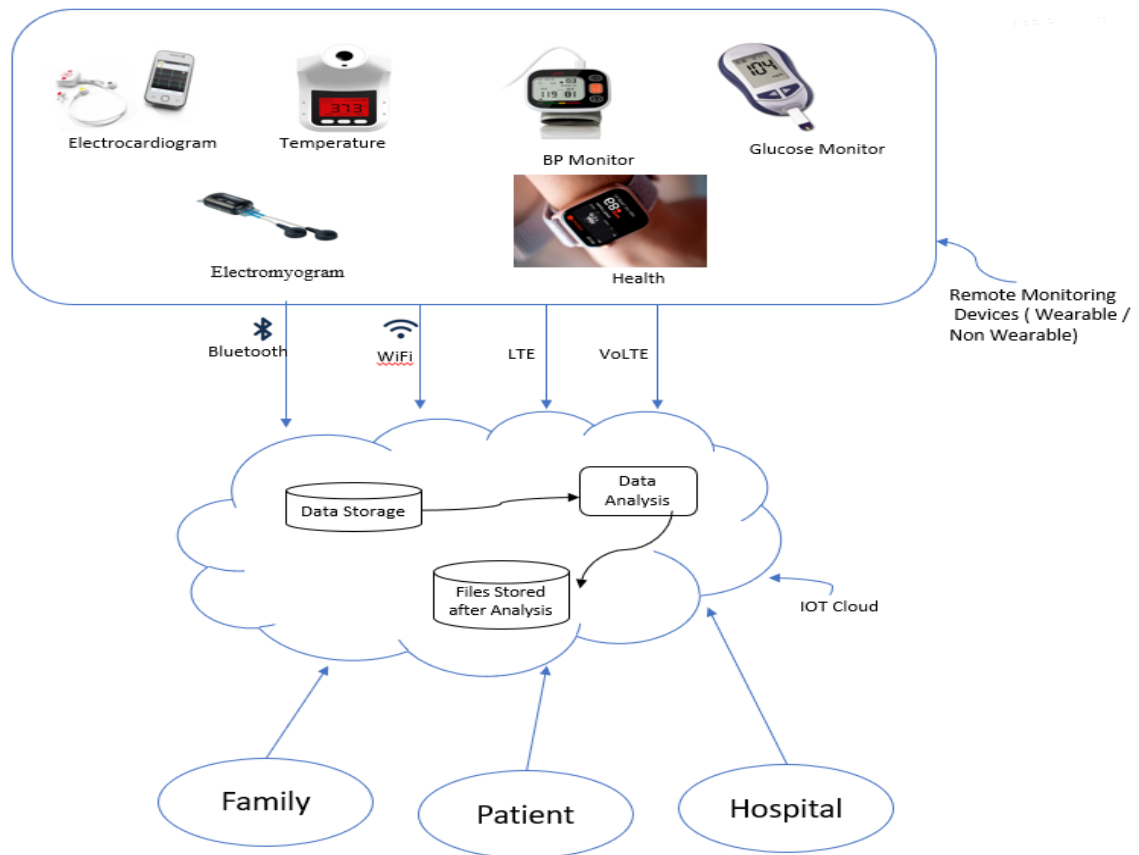


Research Objective

The core objective of this project is the design and implementation of a health monitoring system. The sensors are embedded on the patient body through some wearable devices to sense the temperature and heartbeat and pulses of the patient. Many more sensors are placed at home to sense the humidity and the temperature of the room where the patient is living. These sensors are connected to a control unit, which calculates the values of all the sensors and save the information on the cloud. These calculated values are then transmitted through a IoT cloud for further treatments and diagnosis. Thus, based on the temperature and heartbeat values and the other sensor values, the doctor can decide the state of the patient and appropriate measures can be taken.

Research Methodology

Internet of Things (IoT) is a large-scale connection where information and communication tools connect various embedded devices to the Internet to collect and convert data. A combination of embedded devices with cloud servers recommends a wide range of IoT functionality in a few areas of human life. This paper has paved the way for using cloud based IoT healthcare sensors to streamline patient monitoring. In conjunction with the implementation of a variety of internal capabilities, multi-network wearable sensors can be used for biomedical data collection to transfer patient data directly to robust cloud systems to monitor health remotely.



Research Outcome

Remote Health monitoring systems play a crucial role in health and early prediction health problems. These systems are also a means of reducing medical costs for regular checks and visitors of hospitals. Therefore, the development of a system that provides data on health from the patient, the location of the opponent, or medical professionals was needed as demand has increased. This document uses IoT technology and cloud computing to provide a safe, inexpensive, reliable health monitoring system that provides real-time monitoring panels for biological indicators in a safe environment. The proposed system is enabled for use in AES algorithms to encrypt important signals captured from the sensor before they are sent to the cloud for storage. A NodeMCU microcontroller is used to perform processing and encryption functions and connect to the cloud via WiFi. The proposed system also provides an alert by sending an email to the patient's relatives or coordination specialists if vital signs are outside the normal range.

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