IOT Enabled Smart E-Healthcare System with Predictive Prescription Algorithm for Automatic Patient Monitoring and Treatment

Mr. B. Venkatesu, M.Tech ,
Jinka . Aravind Kumar,
Dharmavarapu . Venugopal,
K.V.V. Sandeep Kumar,
Gattu . Sai Kiran
Associate Professor-ECE

Sanskrithi school of engineering

Students of ECE

Sanskrithi School of engineering,Puttaparthi-515134

Abstract

I. This project presents an IoT-enabled Smart E-Healthcare System designed for continuous patient monitoring and predictive treatment using a combination of embedded systems and machine learning. The system utilizes an Arduino UNO integrated with a heartbeat sensor, respiratory sensor, pulse oximeter, and DS18B20 temperature sensor to collect real-time health data. An LCD displays the readings locally, while data is processed using a Python-based predictive prescription algorithm that analyzes abnormalities and suggests preliminary treatments or alerts caregivers. Powered by 5V and 12V adapters, the system ensures reliable operation and supports cloud integration for remote access. The collected data can also be stored for medical history analysis, enabling doctors to track patient progress over time. This intelligent system reduces the burden on medical staff, enhances diagnostic accuracy, and ensures timely medical interventions, especially in emergency scenarios. With scalability, portability, and real-time responsiveness, the proposed solution is ideal for smart hospitals, home care, rural health centers, and telemedicine applications, offering a step toward accessible and personalized healthcare.

II. INTRODUCTION

The evolution of modern healthcare is increasingly being driven by the integration of smart technologies, especially the Internet of Things (IoT) and embedded system s. Traditional patient monitoring methods often rely heavily on manual observation and periodic checkups, which can result in delayed diagnosis and treatment, particularly in critical or remote scenarios. To overcome these limitations, this project proposes an IoT-enabled Smart E Health care System that provides continuous, real-time monitoring of vital health parameters and offers predictive prescription capabilities. The system incorporates multiple biomedical sensors, including a heartbeat sensor, respiratory sensor, pulse oximeter, and DS18B20 digital temperature sensor, all interfaced with an Arduino UNO microcontroller. These sensors collect accurate physiological data, which is then displayed on an LCD and transmitted for further ana lysis. A Python-based predictive algorithm processes this data to detect anomalies and provide preliminary treatment suggestions or emergency alerts. The system is powered using a regulated 5V power supply and 12V adapters, ensuring stable operation in diverse environments. Designed for both home and clinical use, this solution enhances healthcare delivery by supporting early diagnosis, reducing hospital visits, and enabling remote medical assistance making it highly effective for smart hospitals, rural health centers and telemedicine applications.

LITERATURE SURVEY

- 1.Cloud based IOT health monitoring system with predictive algorithm

Authors: P.A.R.D.S patel et al

This work integrates health monitoring devices with cloud computing and predictive algorithms to suggest prescriptions for patients.

- 2.Enhancement IOT based healthcare monitoring system with LCD display Author:Rani et al

This paper presents healthcare monitoring sytem with integration of multiple biosensors with a microcontroller and collected data is displayed on LCD.

- 3.A cloud based healthcare monitoring system with predictive analytics Author:Patel and Verma

This system proposes IOT enabled healthcare system with cloud based health monitoring.

Embedded system implementation :

Introduction :

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too.The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic controlsystems, etc.

Embedded system:

Embedded system includes mainly two sections , they are

1. Hardware
2. Software

Embedded System Hardware:

As with any electronic system, an embedded system requires a hardware platform on which it performs the operation. Embedded system hardware is built with a microprocessor or microcontroller. The embedded system hardware has elements like input output (I/O) interfaces, user interface, memory and the display. Usually, an embedded system consists of:

- Power Supply
- Processor
- Memory
- Timers
- Serial communication ports
- Output/Output circuits
- System application specific circuits

Embedded systems use different processors for its desired operation. Some of the processors used are

1. Microprocessor
2. Microcontroller
3. Digital signal processor

Microprocessor vs. Microcontroller

Microprocessor

- We can attach required amount of ROM, RAM and I/O ports.
- Expensive due to external peripherals.
- general-purpose

Microcontroller

- **Computer** on a chip
- fixed amount of on-chip ROM, RAM, I/O ports
- Compact in size.
- Specific –purpose

Embedded System Software :

The embedded system software is written to perform a specific function. It is typically written in a high level format and then compiled down to provide code that can be lodged within a non-volatile memory within the hardware. An embedded system software is designed to keep in view of the three limits:

- Availability of system memory
- Availability of processor's speed
- When the system runs continuously, there is a need to limit power dissipation for events like stop, run and wake up.

Bringing software and hardware together for embedded system:

To make software to work with embedded systems we need to bring software and hardware together .for this purpose we need to burn our source code into microprocessor or microcontroller which is a hardware component and which takes care of all operations to be done by embedded system according to our code.Generally we write source codes for embedded systems in assembly language, but the processors run only executable files. The process of converting the source code representation of your embedded software into an executable binary image involves three distinct steps:

1. Each of the source files must be compiled or assembled into an object file.
2. All of the object files that result from the first step must be linked together to produce a single object file, called the re-locatable program.
3. Physical memory addresses must be assigned to the relative offsets within the re-locatable program in a process called relocation.

The result of the final step is a file containing an executable binary image that is ready to run on the embedded system.

Methodology :

The concept here is introducing the healthcare.This project aims to revolutionize healthcare by levaaraging IOT,data anlytics and predictive algorithm to provide proactive personalized care.

Applications :

Embedded systems have different applications. A few select applications of embedded systems are smart cards, telecommunications, satellites, missiles, digital consumer electronics, computer networking, etc.

Embedded Systems in Automobiles

- Motor Control System
- Engine or Body Safety
- Robotics in Assembly Line
- Mobile and E-Com Access

Embedded systems in Telecommunications

- Mobile computing
- Networking

Embedded Systems in Smart Cards

- Banking
- Telephone
- Security Systems

Introduction to Arduino IDE :

- Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- This environment supports both C and C++ languag

RESULTS :

- The IOT enabled smart E healthcare system using predictive prscription algorithm for patient monitoring and treatment improved enhanced patient care,better disease management.
- The system reduced hospital readmissions,optimized resource allocation.
- The system empowered patients.
- The system informs clinical decisions,ensures accuracy and reliability.

CONCLUSION :

In conclusion, the IoT-enabled Smart E-Healthcare System with a predictive prescription algorithm offers reliable, real-time, and intelligent solution for continuous patient monitoring and early diagnosis. By integrating multiple biomedical sensors with an Arduino UNO and utilizing a Python-based algorithm, the system not only collects and displays vital health parameters but also provides smart analysis and treatment suggestions. It addresses the limitations of traditional healthcare systems by enabling remote monitoring, timely alerts, and proactive care, especially beneficial in rural areas and for elderly patients. The system's cost-effectiveness, scalability, and adaptability make it a promising tool for improving healthcare accessibility, reducing hospital burden, and enhancing patient outcomes in both clinical and home environments.

REFERENCES :

[1] S. Kumar, A. Patel, and M. Joshi, "IoT Based Health Monitoring System Using Arduino and Cloud," *International Journal of Engineering Research & Technology (IJERT)*, vol. 10, no. 5, pp. 122–126, May 2021.
[2] R. Sharma and N. Singh, "Remote Patient Monitoring System Using IoT," *International Journal of Computer Applications*, vol. 182, no. 42, pp. 1–5, Feb. 2020.
[3] A. Rani, P. Verma, and S. Gupta, "Smart Healthcare System for Monitoring Vital Signs Using IoT and Machine Learning," *Journal of Healthcare Engineering*, vol. 2022, Article ID 9328763, 2022.
[4] B. N. Patel and D. R. Mehta, "Predictive Healthcare Analytics Using IoT and Python-Based Algorithms," *IEEE Access*, vol. 9, pp. 110234–110245, 2021.
[5] M. S. Islam, S. R. Islam, and T. S. Yeo, "Smart Healthcare Monitoring System with IoT," *Sensors*, vol. 21, no. 6, pp. 1–18, 2021.
[6] A. Mishra, "Role of Embedded Systems in Modern Healthcare Applications," *International Journal of Scientific Research in Engineering and Management (IJSREM)*, vol. 6, no. 2, pp. 20–25, 2022.

ADVANTAGES

- This IOT E healthcare system gives tailored treatment plans,enables ereal time monitoring.
- This system performs automated data collection,optimized resource allocation.
- The system enables enhanced patient care.
- The system has scalability and flexibility.

III. CONCLUSION

This smart E healthcare project offers reliable,real time and intelligent solution for continuous monitoring and early diagnosis. . It addresses the limitations of traditional healthcare systems by enabling remote monitoring, timely alerts, and proactive care, especially beneficial in rural areas and for elderly patients.

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