

IOT-BASED RASPBERRY PI CONTROLLED SECURED HEALTH MONITORING AND APPLIANCES CONTROL FOR THE MULTIPLE DISABILITIES IN A PERSON

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Abstract - The importance of embedded systems is growing continuously. In this paper, we propose a novel signal quality-aware Internet of Things (IoT)-enabled WSN System for health monitoring applications. Disabled persons getting troubled in controlling the home appliances and it is difficult to getting the condition of his health when the person is having multiple disabilities. Although many systems are designed for multiple disabled persons. But it can't be applicable for the single person having multiple disabilities as the existing systems are designed for the different disabilities for the different persons. IOT placing a major role in health care environment brings convenience of physicians and patients, since they are applied to various medical areas (such as real-time monitoring, patient information management, and healthcare management) using the Body Sensor Network (BSN) technology that is placed with the patient. The sensor system is light weight can deploy easily with the patient. By using this healthcare system, patient can be monitored. However, the development of this new technology in healthcare applications without considering security makes patient vulnerable. In this paper, we highlight the major security requirements that are to be considered for calculation of essential parameters such as Heart beat and body temperature can be calculated and send the data to web server. Subsequently, we proposed a secure IoT-based secure system that can be used to control the devices by using either web server or manually patient can be control the devices by operating the switches. The Wi-Fi and Raspberry pi are used in the implementation of sensor module. This system offers a complete low cost, powerful and user friendly way of real time monitoring and control of devices.

Keywords: *Raspberry Pi, Heart Beat Sensor, LM35 Temperature sensor, Embedded Web Server*

I. INTRODUCTION

India has a vast health care system, but the quality of service at hospitals will be different between rural and urban areas as well as between public and private health care system is different due to very less in number of doctors. Despite this, In future India became as a popular destination for treatment for various diseases across the world because of low cost and high quality of its private hospitals. As the technology increases we are finding solution for the problems that we are having in medical health care system.

Systems will end up increasingly more ubiquitous at home soon and will also be very helpful in assistive in control the devices automatically. Appliances monitoring and control system is one of the important measures to be closely monitored in real-time for safety, security and comfort of people.

Using IOT we can able to connect devices and interact with sensor such as heart beat sensor, Temperature sensor. Because of this reason IOT was used in health care system. In our project we use IOT and different wearable sensors which can able to get the information from our human organs and body and the processor used will calculate the information. We will be using sensors in health

monitoring system, which will make the monitoring system more powerful anywhere, any time. With this improves the age of people which improves the quality of life.

For the health care system we are using low power consumption and light weight based wireless sensors. These sensors were be used to monitor the human body functions such as heart beat and environment parameters like temperature. The collected information from wireless sensors will be sensitive which will be used in emergency conditions. Which can also send the information to care taking persons, updates the data using IOT in web server.

Web server information can be monitored by the hospital staff like doctors and can able to precautionary steps at the emergency level.

In this project, we were addressed several security requirements such as usage of wireless sensors in healthcare system, passing the information to web server using IOT e monitor of ECG using web server can work efficiently as per the medical standards and requirements.

II. LITERATURE SURVEY

Wireless Sensors Network (WSN) has wide spectrum of applications in various sectors. In these applications, it is necessary to monitor& control physical environments remotely with great accuracy & ease [9]. As in [7] a wireless sensor network is a system combination of radio frequency (RF) transceivers, microcontrollers, sensors and power supply source. Wireless sensor networks with self-configuring, self-organizing, self-diagnosing and self-healing capabilities have been developed to omit problems or to enable applications that traditional technologies could not fix. Wireless sensor network consists of various sensors and controller. Wireless communication is the transfer of information over a distance without the use of electrical conductors or wires. The distances involved may be short (a few meters as in a television remote control) or very long (thousands or even millions of kilometers for radio communications). Wireless communication involves -Radio frequency communication, Microwave communication, Infrared (IR) short-range communication. Applications of this

communication may involve point-to-point communication, point-to-multipoint communication, broadcasting, cellular networks and other wireless networks. In the last few years, the wireless communications industry experienced drastic changes driven by many technology innovations. There are several systems that allow data to be remotely accessed. As a solution to wireless data collection through the Internet, GSM is a popular choice in several applications.

III. EXISTED AND PROPOSED SYSTEMS

In embedded system with the advancement in Internet technologies and Wireless Sensors Networks, such monitor the environment parameters. Wireless Sensor Network (WSN) is being implemented to monitor and broadcast information from different applications. It is being developed in various fields such as homes and hospitals. WSN consists of a large number of wireless sensor devices working together to achieve a common objective. A wireless sensor device is a battery-operated device that has the capability of sensing physical quantities, provides efficient wireless communication and data storage. Moreover, a WSN has one or more base-stations that gather information all the sensor devices. The base stations provide an interface through which the WSN interacts with the outside world. This work designs and implements a wireless sensor network inside a house that provide users with special needs essential and basic control within a home environment. However, most of the monitoring and control system in the HAN technology are not feasible to people with disabilities such as visually impaired, deaf, and handicapped. A blind person cannot see whether the window is open/close, similarly a deaf person cannot hear the fire alarm. A handicapped person (with hand disability) one the other hand cannot use his/her phone to check if the refrigerator door is open or closed. Hence, most of the existing HAN technologies are aimed at healthy people. Other specialized devices are developed; however, the devices operate only based on one specific disability. This work proposes a framework that enables the integration, monitoring, and control of events within a HAN. This work also proposes a device that integrates with HAN that is targeted for

people with special needs such as deaf and blind people.

The proposed system contains a Raspberry pi based Heartbeat, Temperature monitoring and appliances controlling. The proposed work enables the user to perform his/her daily activities by remotely monitoring and controlling home appliances without depending on others. The input and output are automatically adjusted depending on the user's special needs and environment. The smart home area network (HAN) technology offers users a wide range of services. Users that integrate HANs into their homes can monitor and/or control their appliances remotely and within the house using smart phones or control panels.

The work proposes a wireless sensor network based system consists of three major blocks namely;

- i. Intelligent Appliances Control system for the handicapped & blind persons
- ii. Health parameters Detection system for the older people
- iii. Alerting system for the dumb people

Home appliances will be controlled by the manual keys as well as through the IOT. And for the health updates, sensors are going to be placed on the body. Parameters are can be monitored on LCD as well as on IOT. For the alerting system, a manual key has been placed in order to alert the peoples around him

IV. OVERVIEW OF SYTEM DESIGNED

This section presents main features and the design requirements of the system.

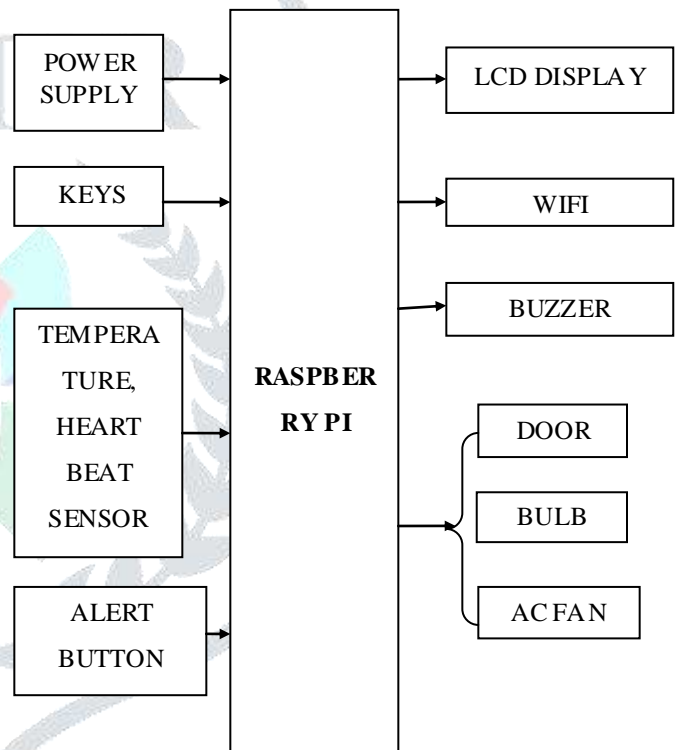
The system consists of an embedded web server ARM11 Raspberry Pi. This ARM11 acts as main processor. Wireless sensor network containing the ARM7 as master controller along with the various sensors such as Heart Beat, Temperature. The ARM hardware is built on single chip module. There are various slots to the ARM11 processor for connecting the various external devices using relay. A memory card can be inserted into the one of the available slot. A regulated power supply is provided to the overall system as shown in fig.1

All the sensors sense the respective data about patient and send this data towards the

controlling unit. Thus all the data is collected by the ARM11 and is maintained at this location.

Here, the data is stored in the data base. At this stage signal conditioning is done and only required amount of data is sent forward. Thus a successful communication is achieved between a server and client side by using this type of system. Thus personal computer & a Smartphone will continuously monitor all the data from remote processing unit and compare with the value preloaded process structure.

Fig1:Block diagram of implemented system



Power Supply:

This section is meant for supplying Power to all the sections mentioned above. It basically consists of a Transformer to step down the 230V ac to 12V ac followed by diodes. Here diodes are used to rectify the ac to dc. After rectification the obtained rippled dc is filtered using a capacitor Filter. A positive voltage regulator is used to regulate the obtained dc voltage. Micro USB socket 5V, 2A is connected to kit.

Temperature sensor:

Thermistors are a temperature sensing device. It is used to sense the temperature. In this

project by depends on the value of temperature the exhaust fan will run.

Pulse sensor:

This sensor senses pulse rate or the heart beat of the person. For this updates, it will be placed to the person finger tips

Keys:

A specific application has been assigned to each key. By using the keys, appliances and buzzer will operates

Alert button:

As the person is dumb, he cant express his emergency condition. So this is used to produce a alarm when the person presses that.

Wi-Fi:

Internet connection has to be provided to the kit to get the continuous updates from the person.

Buzzer:

Here the buzzer has been placed to produce the alarm or a long beep sound.

Bulb:

A low voltage bulb has been placed. When person presses the key or clicks on the link on IOT, it will turn ON.

DC Motor:

DC motor is an output for this project. And DC motor is connected to microcontroller. And this motor controlled by the microcontroller with the respective inputs given by us. Its speed will be varied according to the speed set by the switches.

DC Fan:

Dc fan is the output section. Dc fan needs dc supply. So we can directly add the dc motor to micro controller with transistor logic

LCD Display:

This section is basically meant to show up the status of the project. This project makes use of Liquid Crystal Display to display / prompt for necessary information.

V.IMPLEMENTATION OF THE SYSTEM

The design and implementation consists of two sections as

5.1. Hardware design

5.2. Software design

The hardware design consists of various sensors, Raspberry Pi processor package, GSM modem, a far off computer & an android Smartphone. All these hardware" s are interfaced with each other. We're developed a coding in Python in IDE of python programming. Additionally we're making use of RTOS to manage the whole project and to provide a outcome in actual time.

HARDWARE DESIGN:

To implement the overall system we used different hardwares.

5.1.1. Raspberry Pi Processor:

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation. It has a Broadcom BCM2836 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU.

Its GPU provides Open GL ES 2.0, hardware-accelerated Open VG, and 1080p30 H.264 high profile decode which is capable of 1Gpixel/s, .5Gtexel/sor 24GFLOPs with texture filtering with 1GB RAM[4].It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage. It can be connected to a network using an external user-supplied USB Ethernet or Wi-Fi adapter. Generic USB keyboards and mice are compatible with the Raspberry Pi. The Raspberry Pi primarily uses Linux-kernel-based operating systems. A GSM modem is directly inserted in one of the processors slot.

5.1.2 Web Server:

Web server used to display the temperature sensor value, gas sensor and Light Intensity levels will be displayed. Along with these it can also displays the status of loads whether in the on state or off state. We can control these devices based on links given.

SOFTWARE DESIGN:

A. Python:

Python is a widely used general-purpose, high-level programming language. Its design philosophy emphasizes code readability, and its

syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C. Python supports multiple programming paradigms, including object-oriented, imperative and functional programming or procedural styles. It is a scripting Language and it's executing the code line by line.

B. Raspbian wheezy:

The Raspbian wheezy is another important software part which deals with the Raspberry Pi. Raspbian wheezy is an unofficial port of Debian Wheezy arm of with compilation settings adjusted to produce code that uses hardware floating point, the "hard float" ABI and will run on the Raspberry Pi. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. There are various languages used for web design that have developed over the life time of World Wide Web. Generally web pages are designed using HTML or Hyper Text Markup Language. HTML pages are used for data communication between the client and the server. In the embedded web server, web pages are selected as the media of interaction. Here we are developed a PHP page. The PHP Hypertext Pre-processor (PHP) is a programming language that allows web developers to create dynamic content that interacts with databases.

VI. RESULTS & DISCUSSIONS

In the proposed system, parameters such as heart beat and Temperature of the body can be calculated by using wireless sensors and devices can be controlled by using manual operation or by using web server.

Procedure for monitoring the values:

- i. Create Wi-Fi hotspot from mobile with the following details (Username: project, Password: project8125) to provide the internet connection to the kit.
- ii. Sensor values have been obtained on LCD as well as on links given in Fig7.

- iii. To view the sensor values in web, Open the link given in fig7 and enter Username: sensors016 and Password: sensors016.
- iv. Sensor values can be appeared on web in graphical view and in Table view.

Procedure for controlling the appliances:

- i. By using the links provided in Fig11 the appliances will be controlled.
- ii. By activating the individual links the assigned appliances (written in program) are activated.
- iii. Alert button has been placed in Keys section, it produces alarm in person pressed it.

Fig 2: Prototype of proposed system



Fig 3: Login to Monitoring the Sensor values on web page

Fig 4: Total system response after activating all Appliances



VII. CONCLUSION

The design and the development of an interactive monitoring and controlling system will have WI-FI communication and Web-based measurement and control systems. The Web based monitor and automatic control of equipment is forming a automation field. Proposed design ensures that Disabled person can control the all appliances by the keys provided to him. Alert button produced Alarm when person is in critical situation and health monitoring can be done from Display or via IOT.

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