IOT Based Architecture of Web and Smart Home Interface

Jeffin Thomas[1], Manu K Mathew[2], Rogin P Mathew[3], Shahana Habeeb Mohammed[4]

[1,2,3]*B.Tech Student, Mount Zion College of Engineering, Kadammanitta, Kerala, India*

[4]*Assistant Professor, Department of Electronics and Communication Engineering, Mount Zion College of Engineering, Kadammanitta, Kerala, India*

Abstract- **Today, technology has become an integrated part of human lives. It continues to influence many aspects of people's daily life and provided better social communication and good time management etc. Home automation stand as an introduction of technology into home atmosphere to provide good control and protection of equipments. Hence internet of things (IoT) plays a vital role in the extension of internet connectivity into diverse range of devices and everyday objects that employ embedded system to interact with the extraneous environment. This paper proposes a new technology of IoT for indoor environment monitoring and control. The system characterized by low cost, light weight, easy to expand. Our proposed system employs different kinds of sensors to collect the surrounding information and gave this information to raspberry pi through I^{2}C, serial port, GPIO hardware communication technology. Our experiments manifest that proposed system can employ on the good linkage control to the indoor environment. This system provides good approach to reduce the waste of manpower.**

Index Terms- IoT, I2C, Sensor, Server

I. INTRODUCTION

IoT devices are a part of the concept of home automation, which can include lighting, air conditioning, security systems, etc. Long term benefits could include energy savings by automatically ensuring lights and electronic devices are turned off. A smart home or automated home can be based on a plat form that control electronic devices. Smart home is a modern homes that have electronic devices that can be controlled by the owner via mobile based android application.

Smart home enabled devices can include appliances like AC, water pump, light, fan, motor, etc. It enables owners to remotely or by the use of a smart phone controls electronic devices in the house and it will have a benefit of more energy efficient and time savings. A drawback of smart home is their complexity and security. One of the major advantages of home automation is providing peace of mind to house owners, allowing them to monitor their homes remotely.

IoT is the extension of internet connectivity into physical devices .In smart home IoT is used to collect information and send it or receive the information and then act to it or both. IoT is a simple concept it taking all the things in the world and connecting them to internet. IoT allows business and people to be more connected to the world around them. IoT evolved due to convergence of multiple technologies, real time analytics, machine learning, commodity sensors and embedded systems. IoT concepts have privacy and security concern.

In this study we proposed a set of intelligent indoor monitoring and control system after analysis of existing system and studying the key technologies for IoT. Our system uses various types of sensors to obtain environmental information and passes these information to Raspberry Pi through I2C, serial port, GPIO hardware communication technology. Raspberry Pi will control the hardware to make adaptive response after analyze and interact with server. This system compared to other systems is light weight, low cost, easy to expand for specific needs and so on. Our research thoroughly study the intelligent monitoring through testing in simulation of the house.

II. RELATED WORKS

In recent years the IoT has become a new topic of world concern, which provides a new direction to the indoor environment, intelligent detection and control system.

A. Design and implementation of indoor environment monitoring and control system

Zhi-xiao Tu, Cheng-chen Hong and Hao Feng proposed an intelligent home model based on internet of things. The model detects the indoor environment through different sensors, uses the Raspberry Pi to access the information and pass the information to the server in the internet. User can control the device by mobile phone an application We Chat [1].

B. The Design and Implementation of Smart Home System

Shen Bin proposed an intelligent home model based on the Internet of things. The model detects the indoor environment through various sensors, uses the Zigbee wireless network to access the information gateway gateway, and then forwards the information to the servers in the Internet. Users can view the information of each subsystem in real time and control the operation of home equipment through a mobile phone or a browser or client software on the computer [11].

III. SYSTEM CONFIGURATION

A. System Overview

Intelligent environment monitor and control system as a IoT system, it is generally divided into two parts, hardware and software. The main role of hardware is to collect indoor environment data, such as temperature and humidity; abnormal changes etc, and forward these parameters to the software. The main uses of this software are (a) User interface (b). Receives parameter (c). Analyses parameter. (d). Controls the hardware to respond. (e) To prospect data real time requirements, hardware connect with server through Wi-Fi and software use the primitive http connection.
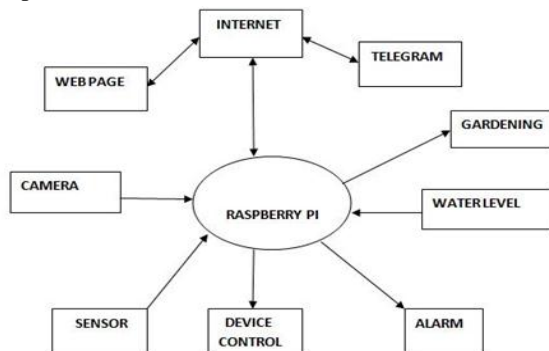

Fig.1. Block Diagram

B. System Hardware

1) Raspberry Pi

Raspberry Pi is a tiny credit card size microcomputer based on ARM. It is the core of the hardware which is Quad Core Cortex A53 with 1GB memory, HDMI high definition video output interface and 3.5mm audio line output interface. It has 100BASE-T Ethernet interface and Bluetooth 4.1 wireless technology. The important thing for this equipment is that it has a 40 pin GPI port including 21 GPIO session, 5V power input session and other common hardware communication. It can control the different data received by the sensors and forward them to the server, and execute server's commands.

2) Sensors

In order to see the temperature and humidity parameters and the changes of the sited environ in real time, the system uses three data propertied equipment: Temperature and humidity sensor, PIR sensor, Fire sensor. These sensors are responsible for monitoring indoor environ parameter and forward them to Raspberry Pi. When the users inspect their home environment quality by the software, the server will push real time data, which can make users perceive the household environment seemly and quickly. When the indoor environment point overtake the threshold, the system will issue a warning to the user and make the relevant treatment. .

3) Control equipment

In order to make the experiment more versatile, when the indoor environment reading are abnormal, we use the imitation control device to imitate the server's response. Our imitation control device include fan, lights, alarm and water level controller etc. fan can be controlled by user, light can stimulate the real lights. Water level controller control the over flow of water from the tank and also it will refill the tank when the water is low, alarm can give out the alarm when the environment is not normal by a buzzer and server notification.

C. System Software

We use the python to develop the entire project. For the general operation of the user such as controlling the device, the user sends the request to the server through the chart ID of the telegram. After the disturbing is verified the instants arrive at the

controller .The controller routine the data by the service logic and returns to the user. In the server we use timing task to achieve the purpose of timing switch equipment. In the connection of hardware and software, the server will set a time delay to ensure that the hardware data in a timely manner and accurate and accurate implementation of user instruction.

D. Function Introduction

1) User Linkage

After users register in telegram application and join in our bot and obtain a chat ID, they can proceed in user linkage operation. User only need to fill user ID with the number receipts from registration, and through internet make a connection between Raspberry Pi and Server, and then experience full services from the architecture of web and smart home interface.

2) Indoor environment information

After completing use linkage, users can check parameters of the indoor environment in telegram. With these parameters, users can control the device to adjust the indoor environment. In addition an indoor environment has an abnormal stage the system will make relevant treatments.

3) Gating and security

Press the button on the telegram and door will open, when the door is open PIR sensor does not operate but when door is locked sensor detect somebody in the room. And user can see the scene inside the room through camera.

4) Remote Control

Through the internet users can remotely control the devices by telegram, including electric light air conditioning, fans. It provides users with great convenience, with low cost but good reliability.

5) Timer Setting

Our system has the feature of setting the timer switch, allowing the user to set a daily automatic switching time for the devices in the system. The controlled devices can keep the running stat automatically during the set time according to users need.

6) Remind of Abnormal

When the abnormal situation appear such as fire accident the system will alert the user immediately through the telegram and an alarm sound will come, while taking measures to reduce or avoid loss.

IV. EXPERIMENT ANALYSIS

After design we made and use test board with different sensors and controllers to verify likelihood of the system.

A) Test Equipment

1. Sensors: DHT11 Digital temperature and humidity sensors; PIR sensor; IR sensor.
2. Processor: Raspberry Pi 3 model B equipped with micro sd card.
3. Controllers: Fan; Light; Buzzer alarm; door suction controller; Water Pump.
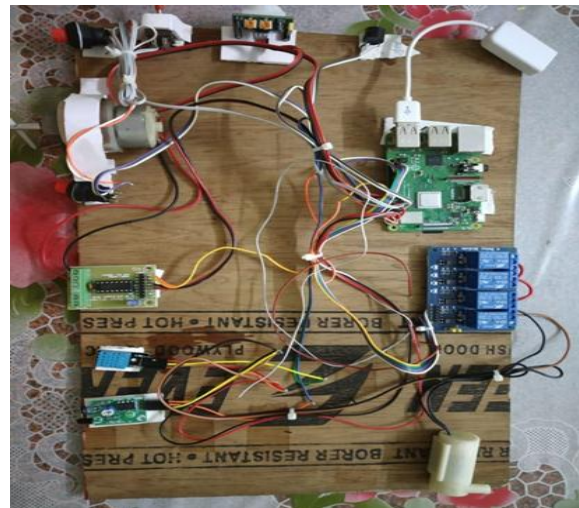4. Others: 220V power supply, small wooden doors
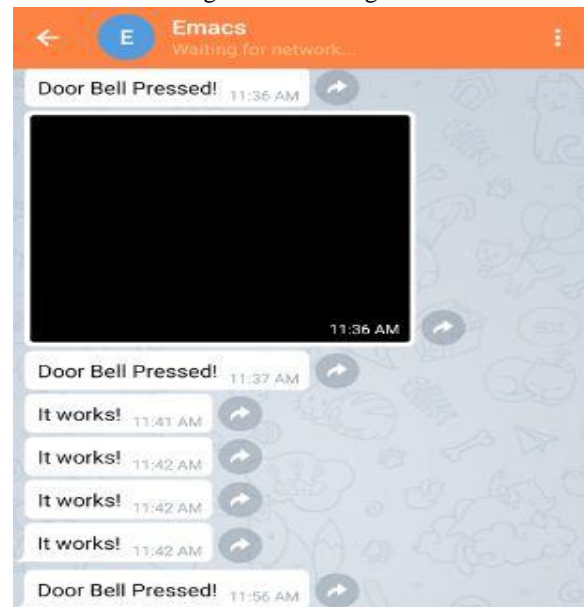

Fig.2. Model Diagram

Fig. 3. Page in Telegram

B) Analysis of test result

Through this test, we can see that our system can meet with alternate situations in the simulated scene and our system reliable in week of probation. Our project proved that Raspberry Pi can interact with various sensors and devices. Through carrying of various types of indoor indicators. If we need to further expand the functions in the system, only need to add sensors that can monitor other environmental data. The experiment proved that the system can initially achieve the data.

V. CONCLUSION

The advantages of this model are as follows;
- Simple and compact structure, stable and reliable.
- Using smart locks users can grant or deny access to visitors. By smart locks the owner can identify the guest who comes to the home and by use of the application unlock the doors for them.
- Household system monitors
- With security camera and a web page, resident can monitor their home when they are away.
- Friendly user interface which changes according to environmental.
- Automatic adjustment combined with remote control of user.
- High scalability

The future development of IoT based architecture of web and smart home interface system solutions can be concentrated in more areas. It can integrate more types of electronic equipment for monitoring and control. Therefore IoT based architecture of web and smart home interface model can meet the specific needs is of great significance to practical use and future development of IoT based architecture of web and smart home interface.

ACKNOWLEDGMENT

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