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IMPLEMENTATION AND RECENT PROGRESS IN CLOUD-BASED SMART HOME AUTOMATION SYSTEMS

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ABSTRACT:
Now-a-days with rapidly growing the technology, the customers are showing interest in smart home concepts. The home appliances industry has introduced Wi-Fi enabled appliances. Manufacturers provide firmware that allows users to control appliances using smart phones from anywhere. Smart appliances, firmware, and smart phones connected to a cloud server for data storage to form a simple smart home automation system (SHAS).This project explains how SHAS is implemented and its recent progress. The proposed modifications in this investigation is the addition of GSM module to the existing SHAS. So that message about home appliances comes to the mobile.

I.INTRODUCTION

1.1 Objective:

Home automation has been a feature of science fiction writing for many years, but has only become practical since the early 20th Century following the widespread introduction of electricity into the home, and the rapid advancement of information technology. Home automation refers to the application of computer and information technology for control of home appliances easily. It is a automation of the home, housework or household activity. Home automation may include centralized control of Light, Appliances, Temperature and other systems, to provide improved convenience. Comfort, energy efficiency and security. Home automation for the elderly and disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care. The popularity of home automation has been increasing greatly in recent years due to much higher affordability and simplicity through Smartphone and tablet connectivity. The concept of the "Internet of Things" has tied in closely with the popularization of home automation. Through the integration of information technologies with the home environment, systems and appliances are able to communicate in an integrated manner which results in convenience, energy efficiency, and safety benefits. As we are using Arduino Uno. It is a popular open source single-board microcontroller, descendant of the open-source Wiring platform, designed to make the process of using electronics in multidisciplinary projects more accessible.

1.2 Motivation:

Proposed system is that it will detect the human, smoke and control temperature of the room. The PIR sensor detects the motion of the humans. The smoke sensor helps from the leakages of the gas. Not only that, it will send the SMS to our mobile.

1.3 Documentation Outline:

This project documentation includes with ten chapters. First chapter describes the introduction to the project i.e. objective, motivation, proposed system. Second chapter provides literature review of the project. Third chapter emphasizes regarding the embedded system. Fourth chapter explains regarding the project description. Fifth chapter explains regarding Hardware elements utilized in the project. Sixth chapter offers the code elements utilized in the project. Seventh chapter deals with Results obtained. Eighth chapter explains blessings of the project. Ninth chapter offers Conclusion. Tenth chapter describes Future Scope.

1.4. Proposed System:

Thus the study of these papers has helped us to propose a system which will monitor the home appliances. In this system we are additionally using the GSM Module, so that it will comes the message to our mobile. Here we are using three sensors namely PIR Sensor, Smoke Sensor, Temperature Sensor. We have to install the TCP Telnet app in our phone. The entire process of the three sensors data will be stored in that app it will act as a cloud.

II.LITERATURE REVIEW

1. "**Java based Android application**" by **R.A.Ramlee, M.A.Othman, M.H.Leong.** This paper describes an IoT based home automation system which makes use of a micro-controller and a java based android application. The micro-controller used is ATmega328 In this paper a low cost and flexible home control and monitoring system using an embedded micro-web server, with IP connectivity for accessing and controlling devices and appliances remotely using Android based Smart phone app. The proposed system does not require a dedicated server PC with respect to similar systems and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality. To demonstrate the feasibility and effectiveness of this system, devices such as light

switches, power plug, temperature sensor and current sensor have been integrated with the proposed home control system.

2."**Implementation of new home automation system using Wi-Fi**" by **M.H.Leong**. In this paper a design and prototype implementation of new home automation system that uses Wi-Fi technology as a network infrastructure connecting its parts. Their system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors users' home. Users and system administrator can locally (LAN) or remotely (internets) manage and control system code. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of home automation system. Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on Wi-Fi network coverage. System supports a wide range of home automation devices like power management components, and security components. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

III.PROJECT DESCRIPTION

This chapter deals with working of "Implementation and recent progress in cloud based smart home automation". It can be simply understood by its block diagram.

3.1 Block Diagram:

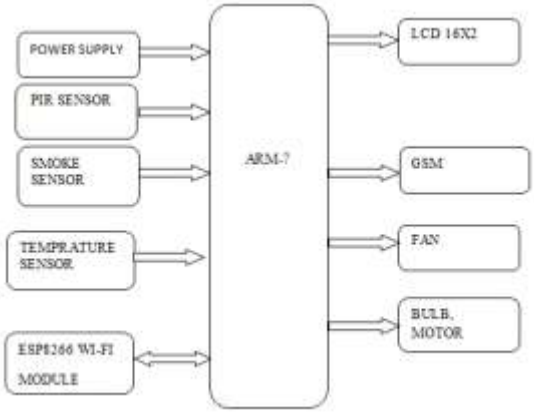

Fig 1: Block diagram

3.2 Working flow of the project:

- First and foremost all the components PIR Sensor, Smoke Sensor, Temperature Sensor, GSM Module, Wi-Fi Module, Buzzer and LCD Display are initialized by connecting the whole system to the power supply.
- Connect the Wi-Fi module to the smart phone wirelessly.
- After connecting the Wi-Fi module to the smart Phone. After this open the 'TCP Telnet app' and connect the host address it will shows 'connected' and then it will shows 'Send SMS to store mobile number' on the LCD.
- We have to send the SMS to the SIM present in the GSM Module and then the kit will start working.
- The PIR Sensor detect the humans and the bulb will switch 'ON' and after sometime the bulb will automatically switch 'OFF'.
- The Smoke sensor detects the smoke and the motor will switch 'ON and after the motor automatically Switch 'OFF'.
- The temperature sensor controls the temperature and the fan will switch 'ON' and after sometime the fan automatically switch 'OFF'.
- The process of this entire activity it will sends the S.M.S to our mobile.

IV.DESIGN OF HARDWARE

This chapter briefly explains about the Hardware implementation of authentication

4.1 LPC2148 (ARM7) MICROCONTROLLER:

The LPC2148 microcontrollers are based on a 32 bit ARM7TDMI-S CPU with real time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory of 512kB. For critical code size applications, the alternative 16-bit Thumb mode reduces the code by more than 30 % with minimal performance penalty.

Due to their tiny size and low power consumption, LPC2148 microcontrollers are ideal for the applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTS, SPI, SSP to I2Cs and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

BLOCK DIAGRAM OF LPC2148 MICROCONTROLLER:

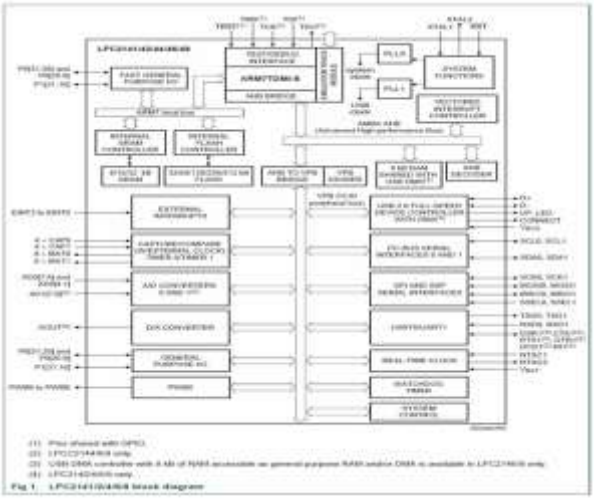

Fig 2: Block Diagram of LPC 2148 Microcontroller

4.2 POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

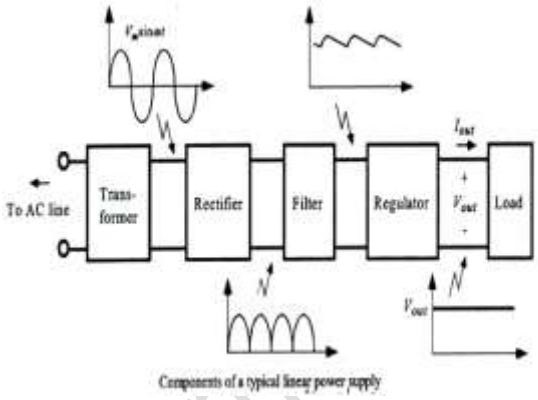

Fig 3: Block Diagram of Power Supply

4.3 PIR SENSOR:

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin.

5.3.4. Quick Start Circuit:

Note: The sensor is active high when the jumper (shown in the upper left) is in either position.

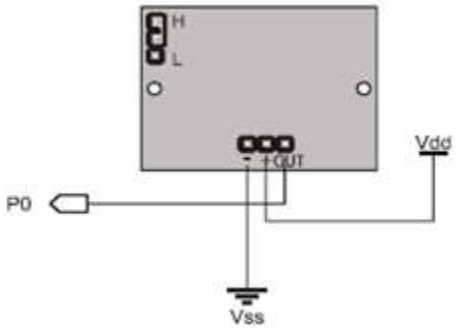

Fig 4: Quick start circuit

Theory of Operation

Pyro electric devices, such as the PIR sensor, have elements made of a crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element change the voltages generated, which are measured by an on-board amplifier. The device contains a special filter called a Fresnel lens, which focuses the infrared signals onto the element. As the ambient infrared signals change rapidly, the on-board amplifier trips the output to indicate motion.

Pin Definitions and Ratings

Pin	Name	Function
-	GND	Connects to Ground or Vss
+	V+	Connects to +5 VDC or Vdd
OUT	Output	Connects to an I/O pin set to INPUT mode

4.4. Smoke Sensor:

MQ2

Fig 5.: Smoke Sensor

DESCRIPTION:

MQ2 flammable gas and smoke sensor detects the concentrations of combustible gas in the air and outputs its reading as an analog voltage. The sensor can measure concentrations of flammable gas of 300 to 10,000 ppm. The sensor can operate at

temperatures from -20 to 50°C and consumes less than 150 mA at 5 V.

4.5. TEMPARATURE SENSOR (LM35):

In order to monitor the temperature continuously and compare this with the set temperature preprogrammed in the microcontroller, initially this temperature value has to be read and fed to the microcontroller. This temperature value has to be sensed. Thus a sensor has to be used and the sensor used in this project is LM35. It converts temperature value into electrical signals.

LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. . The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range.

The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air.

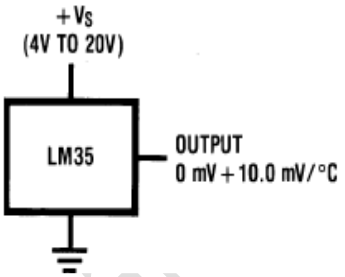

Fig 6: LM35 circuit Without Resistor

The characteristic of this LM35 sensor is: For each degree of centigrade temperature it outputs 10milli volts.

4.6. ESP8266 WIFI MODULE:

The ESP8266 is a low cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif systems.

The chip first came to the attention of western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that

there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.

The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi. The successor to these microcontroller chips is the ESP32.

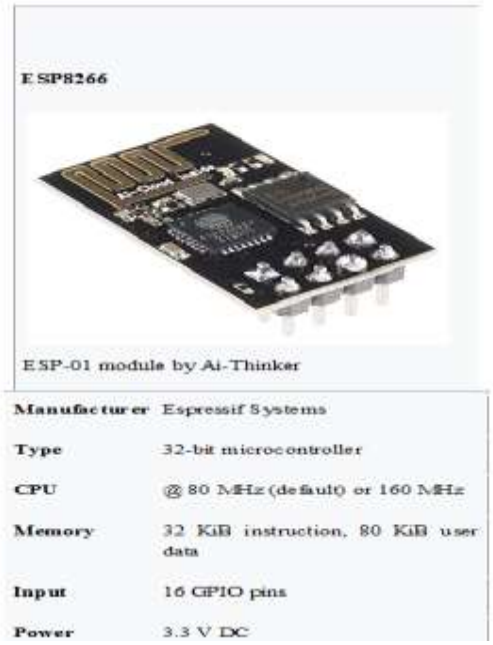

Fig 7: ESP8266 Wi-Fi Module

4.7. LCD:

Liquid Crystal Display also called as LCD is very helpful in providing user interface as well as for debugging purpose. The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. The most commonly used LCDs found in the market today are 1 Line, 2 Line or 4 Line LCDs which have only 1 controller and support at most of 80 characters, whereas LCDs supporting more than 80 characters make use of 2 HD44780 controllers.

Pin Description:

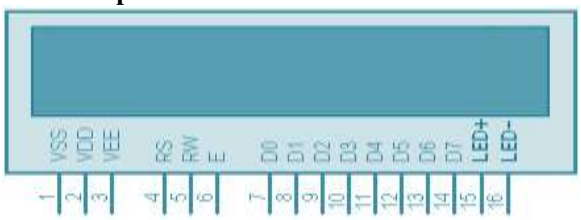

Fig 8: Pin description

4.8 SIM 800C MODULE:

The SIM 800C Module is a complete Quad-band GSM/GPRS solution in SMT type, which can be embedded in the customer applications. These modules are subsystem of the Internet-of-everything hardware. It can transmit voice, SMS and data information with low power consumption. With tiny size of 17.6x15.7x2.3mm, it can smoothly fit into slim and compact demands of customer design.

Fig 9: SIM 800C Module

V.EXPERIMENTAL RESULT

Fig 10: Overview of Project

The Overview of the project displays a Arm 7, PIR Sensor, Smoke Sensor, Temperature Sensor, GSM Module, ESP8266 Wi-Fi Module, Fan, Motor and all these are connected to Smart Phone

Fig 11: Detection of humans by PIR Sensor

The PIR Sensor detects the humans and the bulb glows, it is displayed on LCD and it is noted in the Smart Phone app "TCP Telnet Terminal"

Fig 12: Detection of Smoke by Smoke Sensor

The Smoke is detected by Smoke Sensor and the motor will ON, it is displayed on LCD and it is also noted on the Smart Phone app "TCP Telnet Terminal"

Fig 13: Detection of Temperature by Temperature Sensor

If the temperature is high it is detected by temperature sensor it is displayed on LCD and the fan will Switch ON and the temperature is noted in the Smart Phone app "TCP Telnet Terminal"

Fig 14: Data Storage of the Sensors

The Data of the three Sensors is stored in the smart phone app "TCP Telnet Terminal" it will acts like the cloud system

ADVANTAGES

- It is used for monitoring the home appliances and devices remotely using android based smart phone app.
- It saves the electricity.
- It helps for safety purpose and we can monitor the device 24/7
- You will receive a SMS for any activity.
- It is easy to operate and low cost.
- The Solutions are mainly to detect the human, smoke and control the temperature.

V.CONCLUSION

Smart Home System provide interface between various types of home and electrical appliances like windows and fans etc. It provide control and ease of use of appliances as per users need. After analysing other existing systems, we propose the novel technique for better human interaction and for providing better utilization of android and ARM7. By using Home automation system we can manage cost, flexible and energy efficient smart homes

VI.FUTURE SCOPE

There is always chance to improve any system as research & development is an endless process.

This system is no exception to this phenomenon.

- The various future applications may be used by controlling various household devices of house with internet.
- We can monitor and control the home appliances from anywhere in the world.
- In the future work, the persons other than the residents will also be considered.
- We can put camera and it captures the image and sends it to our phone.
- We can develop finger print security system.
- Improvement of security problems.

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