

An Industrial Security Control System on IOT Platform

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ABSTRACT

The main objective of this project is to develop a home automation system with Android application controlled remote. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving wireless controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a simpler solution with Android application technology. Remote operation is achieved by any smart-phone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based touch screen operation. In order to achieve this, Android application act as transmitter, which sends ON/OFF commands to the receiver where loads are connected. By operating the specified remote switch on the transmitter, the loads can be turned ON/OFF remotely through wireless technology. Industry or manufacturing (we will use these terms interchangeably) is largely the process of conversion of raw materials into products. Manufacturing is increasingly dependent on sophisticated equipment and automation to meet simultaneous demands for safety, quality, efficiency and productivity. However, different generations of equipment and automation co-exist as older plants and mills, or different production areas therein, and continue to operate along their more efficient and newer brethren. Increasingly, the distinction between equipment and automation is becoming blurred as new process equipment has embedded sensing, control and communication devices.

Keywords : GUI, Automation, Remote, Embedded, Mills

I. INTRODUCTION

In the present day, security systems play an important role in the protection of lives and investment. This is achieved by the incorporation of various subsystems into the security system with a single control unit such as surveillance, intruder control, access control, fire detection, etc. A smart home is one that is equipped with lighting, heating, and electronic devices that can be controlled remotely by smartphone or via the internet. An internet based home automation system focuses on

controlling home electronic devices whether you are inside or outside your home [1].

Home automation gives an individual the ability to remotely or automatically control things around the home. A home appliance is a device or instrument designed to perform a specific function, especially an electrical device, such as a refrigerator, for household use. The words appliance and devices are used interchangeably. Automation is today's fact, where things are being controlled automatically, usually the basic tasks of turning ON/OFF certain devices and beyond, either remotely or in close

proximity [2]. Automation lowers the human judgment to the lowest degree possible but does not completely eliminate it.

The concept of remote management of household devices over the internet from anywhere, any time in the world today can be a reality. Assume a system where from the office desk, the user could view the status of the devices and decides to take control by tuning his TV set to his favorite channel, turns on the cooling system, say the air conditioner, and switches on or off some of the lights. This user could walk back home and only find a very comfortable, pleasant home. The recent developments in technology which permit the use of Bluetooth and Wi-Fi have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet based home automation system for remote control of home appliances is designed.

II. OVERVIEW

The secure IOT with respect to a smart home system is. A micro-controller is used to obtain values of physical conditions through sensors connected to it. These integrated sensors such as the temperature sensor read temperature values, the gas sensor detects smoke and cooking gas to avoid fire outbreak. The automatic switching on and off of the light is controlled by the Light Dependent Resistor (LDR) which determines the day light intensity. Also to incorporate security in our design, a motion detector is integrated using Passive Infrared Sensor (PIR) to detect movement in the home when the security system is turned on. A relay switch is used to send control signals from the micro-controller to the

electronic device used to achieve the switching on and off action. A web portal is designed with a one-factor authentication system (username and password) to check authenticity of the home user. It acts as an input device to control the home appliances and also acts as an output device to read the values of the physical conditions. The mobile application also utilizes this same procedure to act as an input and output device. This method is very similar with the industrial application as same. A low cost and efficient smart home system is presented in our design. This system has two main modules: the hardware interface module and the software communication module. At the heart of this system is the Arduino Mega 2560 microcontroller which is also capable of functioning as a micro web server and the interface for all the hardware modules. All communication and controls in this system pass through the microcontroller, the smart home system offers feature such as environmental monitoring using the temperature, humidity, gas and smoke sensors. It also offers switching functionalities to control lighting, fans/air conditioners, and other home appliances connected to the relay system. Another feature of this system is the intrusion detection which it offers using the motion sensor and all these can be controlled from the Android smart phone app or web application.

III. BLOCK DIAGRAM

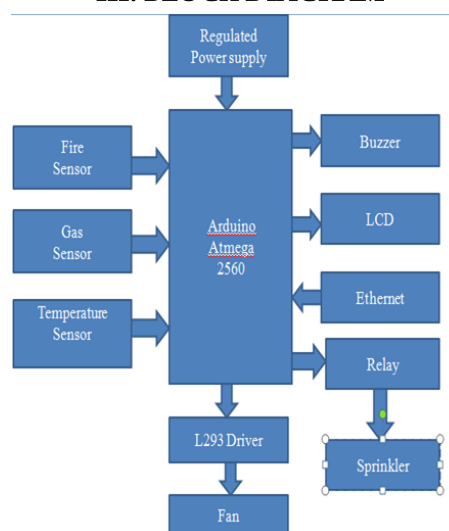


Figure 1: Block Diagram

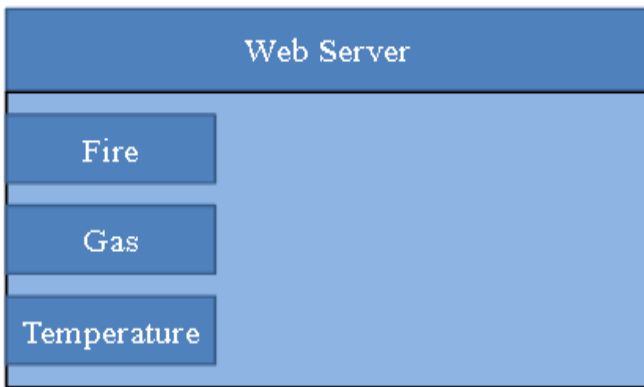


Figure 2 : Web Server Page

Arduino can sense the surroundings by receiving input signal from a variety of sensors And can affect its environment via actuators. An analog temperature sensor is a chip that tells you what the ambient temperature is. The ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed) and is illustrated. It is fairly simple to use, but requires careful timing to grab data.

The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old. The Passive Infra-Red (PIR) sensors allow one to sense motion, almost always and are used to detect whether a human has moved in or out of the sensors range. The PIR sensor is a pyro electric device that detects motion by measuring changes in the infrared level emitted by surrounding objects. This motion can be detected by checking for a high signal on a signal I/O pin. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. MQ2 is a semiconductor type sensor, which can appropriately sense the presence of smoke, LPG, methane, butane, propane and other hydrocarbon combustible gases. The sensitive material in this sensor is tin-dioxide. When it comes in contact with the gas to be monitored, the electrical resistance of the sensor decreases; enabling the microcontroller to respond to the situation. When it detects the concentration of combustible gas in the

air it 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 Veto allow connection for power plugs and switching of electrical load within the home, relay switches are used. The relay switches have capability to carry a maximum load of 10A at 240V. This is sufficient to carry any household appliance as these devices do not draw much current.

To enable connectivity on the microcontroller, a Bluetooth module and Wi-Fi shield is used. The Bluetooth provides connectivity via the serial I/O pins on the Arduino through which the Android based mobile application communicates with the microcontroller. The Wi-Fi shield provides internet connectivity for the embedded micro web server which allows internet access and controls from a web application. The circuit diagram of Home Automation System with is illustrated.

ARDUINO ATMEGA 2560

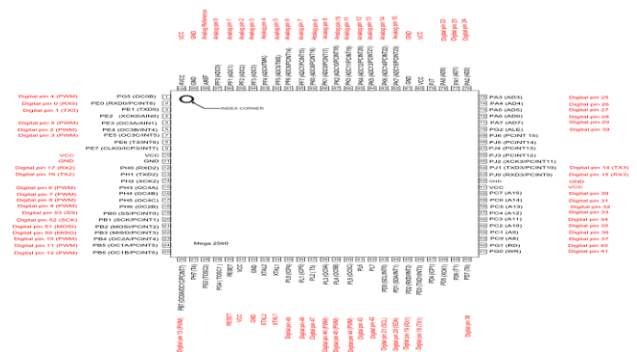


Figure 2 : Arduino ATMEGA 2560 pin configuration

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

POWER SUPPLY

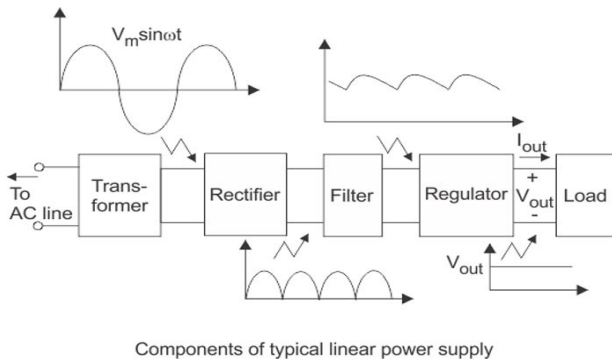


Figure 3: Block diagram of power supply

A power supply is a component that supplies power to at least one electric load. Typically, it converts one type of electrical power to another, but it may also convert a different form of energy – such as solar, mechanical, or chemical - into electrical energy. A power supply provides components with electric power. The term usually pertains to devices integrated within the component being powered. For example, computer power supplies convert AC current to DC current and are generally located at the rear of the computer case, along with at least one fan. A power supply is also known as a power supply unit, power brick or power adapter.

SENSORS



Figure 4 : Different types of sensors

A device which detects or measures a physical property and records, indicates, or otherwise responds to it.

INTERFACING IC

Input Interfacing Circuits. Interfacing is the method of connecting or linking together one device,

especially a computer or micro-controller with another allowing us to design or adapt the output and input configuration of the two electronic devices so that they can work together.

CONTROL IC

Circuitry that functions as a charge regulator controller may consist of several electrical components, or may be encapsulated in a single microchip, an integrated circuit (IC) usually called a charge controller IC or charge control IC.

WIFI MODULE

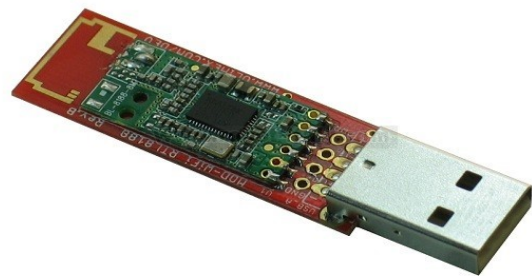


Figure 5 : WIFI module

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

LCD DRIVER



Figure 6 : LCD driver

In Electronics/computer hardware a display driver is usually a semiconductor integrated circuit (but may alternatively comprise a state machine made of discrete logic and other components)

which provides an interface function between a microprocessor, microcontroller, ASIC or general-purpose peripheral interface and a particular type of

display device, e.g. LCD, LED, OLED, ePaper, CRT, Vacuum fluorescent or Nixie.

LCD



Figure 7:LCD

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome.^[1] LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

IV. MODULE

Arduino can sense the surroundings by receiving input signal from a variety of sensors and can affect its environment via actuators. An analog temperature sensor is a chip that tells you what the ambient temperature is. The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed) and is illustrated in Figure 3.

It is fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings

can be up to 2 seconds old. The Passive Infra-Red (PIR) sensors allow one to sense motion, almost always and are used to detect whether a human has moved in or out of the sensors range. The PIR sensor is a pyro electric device that detects motion by measuring changes in the infrared level emitted by surrounding objects. This motion can be detected by checking for a high signal on a signal I/O pin . They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses.

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The Wi-Fi shield provides internet connectivity for the embedded micro web server which allows internet access and controls from a web application. The circuit diagram of Home Automation System with is illustrated. The android application was

designed using the Google App-Inventor Integrated Development Environment (IDE) and Java programming language. The application contains both a Bluetooth module and a Wi-Fi module which interfaces with the micro-controller and allows the android smart phone to communicate with the micro-controller effectively and efficiently. The android application allows the user to control devices and monitor conditions in the home using the Bluetooth connection. The android application is efficient, flexible and has a user friendly Graphic User Interface (GUI). The application has a user authentication page to verify that the authorized user is logged in and has full control of the home-appliances. The authentication page and the bedroom page after.

V. WEB APPLICATION

The internet is great source of information and communication in this information age. Communication with things via the internet also known as Internet of Things (IoT). Bland by name and superficially viewed as gee-whiz technology never to be realized, the IoT has significant potential to transform business. IoT is a developing technology which allows different things and devices to be controlled via the internet. At its heart, IoT is a wide-ranging ecosystem of everyday physical objects connected to the Internet, capable of identifying themselves and communicating data to other objects on the network. In this work its implemented using the Arduino as a micro web server through which we can connect to the hardware modules, receive status updates from them and also send control information.

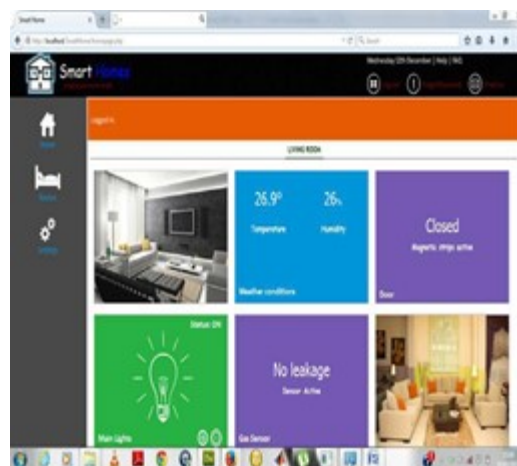


Figure 8 : Showing a logged in user profile

For our web application, which in this text is a website, we used Adobe Dreamweaver as our programming environment and we used Hypertext Pre-Processor (PHP) and also JavaScript (JSON) and also Ajax for our programming languages. The website will control the Arduino by passing information to it as codes. In this case, the Arduino micro-controller acts as a client and the PHP will act as a server because PHP is not a client based programming language. The design of the web pages was chosen to be in metro style as it gives user friendliness and also a colorful display of the web items as. The web page will display all the variables being read from the Arduino micro-controller and also be able to perform the functions as the mobile application. The Wi-Fi shield connected with the Arduino board will be the link between the web pages and the Arduino. When connected to the IP address of the Arduino, the PHP and the Ajax http request will be able to send information over this IP address which in turn is interpreted by the Arduino.

VI. RESULT



Figure 9: Fire Sensor Detected

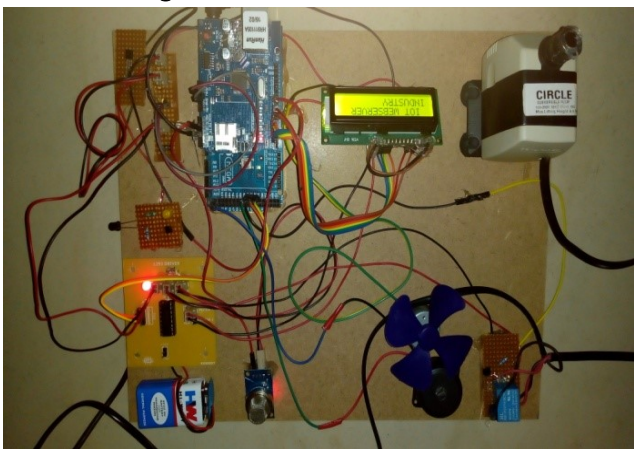


Figure 10: Gas Sensor Detected

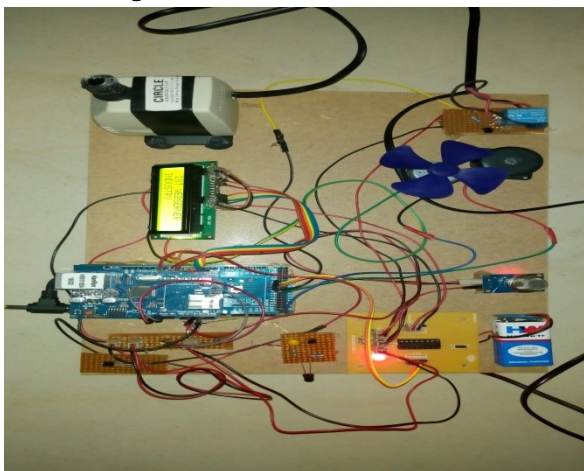


Figure 11: Temperature Sensor Detected

Secure IoT Platform for Industrial Control Systems. Abstract: Supervisory control and data acquisition (SCADA) systems, are part of industrial control system (ICS), have been playing crucial roles in real-time industrial automation and controls. Secure IoT Platform for Industrial Control Systems. Internet of things (IoT) is a ubiquitous platform, a new advance

enhancement, for efficient SCADA system, where billions of network devices, with smart sensing capabilities, are networked over the Internet access.

VII. CONCLUSION

In this paper, a novel architecture for low cost and flexible home and industry control and monitoring system using Android based Smart phone is proposed and implemented. The proposed architecture utilizes a micro web server and wifi communication as an interoperable application layer for communicating between the remote user and the home devices. Any Android based Smart phone with built in support for Wi-Fi can be used to access and control the devices at home. When a Wi-Fi connection is not available, mobile cellular networks such as 3G or 4G can be used to access the system. The system also uses the Google speech recognition engine thus eliminating the need for an external voice recognition module. Prospective future works include incorporating SMS and call alerts, and reducing the wiring changes for installing the proposed system in pre-existing houses by creating a wireless network within the home environment for controlling and monitoring the smart home environment.

VIII. REFERENCES

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BIOGRAPHY

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His Field of Interest is Wireless communication Telecommunication, Computer Networking and Image Processing. Published 12 papers in International Journal, 2 papers in International Conference and 1 paper in National Conference. Presently working as Associate Professor in Department of Electronics & Communication Engineering at Lords Institute of Engineering & Technology, Hyderabad, Telangana state.



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