Design and Implementation of Smart Industrial Monitoring and Control System using IoT

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Abstract--This paper describes how to control and monitor industry appliances using android application over internet. In today's reality Automatic frameworks are being favored over manual framework. Now a day's technology becomes ever more invasive, the design challenges in industry automation are increasingly apparent. Seamless controlling industry, monitoring and programming by the end user have yet to enter the mainstream. There are number of commercial industry automation system available in market. The advanced technology enables the Wi-Fi which is a wireless network to the controlled using any other Wi-Fi network i.e., connecting from any network to the industry network. This is very helpful to physically challenged people. The android mobile is used to send the commands to the Arduino to control all the industry appliances. The electricity cost can be reduced using smart automation as it turns off everything when there is no one in industry. The wireless connection doesn't require any switches and is automated. Therefore, industry appliances can individually be controlled both from within the industry and remotely. Electricity.

Keywords— IOT, WSN, Node MCU

I. INTRODUCTION

A Wireless Sensor Network (WSN) is a computer network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. The development of wireless sensor networks was originally motivated by military applications such as battlefield surveillance. However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, industry automation, and traffic control. In addition to one or more sensors, each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. The size a single sensor node can vary from shoebox-sized nodes down to devices the size of grain of dust. The cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few cents, depending on the size of the sensor network and the complexity required of individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and bandwidth. In computer science, wireless sensor networks are an active research area with numerous workshops and conferences arranged each year. Wi-Fi is a local area wireless computer networking technology that allows electronic devices to connect to the network, mainly using the 2.4 gigahertz (12 cm) UHF and 5 gigahertz (6 cm) SHF ISM radio bands.

The Wi-Fi Alliance defines Wi-Fi as any "wireless local area network" (WLAN) product based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11

Standards. However, the term "Wi-Fi" is used in general English as a synonym for "WLAN" since most modern WLANs are based on these standards. "Wi-Fi" is a

Trademark JNGHJJJ of the Wi-Fi Alliance. The "Wi-Fi Certified" trademark can only be used by Wi-Fi products that successfully complete Wi-Fi Alliance interoperability certification testing. Many devices can use Wi-Fi, e.g., personal computers, video-game consoles, smart phones, digital cameras, tablet computers and digital audio players.

These can connect to a network resource such as the Internet via a wireless network access point. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range outdoors. Hotspot coverage can be as small as a single room with walls that block radio waves, or as large as many square kilometres achieved by using multiple overlapping access points.

II. EXISTING SYSTEM

Industry automation can be defined as a system implemented at a residential place whereby the intention is to make the place intelligent so that energy is conserve and security is maintained. It makes the life of the residents flexible, healthy and comfortable. Initially systems were developed in this regard but those systems had to be deployed on Internet and heavy machineries like a big Personal Computer. Our system will be free from all these giant components, which, indirectly suggests that our system has a good quality of portability. Most systems would exchange data or would communicate with the help of Bluetooth, Zig Bee and GSM. These systems have their own disadvantages. For example, system-implementing ZigBee has too low bandwidth for the data communication whereas the GSM implementing system has too large bandwidth for the data communication. Thus, there is wastage of the essential bandwidth, which goes without being used. The other systems, which were in use, are, for example Java Based Systems and SMS based systems. Java Based Systems still use web pages, which is a disadvantage if data intranet or Internet is off. SMS based system is more costly since it requires data transfer from the real time service provider. This Wi-Fi protocol has some upper hand benefits like its range is in the radius of 150-200m the mobile application can also extend the security of the system via an implementation of the password protected application at industry, there are all kinds of electrical Devices. Also, the gas may lead to fire. Once the danger happens, it will result in the huge losses. The smart industry system is necessary for the safety. The system integrated the
Sensors to monitor the appliances whether they work normally. Once the exceptions have been tested, the owner can get the text massage immediately with the help of GSM.
This system has a light cube. It has 512 lights. After test, this system works to monitor the industry appliances very well at the low cost.

III. MATERIALS AND METHODS

A PROPOSED METHOD

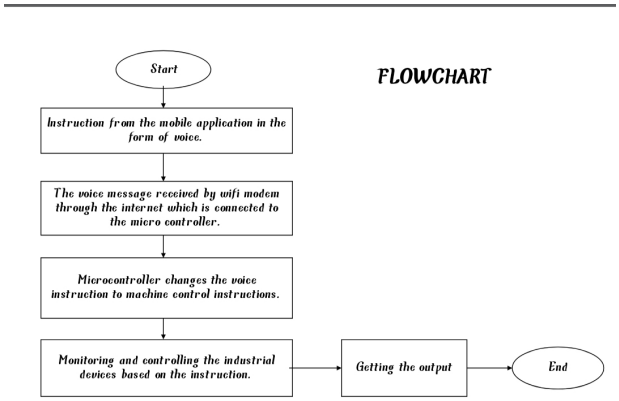
This paper proposes an Industry Automation system that employs the integration of multi-touch mobile devices, cloud networking, wireless communication, and power- line communication to provide the user with remote control of various lights and appliances within their industry. This system uses a consolidation of a mobile phone application, handheld wireless remote, and PC based program to provide a means of user interface to the consumer. The proposed system is a distributed industry automation system, consists of server, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors). which the card is inserted, acts as android app. Automation System can be accessed from the android app with voice control in google assist, or remotely from any PC or mobile handheld device connected to the internet with mobile through android app. Wi-Fi technology is selected to be the network infrastructure that connects server and the sensors. Wi-Fi is chosen to improve system security (by using secure Wi-Fi connection), and to increase system mobility and scalability. IOT or internet of things is an upcoming technology that makes use of internet to control/monitor electronic/mechanical devices, automobiles and other physical devices connected to the internet. IOT gives user the ability to control more than digital things easily through a comfortable GUI over the internet. We are amongst the pioneers researching in the field of internet of things. Our efforts concentrate on researching innovative IOT projects that could benefit the mankind. These IOT project ideas are an inspiration to students and researchers for further IOT research. Our researchers focus on the use of IOT for industry/industry automation and monitoring various physical parameters over the

internet. Here you may find a wide list of projects related to internet of things. These internet of things projects have been proposed on existing system improvements and new innovative solutions to different problems. With the emerging possibility of connecting more and more hardware to the internet, our research on IOT projects is never ending. We constantly research on newer and better IOT project ideas every month.

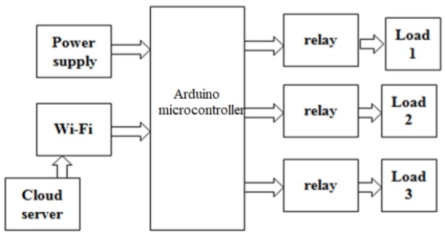
A OBJECTIVE

To represent this, we are presenting an Industrial Automation System (IAS) with wireless senses sensor networks using IOT. To design the system, Industry appliances can individually be controlled both from within the industry and remotely. This is very helpful to physically challenged people. It is low cost and expandable allowing a variety of devices to be controlled.

B FLOW CHART



D.BLOCKDIAGRAM



The project's board designs use a variety of microprocessors and controllers. These systems provide sets of digital and analogue input/output (I/O) pins that may be interfaced to various expansion boards and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers.

A NODE MCU

The Node MCU (Node Microcontroller Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SOC) called the ESP8266. The ESP8266, designed and manufactured by Expressive Systems, contains the crucial elements of a computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for the Internet of Things (IOT) projects of all kinds. But, what about Arduino? The Arduino project created an open-source hardware design and software SDK for their versatile IOT controller. Similar to Node MCU, the
Arduino hardware is a microcontroller board with a USB connector, LED lights, and standard data pins. It also defines standard interfaces to interact with sensors or other
Boards. But unlike Node MCU, the Arduino board can have different types of CPU chips (typically an ARM or Intel x86 chip) with memory chips, and a variety of programming
Environments. There is an Arduino reference design for the ESP8266 chip as well. However, the flexibility of Arduino also means significant variations across different vendors. Input and Output each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode (), digital Write (), and digital Read () functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 m A and has an internal pull-up resistor (disconnected by default) of 20-50 k Ohms. In addition, some pins have specialized functions: Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip. External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt () function for details. PWM: 3, 5, 6, 9, 10, and 11.
Provide 8-bit PWM output with the analogy Write () function.
SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library. LED: 13.
There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. 3 | P a g e 3 Arduino Uno The Uno has 6 analogy inputs, labelled A0 through A5, each of which provide 10 bits of resolution (i.e.1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogue Reference () function. Additionally, some pins have specialized functionality.

A PROGRAMMING

The Arduino Uno can be programmed with the Arduino software. Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes preponed with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500protocol (reference, C header files). You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega8U2 firmware source code is available. The given
ATmega8U2 is loaded with a DFU boot loader, which can be activated by connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU boot loader). See this user-contributed tutorial for more information. Embedded systems programming is different from developing applications on a desktop computers. Key characteristics of an embedded system, when compared to PCS, are as follows. Embedded devices have resource constraints (limited ROM, limited RAM, limited stack space, less processing power) Components used in embedded system and PCs are different; embedded systems typically uses smaller, less power consuming components. Embedded systems are more tied to the hardware. Two salient features of Embedded Programming are code speed and code size. Code speed is
Governed by the processing power, timing constraints, whereas code size is governed by available program memory and use of programming language. Goal of embedded system programming is to get maximum
Features in minimum space and minimum time.
C is used for desktop computers, while embedded C is for microcontroller-based applications. Accordingly, C has the luxury to use resources of a desktop PC like memory, OS, etc. While programming on desktop systems, we need not bother about memory. However, embedded C has to use with the limited resources (RAM, ROM, I/OS) on an embedded processor. Thus, program code must fit into the available program memory. If code exceeds the limit, the system is likely to crash. Compilers for C typically generate OS dependant executables. Embedded C requires compilers to create files to be downloaded to the microcontrollers/microprocessors where

it needs to run. Embedded compilers give access to all resources which is not provided in compilers for desktop computer
Applications. Embedded systems often have the real-time constraints, which is usually not there with desktop computer applications.

IV. RESULTS

A. HARDWARE CONNECTIONS

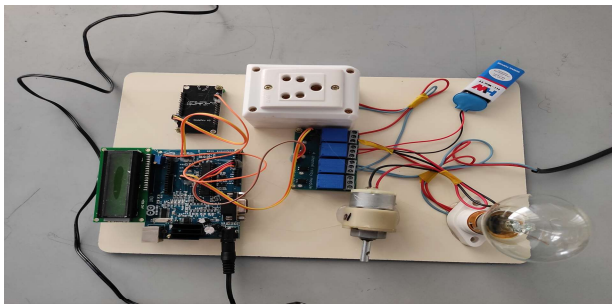


Figure 4: Circuit (Hardware)

B. Manipulating with WiFi Module

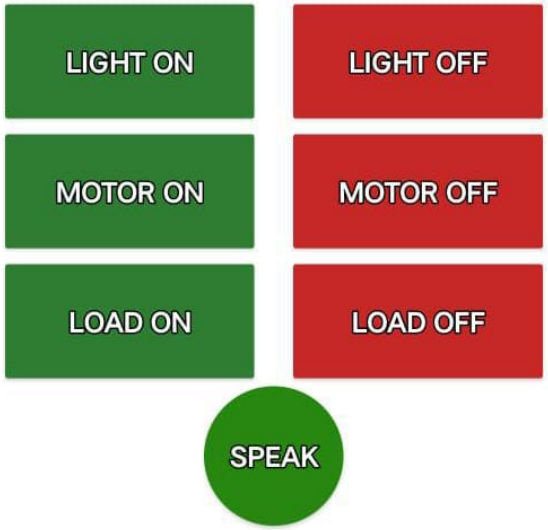


Figure 5: Application of voice notes

V. CONCLUSION

The process of controlling electrical appliances remotely and to perform automation process concludes the use of microcontrollers like Arduino, Raspberry pi, etc. The advanced technology enables the Wi-Fi which is a wireless network to be easily controlled using any other Wi-Fi network i.e., connecting from any network to the industry network. The electricity cost can be reduced using smart automation as it turns off everything when there is no one in industry. The wireless connection doesn't require any switches and is automated. Power consumption inside the building when the loads were in off conditions can be monitored, controlled and easily managed using smart
Applications that are designed for saving energy

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