

Wi-Fi Controlled Faculty Room

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Abstract- *There is an increasing demand of smart Facilities, where appliance react automatically to changing environment condition and can be easily controlled through one common device. This project presents a possible solution whereby the user control device by using their existing mobile number, where control is communicated to the NodeMCU from a mobile phone through its Android Application. The aim of this project is to design a circuit such that one can control Faculty or industrial appliances using the help of Wi-Fi. This project presents a design and prototype implementation of new faculty automation system that uses Wi-Fi technology as a network infrastructure connecting its parts. The proposed system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors users. Users and system administrator can locally (LAN) or remotely (internet) manage and control system code. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of Faculty automation system like most of available Faculty automation system in the market the proposed system is scalable that one server can manage many hardware interface modules if it exists on Wi-Fi network coverage.*

I. INTRODUCTION

The project aims at designing an advanced Faculty automation system using normal web server and Wi-Fi technology. The devices can be switched ON/OFF, and sensors can be read using a Personal Computer (PC) through Wi-Fi. Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user-friendly nature. These can be used as a replacement of the existing switches in Faculty which produces sparks

and also results in fire accidents in few situations. Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the house.

Wi-Fi (Short for Wireless Fidelity) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet. The controlling device for the automation in the project is a NodeMCU. The data sent from PC over Wi-Fi will be received by Wi-Fi module connected to NodeMCU. NodeMCU reads the data and decides the switching action of electrical devices connected to it through Relays. The proposed system controls the electrical loads based on the data transmitted by the Android device. An Android application should be installed in user's mobile or tablet to control the electrical loads. Using this Android application user can send the commands to the Wi-Fi module to control the electrical loads. Wireless technology used in this project is Wi-Fi. It can also be called as "Wi-Fi Controlled Electronic Faculty Appliances" or "Android based Faculty Automation System" or "Remote Password Operated Electronic Faculty Appliances Control System".

IoT (Internet of Things) is the environment in which physical items interact with each other and user-to-computer communications, machine-to-machine communications are enabled, and this communication is extended to "things" [1]. The IOT devices have the capacity to exchange the contents depending upon the control of function in a specified manner. The benefit of IOT networks is that they can separate and create information by designating, filtering, handling and extracting the data. The authorities predicted that by the year 2020, around 50 billion devices will have internet connection. This article explains the various

possibilities of connecting small devices and make it easier to the human life much easier. More than one device can be connected to a single network through the wireless fidelity technology. 2.4GHZ is the frequency range which is officially agreed for it. IOT plays a virtual role of creating smart environments by connecting to the internet. Represents the usage, maintenance, helpfulness, efficiency of IOT in rapidly growing technology at anywhere, any network, any time, anyone. Also, as IoT deals with large quantity of data received from different sensors which are deployed in the smart environment, sufficient care must be taken for efficient maintaining, securing and for storing this collected data. This system also works for the security purpose, if any inevitable incident happens, the user will immediately receive alert message in their smart phone.

II. LITERATURE SURVEY

When people think about Faculty automation, most of them may imagine living in a smart Faculty: One remote controller for every household appliance, make a coffee automatically, starting air conditioner automatically, heating water automatically and shading the window automatically when night coming. To some extent Faculty automation equals to smart Faculty. They both bring out smart living condition and make our life more convenient and faster. Review of Foreign Studies: In their paper, Tan, Lee and Soh (2002) proposed the development of an Internet-based system to allow monitoring of important process variables from a distributed control system (DCS).

This paper proposes hardware and software design considerations which enable the user to access the process variables on the DCS, remotely and effectively Potamitis, Georgila, Fakotakis, and Kokkinakis, G. (2003) suggested the use of speech to interact remotely with the faculty appliances to perform a particular action on behalf of the user. The approach is inclined for people with disability to perform real-life operations at Faculty room by directing appliances through speech. Voice separation strategy is selected to take appropriate decision by speech recognition In the year 2006, S. M. Anamul Haque, S. M. Kamruzzaman and Md. Ashraf Islam proposed a system entitled "A System for Smart-Faculty Control of Appliances Based on Time and

Speech Interaction" that controls the Faculty appliances using the personal computer. This system is developed by using the Visual Basic 6.0 as programming language and Microsoft voice engine tools for speech recognition purpose. Appliances can be either controlled by timer or by voice command.

Ciubotaru-Petrescu, Chiciudean, Cioarga, and Stanescu (2006) present a design and implementation of SMS based control for monitoring systems. The paper has three modules involving sensing unit for monitoring the complex applications. A processing unit, that is microcontroller and a communication module that uses GPRS modem or cell phone via serial port RS-232. The SMS is used for status reporting such as power failure. Jawarkar, Ahmed, Ladhake, and Thakare (2008) propose remote monitoring through mobile phone involving the use of spoken commands.

III. OBJECTIVE OF PROJECT

- The goal of this project is to develop a faculty automation system that gives the user complete control over all remotely controllable aspects of his or her faculty.
- The automation system will have the ability to be controlled from a central host PC, the Internet, and remotely accessed via a Pocket PC with a Windows Mobile based application.
- The System will also sense the Accidental Gas leakage, water level and will notify the user by SMS.
- In this project, a Wi-Fi module is interfaced to 8051 Microcontroller. This Wi-Fi Module receives the commands from the Android application that is installed on the Android device, using wireless communication (Wi-Fi Technology).
- The program which is written to the 8051 microcontroller communicates with Wi-Fi module serially to receive the commands. Microcontroller switches the electrical loads automatically based on the commands received from the Wi-Fi.

IV. SCOPE OF PROJECT

- Day by day, the field of automation is blooming, and these systems are having great impact on

human beings. The project which is to be implemented is a faculty automation using Easy IOT Webserver and WIFI and has very good future development. In the current system webserver is installed on a windows PC so the faculty appliances can be controlled using only by using the device on which webserver is installed.

- This can be further developed installing webserver on cloud. Advantage of installing webserver on the cloud is that Faculty can be controlled by using any device which has WIFI 802.1 and a web browser. By visiting the IP address of the cloud, the control actions can be taken.
- This setup can further be developed into IOT project by adding some sensor (PIR, Temperature), Ethernet Shield. It can be controlled from anywhere around the world having feedback from the devices to further improve the energy savings.

V. METHODOLOGY AND WORKING

- Block Diagram:

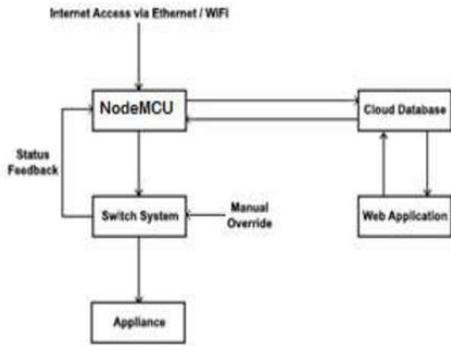


Fig 1 Block Diagram of the System

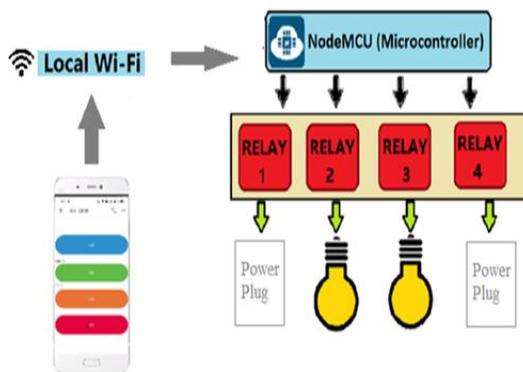


Figure 2

Mobile App/Web Page → Local Wi-Fi → Node MCU → Relay Module → Appliances

- First node MCU module connects to the Wi-Fi by Local hotspot.
- Phone already have an application to provide the interface between mobile and Wi-Fi module.
- By using the application, the Mobile send the command signal to node MCU by the Wi-Fi or network.
- Relay is connected to the node MCU by its pins.
- The relay is connected to the load by its pins. when node MCU receives the command from mobile, it operate the load.
- We also can operate load by switches.
- The block diagram of the system is shown in Fig - 1. The input will be given through a Web App which will be based on IoT platform. Through this Web App, besides the regular on or off operation, the intensity of different devices can be controlled. Also, depending on the environment and outdoor conditions, the devices will themselves change their working., the system will support manual operation. The IR sensor will sense some aspects of the surroundings.

- Mechanical Arrangement

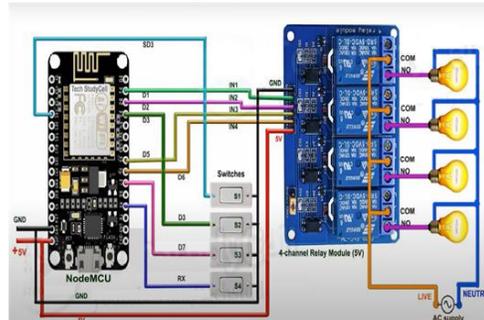


Fig 3 Circuit Diagram



Fig 4 Mechanical Arrangement

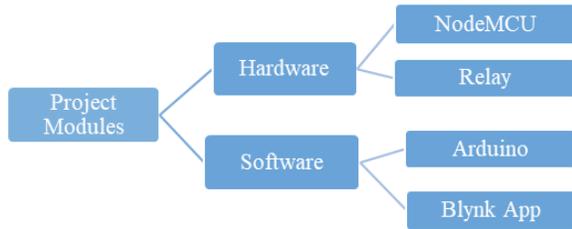


Fig 5 Project Module

VI. HARWARE

- NodeMCU ESP8266:

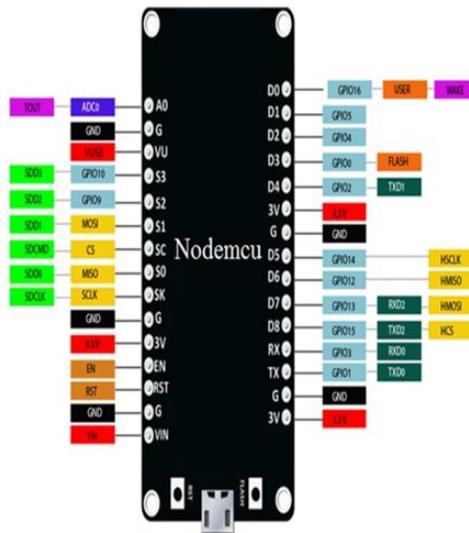


- NodeMCU is a low-cost open source IoT platform.
- The NodeMCU (Node Microcontroller Unit) is an open-source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266.
- The ESP8266, designed and manufactured by Espressif Systems, contains all crucial elements of the modern computer: CPU, RAM, networking (Wi-Fi)
- There are two available versions of NodeMCU as version 0.9 & 1.0 where the version 0.9

contains ESP-12 and version 1.0 contains ESP-12E where E stands for "Enhanced"

NodeMCU Features

- Microcontroller ESP8266 32-bit
- Operating Voltage: 3.3V.
- Input Voltage: 4.5-10V.
- Clock Speed: 80 MHz.
- Digital I/O Pins (DIO): 11.
- Analog Input Pins (ADC): 1.
- Wi-Fi Built-In: 802.11 b/g/n.
- Flash Memory/SRAM: 4 MB/64 KB.



- Relay Module (4 Channel)



A relay is an electrical device which is generally used to control high voltages using very low voltage as an input. This consists of a coil wrapped around a pole

and a two small metal flaps(nodes) that are used to close the circuit. One of the node is fixed and other is movable. Whenever an electricity is passed through the coil, it creates a magnetic field and attracts the moving node towards the static node and the circuit gets completed. So, just by applying small voltage to power up the coil we can actually complete the circuit for the high voltage to travel. Also, as the static node is not physically connected to the coil there is very less chance that the Microcontroller powering the coil gets damaged if something goes wrong.

This is Four Channel relay board controlled by computer USB port. The usb relay board is with 4 SPDT relays rated up to 10A each. You may control devices 220V / 120V (up to 4) directly with one such relay unit. It is fully powered by the computer USB port. Suitable for Faculty automation applications, hobby projects, industrial automation. The free software allows to control relays manually, create timers (weekly and calendar) and multivibrators, use date and time for alarms or control from command line. We provide software examples in Labview, .NET, Java, Borland C++, Python

Features:

- Datasheet - here
- Power led: Yes
- Relay leds: Yes High quality
- 4 SPDT Relay channels - selectable by user: 36 o JQC-3FC/T73 DC5V (7A / 250VAC, 10A / 125VAC, 12A / 120VAC, 10A / 28VDC) o RAS-05-15 (10A / 250VAC, 15A / 120VAC, 15A / 24VDC)
- PCB parameters: FR4 / 1.5mm / two layers / metalized holes / HAL / white stamp / solder mask / extra PCB openings for better voltage isolation / doubled high voltage tracks • Power supply: from USB port
- Current consumption: 400 mA
- Chip: FT245RL
- Size: 77mm x 56mm x 17mm
- Supported by DRM software (Windows and Linux): Yes
- Supported by Denkovi Command line tool (Windows, Linux): Yes
- Android software available (low cost but very useful): Yes - New
- Software examples - here

- Documentation: here

Advantages:

- High quality
- Low cost
- No extra power supply
- Software with many functions
 - Control electrical devices according weekday/date/time
 - Create timers or pulses with our software 37

Applications:

- Faculty automation
- Robotics
- Alarms
- Timers
- Open doors and windows via PC
- Aquariums applications Additional

Information:

This is relay board with 4 SPDT Relays controlled from USB port of your computer. The main purpose of this USB relay module is to help you building projects regarding robotics and Faculty automation (demotic).

You may control different electrical devices like Faculty lights, DC motors, pneumatic cylinders, lasers and so on. Each such board requires one USB port. The more USB ports you have the more such relay units you may connect and control.

The relay module outputs are controlled by FT245RL. It has 8-bit data output register (this device use only 4 of them). The usb relay card cannot be controlled directly via COM port - you need to download our DRM Software to control the device.

The usb relay unit cannot work without PC. Only one such device can be supplied from single USB port. If you want to supply many such devices, you need USB HUB with extra power supply.

VII. SOFTWARE

- Arduino 1.8.19
- The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software

library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware

- **Android Application: Blynk**

Blynk is an Internet of things (IoT) company which provides a platform for building mobile (IOS and Android) applications that can connect electronic devices to the Internet and remotely monitor and control these devices.

CONCLUSION

- Home automation is undeniably a resource which can make a home environment automated people can control their electric device by these home automation devices and set up controlling action through mobile.
- In the future this product may have high potential for marketing.
- This project reduces human efforts, helpful for handicapped or disabled people and save the energy power.

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