

Implementation of Embedded system for Industrial Automation

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Abstract - The Internet of Things (IoT) continues to gain traction in all kinds of industries and applications. Industrial Automation is one such industry that's seen a big increase in IoT utilization. This paper is useful for industrial equipment as well as household appliance control using Node MCU Module, Bluetooth and DTMF technology. In the proposed system wireless control is implemented hence, it can be effectively used in systems where unwired connections are required or desired. Using wireless technology specific codes are transmitted, that code is received by receiver and decoded by the microcontroller. According to code it will perform the ON-OFF operations. At output Electromechanical Relay and Solid State Relay are used. At output Induction motor, 3 Phase supply and Single phase supply are controlled.

Key Words: Bluetooth , DTMF , Node MCU , Blynk Server

1.INTRODUCTION

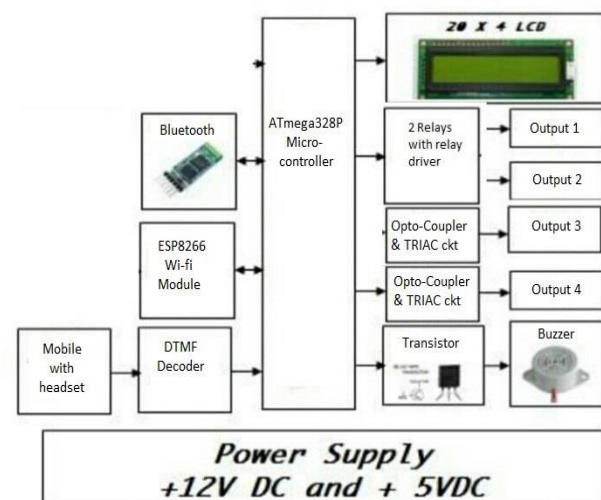
The electrical appliance in industry and home can be controlled remotely is an original idea. We can use the appliances, which can be anything like three phase load or single phase load in the industry or home such as induction motor, security system, an air conditioner, light, set top box and so on. The remote control capability & the achieving possibility of it at a reasonably low cost have motivated the need to research into it. 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 [1]. This work aims in designing a system which makes operating of electrical appliances in industry through Bluetooth and or IoT and or DTMF. Internet of Things (IoT) is one of the most upcoming technologies which can be used for managing and controlling any object by connecting it to the internet [4]. With the ever increasing internet users over the past few years, it has become a part of everyone's life. All the domestic or industrial electric equipment are controlled using these technologies. Here in this project the Android smart phone with Bluetooth feature OR normal mobile with DTMF key pad OR Blynk application special designed transmitter is used as remote to control for operating the electrical appliances using DIY Arduino uno controller and Electromechanical Relay and Solid State Relay. The proposed system design consists of DIY Arduino Uno Microcontroller [2] that acts as the main controller. Android application, that helps in remote monitoring. The controls for

switching ON/OFF of the appliances are performed using the relays based on the touch control commands given through android application. It mainly consists of switches to ON/OFF [7]. This system also implements voice controlling using Bluetooth module.

Following wireless technologies are used to implement industrial automation:-

1. Bluetooth technology for range up to 15 Meters.
2. DTMF technology for infinite range.
3. Node MCU with Blynk Server for infinite range.

2. HARDWARE IMPLEMENTATION



The main blocks of the project are:-

A. CPU i.e. DIY Arduino Uno with power supply.

B. Input Section:-

- B.1. Bluetooth Transmitter and Receiver
- B.2. DTMF Transmitter and Receiver
- B.3. ESP8266 (NodeMCU) IoT

C. Output Section:-

- C.1. 20 X 4 LCD Display
- C.2. Relay with Relay Driver
- C.3. Opto-coupler with TRIAC (Solid State Relay)
- C.4. Buzzer with Buzzer Driver

4.6 Buzzer with Buzzer Driver:

In my project emergency button is used. When this button is pressed then all outputs will turn OFF and buzzer will turn ON to indicate emergency. So for emergency I have to turn on the buzzer. But we can't connect buzzer directly. The output of micro-controller is insufficient to operate buzzer directly. Therefore to drive the buzzer transistor as switch is used, which will drive the buzzer. When there is emergency then and then only Buzzer turns ON. Otherwise buzzer will be turned off.

4.7 NodeMCU:

Node MCU is very popular in Home Automation. It's Wi-Fi capabilities and Arduino IDE support making it easier for IoT Applications. It is very tiny and has many Digital I/O pins, Serial Communication and I2C Communication. Node MCU has a micro

USB port to program it using your existing mobile cable (no additional programmer needed). There is a successor called ESP32 Development board which has more Analog pins and Digital pins. You can use any one of them for this project according to your requirements. Here we will be using NodeMCU.

Blynk is a mobile application which has its own server to process user requests. It is an open source application and anybody can use it in their Home Automation to control devices, monitor sensor data and get a notification by some trigger actions. It has a nice GUI with Graphs, Timers, Slider, Joystick and even Video Streaming.

5. PROJECT PHOTO

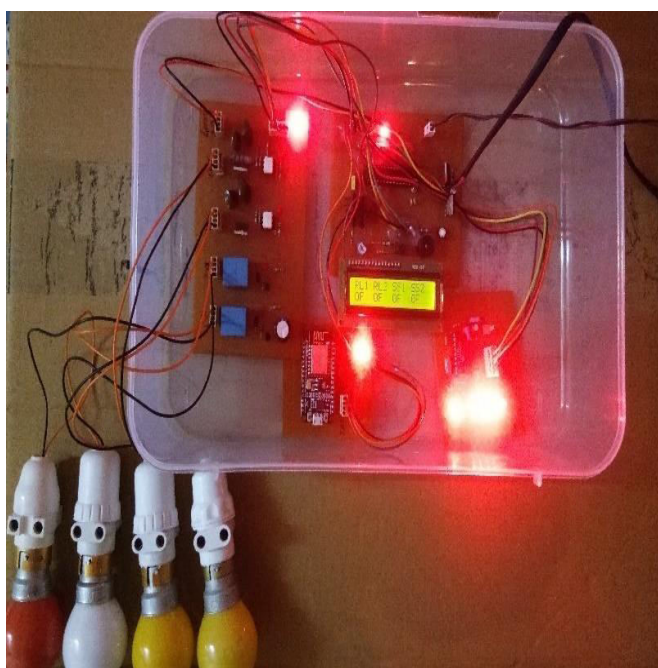


Fig 5.1 Prototype System

6. EXPERIMENTAL RESULT

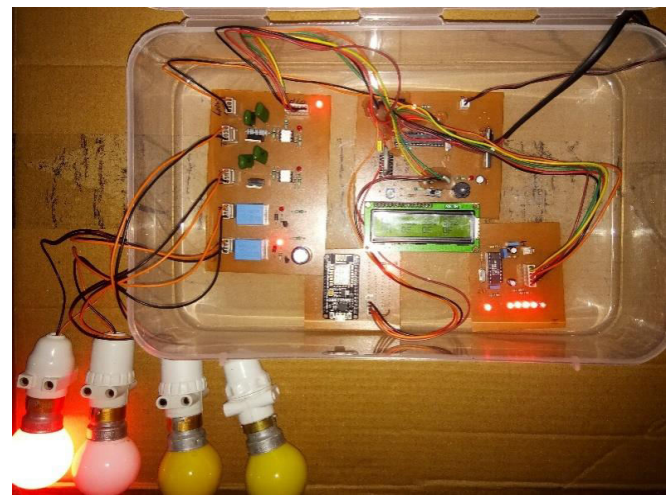


Fig 6.1 Device 1 ON using Bluetooth

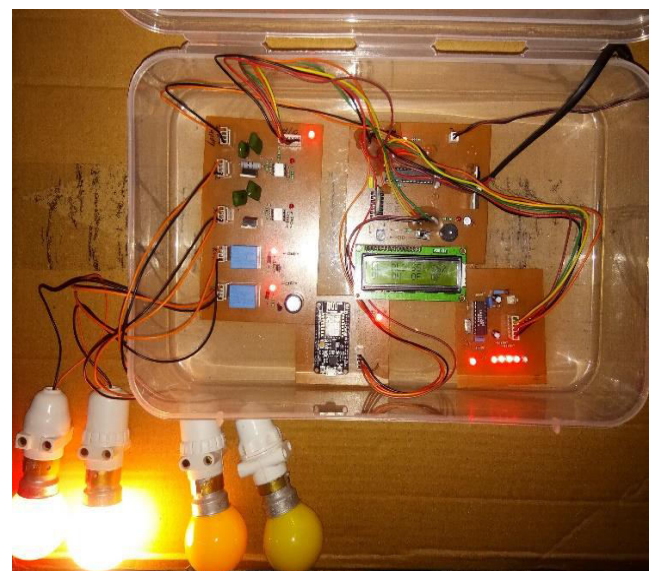


Fig 6.2 Device 1 and 2 ON using Bluetooth voice

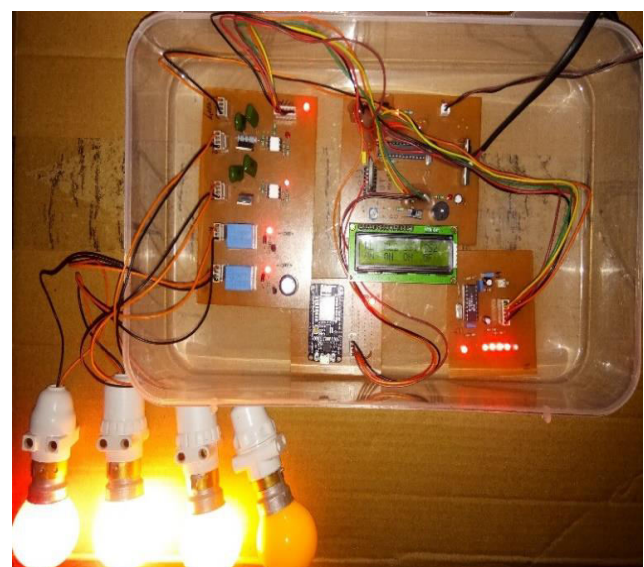


Fig 6.2 Device 1,2 and 3 ON using DTMF

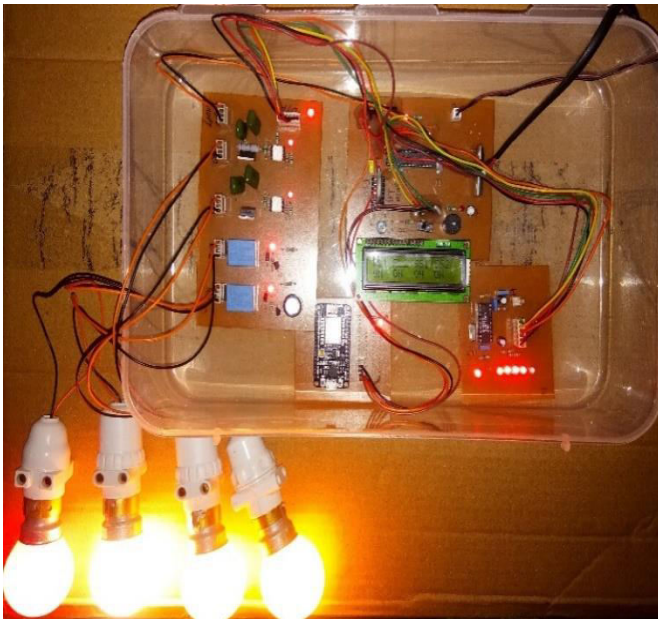


Fig 6.2 Device 1,2,3 and 4 ON using IoT

7. RESULT AND CONCLUSION

In this model we have controlled the devices using three communication protocols i.e., Bluetooth, DTMF and IoT Fig 6.1 shows switching of the bulb by using Bluetooth which is operatable between 10 to 15 meters of range

Fig 6.2 shows the switching of bulb through voice by using Bluetooth.

Fig 6.3 shows the switching of bulb by using DTMF which has infinite range

Fig 6.4 shows the switching of bulb through IoT.

Finally, using advanced ICs and growing technology, the prototype has implemented successfully

From the convenience of a micro- controller, a user is able to control industrial accidents, human errors and for manual safety. The end product will have a simplistic design making it easy for users so that they can interact. This will be essential because of the wide range of technical knowledge that industries have. This System can be used even in simple automation system where the internet facilities and even PC are not provided; one can use mobile phone based control system which is simple and cost effective.

8. FUTURE SCOPE

This work can be further extended using high efficiency GSM module through which devices can be controlled from unlimited distance and also the Gesture controlling feature can be implemented for the ease of differently abled people.

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