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IP BASED SMART LIGHT CONTROLLER

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Abstract: Present a 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. The module is mainly based on that is a low-cost Wi-Fi microchip incorporating both a full TCP/IP stack and microcontroller capability. The ESP8266 Node MCU is a complex device, which combines some features of the ordinary Arduino board with the possibility of connecting to the internet.

Keywords: *ESP8266, IOT, Relay, Node MCU, IP*

I. Introduction

1.1 Background

The IP BASED SMART LIGHT CONTROLLER can be described as connecting everyday objects like smart-phones, smart appliances, sensors and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. Now anyone, from anytime and anywhere can have connectivity for anything and it is expected that these connections will extend and create an entirely advanced dynamic network of IoTs. IoTs technology can also be applied to create a new concept and wide development space for smart homes to provide intelligence, comfort and to improve the quality of life.

In this project, we extend our previous work and present a low cost and flexible light control and monitoring system using an embedded web server, with IP connectivity for accessing and controlling devices and appliances remotely using Android based Smart phone HTML web page. 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. We have utilized RESTful based Web services as an interoperable application layer that can be directly integrated into other application domains like e-health care services, utility, distribution, or even vehicular area networks (VAN).

Home automation or smart homes can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants.

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With the introduction of the Internet of Things, the research and implementation of home automation are getting more popular. The proposed mobile IP based architecture and its potential web page in Smart homes security and automation without any actual deployment and testing. Lately few researchers have also presented use of Web services, simple object access protocol (SOAP) and representational state transfer (REST) as an interoperable application layer to remotely access home automation systems. Introduced a smart home management scheme over the Ethernet network based on XML SOAP standards. The drawback of using SOAP based Web a service is that it is complex and adds overhead to the client and server when parsing the message, resulting in slower operation and higher bandwidth.

1.2 Problem statements

Home automation or smart homes can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants. With the introduction of the Internet of Things, the research and implementation of home automation are getting more popular. Various wireless technologies that can support some form of remote data transfer, sensing and control such as Bluetooth, RFID, and cellular networks have been utilized to embed various levels of intelligence in the home.

The studies have presented Bluetooth based home automation systems using Android Smart phones without the Internet controllability. The devices are physically connected to a Bluetooth sub-controller which is then accessed and controlled by the Smart phone using built-in Bluetooth connectivity. Researchers have also attempted to provide network interoperability and remote access to control devices and appliances at home using home gateways. Proposed mobile IP based architecture and its potential web server in Smart homes security and automation without any actual deployment and testing.

Lately few researchers have also presented use of Web services, simple object access protocol (SOAP) and representational state transfer (REST) as an interoperable application layer to remotely access home automation systems. Introduced a smart home management scheme over the Ethernet network based on XML SOAP standards. The drawback of using SOAP based Web a service is that it is complex and adds overhead to the client and server when parsing the message, resulting in slower operation and higher bandwidth.

1.3 Objectives

- We use an ESP8266 module for sending and receiving data to monitoring the street light.
- In order to acquire High efficiency with low cost.
- In our project we use this button to reset the IP address which we use to activate the operation of the light.
- The system release the SDK for programming the chip directly, which removed the need for a separate microcontroller.
- The ESP8266 Node MCU is a complex device, which combines some features of the ordinary Arduino board with the possibility of connecting to the internet.

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- Event-driven API for network applications, which facilitates developers writing code running on a 5mm*5mm sized MCU in Nodejs style.

II. Components Description

ESP8266 Wi-Fi module (node MCU)

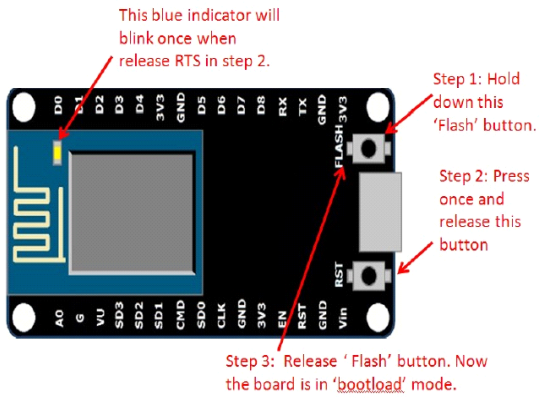
Various vendors have consequently created a multiple of modules containing the esp8266 chip at their cores. Some of these modules have specific identifiers, including monikers such as “Wi07c” and “ESP-01” through “ESP-13”, while other modules might be ill- labelled and merely referred to by a general description- e.g- “ESP8266 wireless transceiver”. ESP8266 based modules have demonstrated themselves as a capable, low-cost, networkable foundation for facilitating end point IOT developments. ESPressif’s official module is presently the ESP_wroom-02 [4]. The AI thinkers are succinctly labelled ESP-01 through ESP-13. NODEMCU boards extended upon the AI-thinkers modules. Olimex, ADAfruit, SPArkfun, WEmo

A) Features

- The operating voltage is 3.3V to 5V
- Microcontroller esp-8266 32-bit
- Flash memory 4MB
- Clock speed 80MHz
- Digital input 11
- Analog input 1
- USB conveter CP2102

B) NODE MCU ESP8266 Pin Diagram

- The NODE MCU board can be built with power pins, Reset button, power LED, digital pins, TX/RX, Flash button.
- USB to UART converter is added on the module that helps in converting USB data to UART data which mainly understands the language of serial communication.



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ESP8266 microchip

•VCC, Voltage (+3.3 V; can handle up to 3.6 V)

•GND, Ground (0 V)

•RX, Receive data bit X

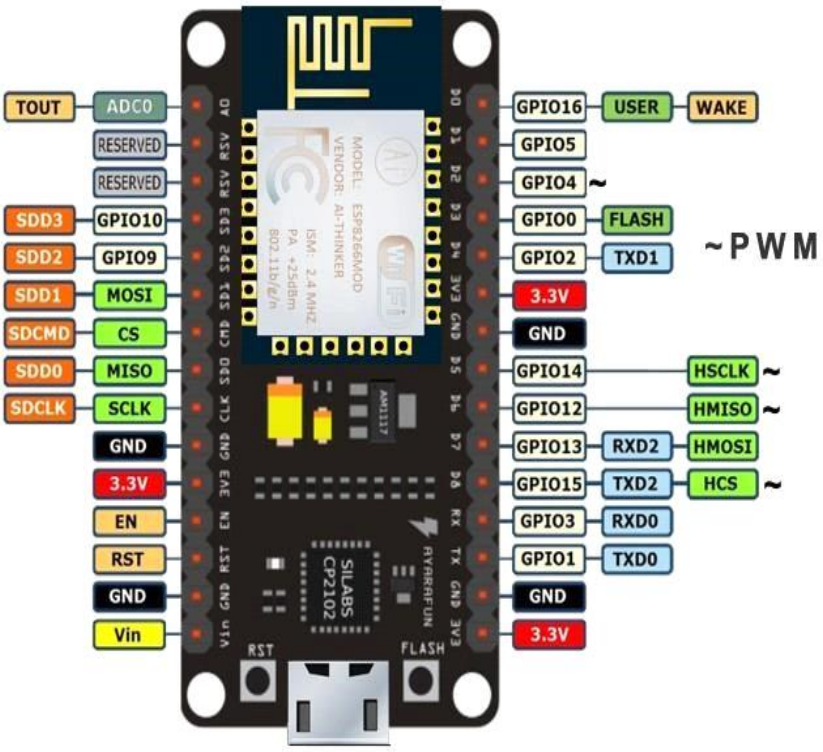
•TX, Transmit data bit X

•CH_PD, Chip power-down.

• RST, Reset.

•GPIO 0, General-purpose input/output No.

•GPIO 2, General-purpose input/output No. 2



There is a candid difference between Vin and VU where former is the regulated voltage that may stand somewhere between 7 to 12 V. while later is the power voltage for USB that must be kept around 5 V.

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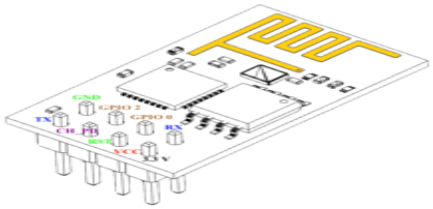
Pinout of ESP-8266



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Features

- Processor: L106 32-bit RISC microprocessor core based on the Tensilica Xtensa Diamond Standard
- UART on dedicated pins, plus a transmit only UART can be enabled on GPIO2

RELAY

A relay is a simple electromechanical switch made up of an electromagnet and a set of contacts. Relays are found hidden in all sorts of devices. In fact, some of the first computers ever built used relays to implement Boolean gates. In this article, we will look at how relays work and a few of their applications. Relays are amazingly simple devices. There are four parts in every relay.

Electromagnet, Armature that can be attracted by the electromagnet, spring, Set of electrical contacts which is shown in figure 2 & 3.

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching.

Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays". Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

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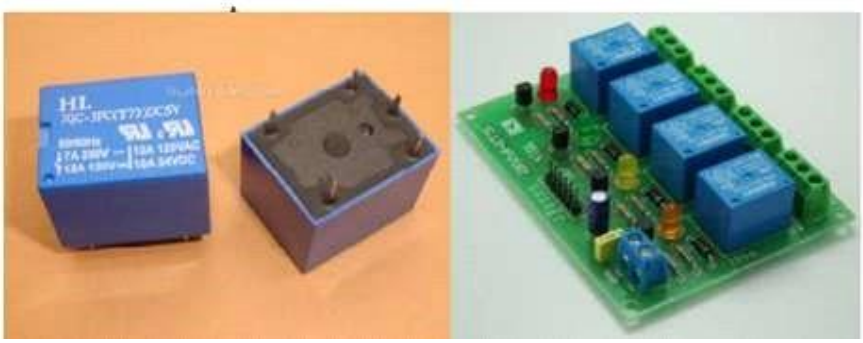
Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.



LOAD

Here lamp are connected in power supply. And when power supply is on. And it is not applicable for all type of load

III. Software Development Kit

Arduino.cc, which is mainly used for editing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go. IDE stands for "Integrated Development Environment": it is an official software introduced by Arduino.cc

- **ARDUINO IDE**

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.

A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo and many more. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a

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sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.

The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.

IV. Coding

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

// You should get Auth Token in the Blynk App.

// Go to the Project Settings (nut icon).

char auth[] = "YourAuthToken";

// Your WiFi credentials.

// Set password to "" for open networks.

char ssid[] = "YourNetworkName";

char pass[] = "YourPassword";

void setup()

{

  // Debug console

  Serial.begin(9600);

  Blynk.begin(auth, ssid, pass);

  // You can also specify server:

  //Blynk.begin(auth, ssid, pass, "blynk-cloud.com", 80);

  //Blynk.begin(auth, ssid, pass, IPAddress(192,168,1,100), 8080);

}

void loop()

{

  Blynk.run(); }
```

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V. WORKING

- We have to send the control command with help of HTML web page to the ESP8266 micro chip through the IP address.
- In this control command can be received with the help of ESP8266 and it can be convert into binary data.
- And the binary data can readed with the help of Node MCU chip.
- Then the Node MCU can turn ON the 5V relay for operate the load.

VI. Conclusion

- With our project we became successful to demonstrate with regarding the objectives of the project.
- The load can be worked depends on the two different modes. They are manual mode and auto mode.
- The auto mode can control the load automatically our preferred time already prefixed.

Grouped as follows.

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