EMBEDDED PROJECT REPORT

IOT Home automation system

Group Number. 28

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Communication Part:

For communication we are using UART protocol to communicate between HC-05 Bluetooth module and the STM32F303RE board. The Bluetooth module HC-05 uses the Bluetooth SPP (serial port profile) which is similar to RS232 and UART protocol but medium is wireless and through Bluetooth. Each Bluetooth device is provided with a 48 bit Mac address by the manufacturer for e.g. the module which we are using has the Mac address of 00:21:13:00:A1:11 , where the first most-significant half (24 bits) of the address is an organization unique identifier (OUI), which identifies the manufacturer. The lower 24-bits are the more unique part of the address.

Any Bluetooth network has a master and slave device in its mesh. By default the module is in the slave mode and the slave mode cannot initiate connection with other device but can receive connection requests. The operating voltage is from 3.3 to 5 V and the baud rate for UART serial communication of the module is found to be 38400.

The UART communication stands for universal asynchronous transmitter and receiver.

POWER ELECTRONICS PART:

Our objective is to control the intensity of light of the AC bulb depending upon the amount of light available. Firstly we sense the amount of light available using an LDR sensor. An LDR sensor basically detects light and gives an analog output in terms of voltage. We give 5V supply to the LDR and as the amount of light decreases the resistance of the sensor increases which gives a low voltage value and vice versa. Here we use ADC to convert the analog value to digital value. We now generate a PWM output according to the digital output from LDR. This PWM output is given as the input to the power circuit.

POWER CIRCUIT

The power circuit consists of two parts

1.) The Triac driver circuit

2.) The zero crossing detection circuit

The driver circuit

As we are trying to do ac power control we would be requiring a Triac. A Triac is a device in which two thyristors are connected in anti parallel. It has 3 terminals MT1, MT2 and Gate. Triac allows power flow in both the directions. It acts as a switch and is only turned on when the gate pulse is triggered. Here we are also using a MOC3021 which is an optocoupler. The main purpose of the

MOC is to optically isolate the microcontroller side from the power circuit side and to amplify the PWM signal and give it to the gate terminal of the Triac. It consists of an IR LED which emits light when it receives a voltage more than 1.1V and a Diac which acts as an LASCR (Light activated Silicon Controlled Rectifier).The Diac starts conducting whenever light is emitted by the diode. Whenever the Diac conducts the gate pulse is being given to the Triac and it starts firing.

Zero crossing detection circuit

In this circuit we will be using a 220V-6V step down transformer, LM741 op amp which acts as a comparator, a signal diode. This circuit is used to detect instances where the ac supply is crossing zero. What it does is it creates a rising edge and a falling edge alternatively whenever it detects a zero on the ac supply. We will read these rising and falling edges through the microcontroller and generate an interrupt exactly when the edges are detecting. The PWM output which is generated by the output of LDR should be given to the MOC exactly when an interrupt is being generated so that the gate pulse and the ac supply are in synchronization. This circuit helps us in preventing giving two gate pulses in a single period of 180 degrees.

Circuit Diagrams:

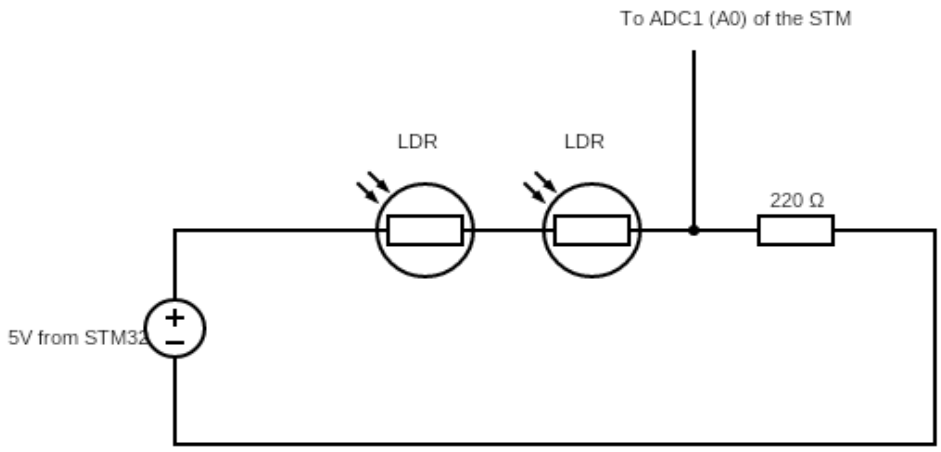
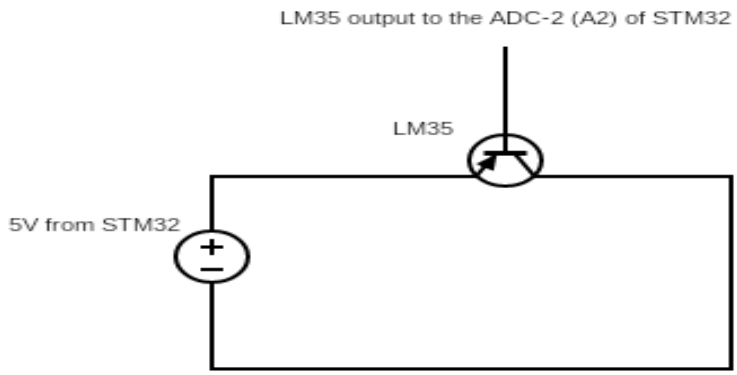


FIG 1. The LDR circuit



LM35 circuit

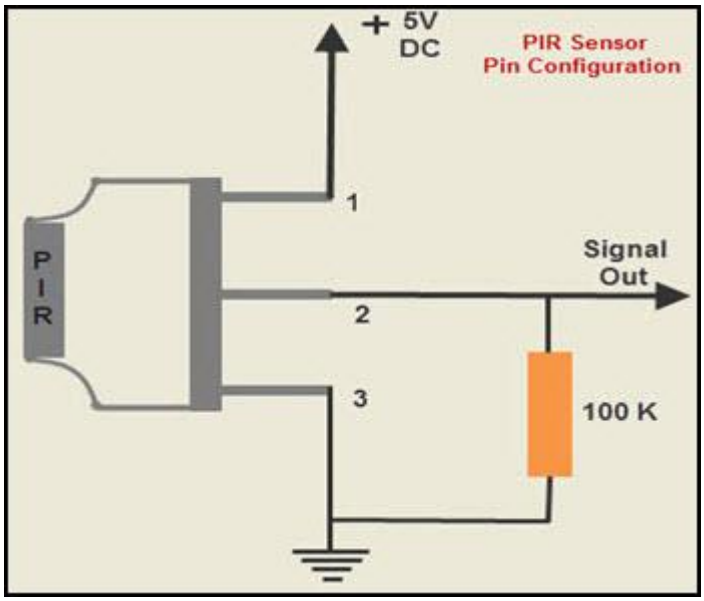


FIG 3. PIR circuit

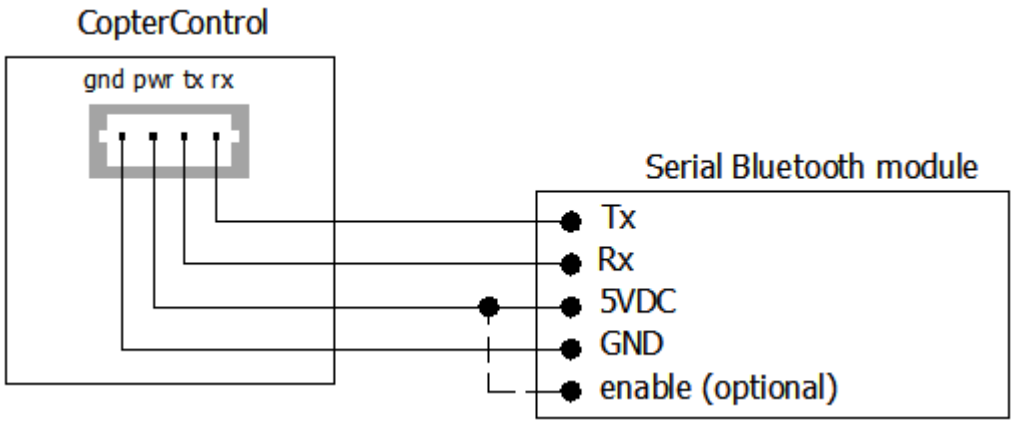


FIG 4. Bluetooth pin diagrams

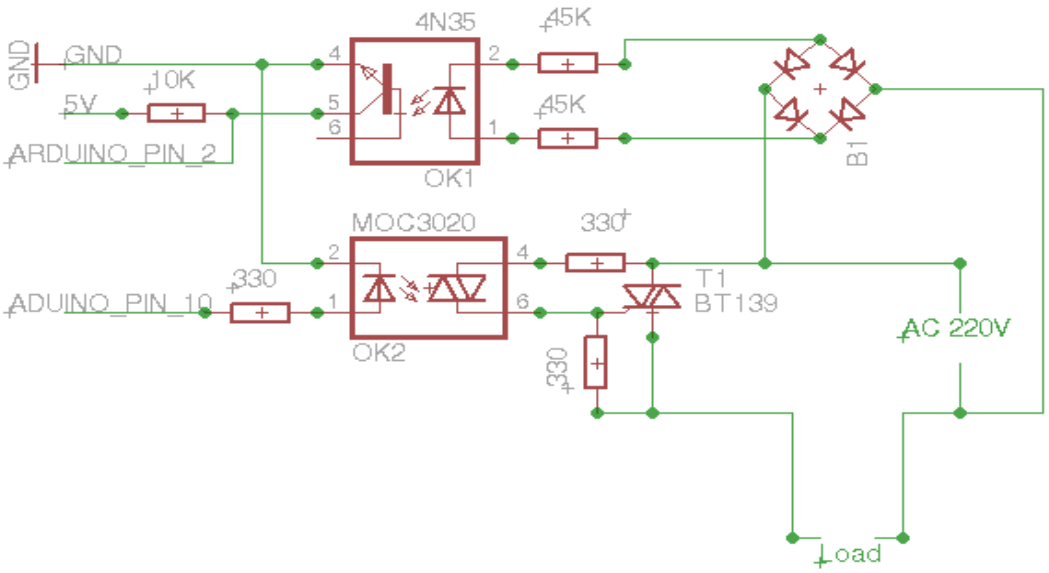


FIG 5. Power Circuit

Objective of the Project:

The aim of the project is to make a home automation system using which we can control the lights and fans inside a room through the mobile. The home automation system senses the values of the temperature and the brightness inside the room and sends the values of the temperature and brightness inside the room to the mobile using Bluetooth. The speed of the fan and the intensity of the lights are automatically adjusted based on the readings of the temperature and brightness of the room. The objective is to control the speed of a DC motor which tries to replicate a fan and to control the intensity of an AC bulb and two led lights which replicate the lights inside a room. Moreover, the speed of the motor and the intensity of the lights can be controlled through a mobile bypassing the automation.

ACHIEVEMENTS:

We have successfully interfaced the PIR, LDR and LM35 sensor. The PIR sensor will be used to detect any person that has entered the room. The lm35 sensor would be used to sense the temperature of the room and the LDR would be used to sense the light intensity. The values of the sensed parameters are being sampled by the ADCs in the STM.

Based on the intensity sensed by the LDR the PWM output to LED light would be varied. Based on the temperature of the room from lm35 sensor the PWM output to dc motor fan would be varied. Based on the output of PIR sensor the green LED light would be made ON for 1 second.

The Bluetooth HC-05 module has been successfully interfaced with microcontroller; the values of temperatures, light intensity are sent from slave to the master module that’s the phone. The person entered who is detected is send to master module.

We are able to receive the data from master to the slave module.