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Vellore Institute of Technology
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CSE3999

TECHNICAL ANSWERS FOR REAL WORLD PROBLEMS

SLOT – TG1

ASSESSMENT - 3

“AUTOMATIC POWER CONTROLLER”

Submitted to:

Prof. DURAI RAJ VINCENT P.M.

Submitted by-

Team Members

16BCE0481-SHAIK MUZAMMIL

16BCE2028-RISHAB TYAGI

16BCE2073-MOHIT GUPTA

16BCE2092-RAVI RAJ

17BCE0354-HRITUJA SEN

17BCE0851-MIHIR KUMAR SINGH

17BCE0898-AVINA

Problem Statement

The issue at hand is the wastage of electrical energy in electrical appliances in cities by almost all people, which also causes shortage of supply of electricity in villages.

Abstract

Our main aim in this project is to make an Automatic Power Controller, which undertakes the initiative to save energy. Through this project, we aim to address the problem statement at hand.

This project aims to curb the wastage of electricity because of switches and electrical devices which are left on unnecessarily. We aim to do so by placing a sensor above the doors, which can detect the presence of people inside, and switch off the electricity supply when the room is empty.

Objective

Choosing a sensor which can detect the presence of humans and send data to the microcontroller.

Building a prototype before an actual system.

Detecting the devices which are switched on unnecessarily.

Work Plan

Developing a circuit for controlling the switches using correct sensor and microcontroller.

Testing of a prototype before actual system can be implemented.

Also, convincing the villagers of India might be necessary, as they might show hesitation in getting sensors installed into their houses.

Methodology

The IR transmitter will emit modulated 38 kHz IR signal and at the receiver we use TSOP1738 (Infrared Sensor). The output goes high when there is an interruption and it returns back to low when there is no obstacle to the ray. Input is given to the Port 4 of the Arduino microcontroller. Port 8 to 13 is used for the 7-Segment display purpose. Port 2 is used for the Relay/LED Turn On and Turn off Purpose. LTS 542 (Common Anode) is used for 7-Segment display. And that time Relay/LED will get Voltage and triggered so light will get voltage and it will turn on. And when counter will be 00 that time Relay will be turned off. In this bidirectional circuit two infrared (IR) sensor components are used for up and down counting, respectively. Whenever an interruption is observed by the IR sensor then the IR sensor increments the value of counter and whenever the second sensor detects any obstacle, the counter is decremented. The number of interruption count depends upon the sensor's input and is displayed on a set of seven segment displays by using the concept of multiplexing. The IR sensor

input is defined as up and down selector mode for the counter in the code. Every time the first sensor is blocked, the first sensor gives a high voltage signals and the count value gets incremented. The value of second sensor gets decremented when connected to second a sensor, gives high input. At every setup, the value of the counter is sent and displayed it on the Sensor, gives high input. At every setup, the value of the counter is sent and displayed it on the seven segments.

Discussion on Implementation

- > Bread Board
- > Connecting Wires
- > LED
- > BC547 Transistor

b) Description of components

1)**Arduino Uno**: An Arduino is an open-source microcontroller development board. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on computer, used to write and upload computer code to the physical board. The board features an Atmel ATmega328 microcontroller operating at 5 V with 2Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second. The board has 14 digital I/O pins and 6 analog input pins.

->**Power**: The Uno board can be controlled through the USB association or with an outer power supply. Outside (non-USB) force can come either from an AC-to-DC connector (divider wart) or battery. The board can work on an outside supply from 6 to 20 volts.

->**Memory of Arduino Uno**: The ATmega328 has 32 KB (with 0.5 KB involved by the bootloader). It likewise has 2 KB of SRAM and 1 KB of EEPROM (which can be perused and composed with the EEPROM library).

->**Input and output of Arduino Uno**: Arduino has 14 digital pins. They work at 5 volts. Every pin can give or get 20 mA as prescribed working condition and has an interior draw up resistor of 20-50k ohm. A greatest of 40mA is the worth that must not be surpassed on any I/O pin to maintain a

strategic distance from perpetual harm to the microcontroller. Furthermore, a few pins have specific capacities:

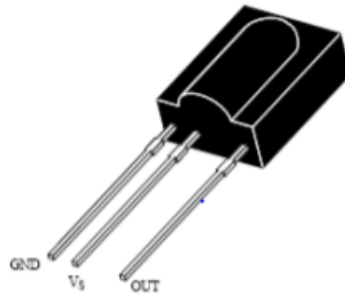
- i) **Serial:** 0 (RX) and 1 (TX). Used to get (RX) and transmit (TX) TTL serial information.
- ii) **Outside Interrupts:** 2 and 3. These pins can be designed to trigger a hinder on a low esteem, a rising or falling edge, or an adjustment in worth. I
- iii) **PWM:** 3, 5, 6, 9, 10, and 11. Give 8-bit PWM yield with the `analogWrite()` capacity.
- iv) **SPI:** 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins bolster SPI correspondence utilizing the SPI library.
- v) **Driven:** 13. There is an implicit LED driven by advanced pin 13. At the point when the pin is HIGH esteem, the LED is on, when the pin is LOW, it's off.
- vi) **TWI:** A4 or SDA pin and A5 or SCL pin. Support TWI correspondence utilizing the Wire library.

The Uno has 6 simple Analog inputs, named A0 through A5, each of which give 10 bits of determination (i.e. 1024 unique qualities).

There are a few different pins on the board:

- i) **AREF.** Reference voltage for the simple inputs. Utilized with `analogReference()`.
- ii) **Reset.** Convey this line LOW to reset the microcontroller. Normally used to add a reset catch to shields which obstruct the one on the board.

2)IR Sensors:

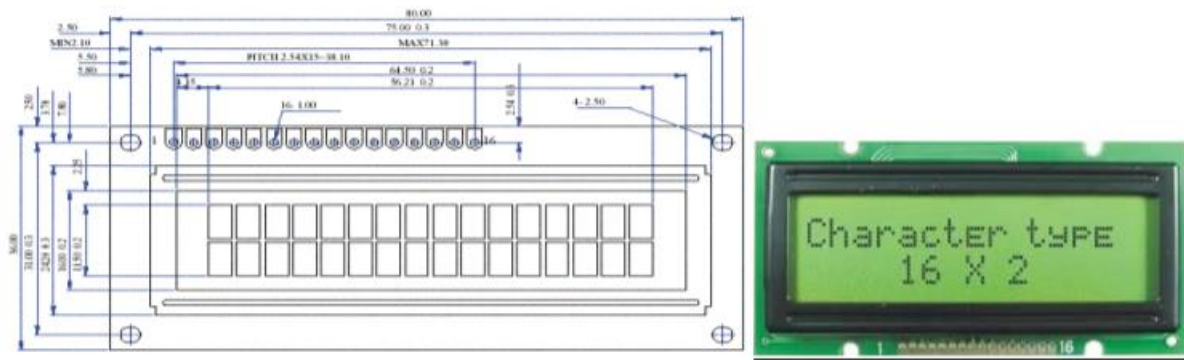


Series are miniaturized receivers for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter. The demodulated output signal can directly be decoded by a microprocessor. TSOP17.. is the standard IR remote control receiver series, supporting all major transmission codes.

->Features:

- > Photo detector and preamplifier in one package
- > Internal filter for PCM frequency
- > Improved shielding against electrical field disturbance
- > TTL and CMOS compatibility
- > Output active low
- > Low power consumption
- > High immunity against ambient light
- > Continuous data transmission possible (up to 2400 bps)
- > Suitable burst length .10 cycles/burst

3)16 X 2 LCD Display LCD (Liquid Crystal Display):



This screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

c) Working

The IR sensor continuously senses the presence of any obstacles (a person in our case).

If sensor 1 senses a person, it informs the controller that a person has entered so that controller can increment the count.

At the same time it gives a delay of 1second, so that the person can cross the sensor 2 and the count is maintained correctly.

When a person exits, the sensor 2 informs the controller to decrement the count. Similarly it also provides a delay of 1 sec to maintain count properly.

The count is displayed on LCD by the controller.

If there is at least 1 person is inside the hall, an LED will glow otherwise it will stay off.

References

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Simulation of energy efficient Bidirectional Visitor Counting Machine.
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