TIME OPERATED ELECTRICAL APPIALNES CONTROL SYSTEM USING ARDUINO

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Abstract - *Time operated electrical appliances control system using arduino takes over the work to switch ON/OFF the electric devices with respect to time. This paper provides alternative replacement of manual switching by technology enhancement towards user effective and prevent hazard. It has inbuilt real time clock which tracks over the real time. When this real time equals to programmed time, then the corresponding device is switched ON or OFF with given ON time or OFF time. The switching time can be edited any time using the keypad. The real time clock is displayed on the 7-segment display.*

Key Words: **Arduino, LCD, Real time clock, Relay module, control inputs.**

1.INTRODUCTION

We are surround with many embedded products our daily life depends on the proper functioning of these gadgets. By using palm devices of our work space enables us to do many of our tasks effectively like television, radio, washing machine, micro oven in our kitchen. As the technology is advanced things are becoming easier for us and with the help of Automation devices are controlled to reduce the human work in production of goods and services.

The most important problems faced in our society is misusage of electricity and its loss. Sometimes due to knowingly or unknowingly persons switch ON the lamps or fans which results in wastage of electricity. The design helps to finish all these problems. Time operated electrical appliances control system is the system of arduino based design.

2. Previous method

Manual system put pressure on people to be correct in their all details of work at all the time, the problem being is that people aren't perfect however much easy of us wishes we were. With manual systems the work depends on individuals and this leads to a requirement of management to run training continuously for staff to keep them motivated and to ensure they are following the correct procedures. It takes more effort and physical space. When mistakes are made or changes or corrections are needed, often a manual transaction must be completely redon rather than just updated. With manual systems information often has to be written down and copied or entered data more than once.

The speed of manual system is slow compared to automated system as well as the response is also slow. Hence more accidents are prone to happen in manual systems than in automated system. The manual system is inaccurate as a result of not following the instructions to details. The manual safety system cannot be programmed to do many tasks a part from the one it prescribed to carry out and therefore not economical to use

3. PROPOSED SOLUTION

Our proposed work is mainly focusing on to design and construct a micro computer based design system to control electrical appliances such as light, fan etc. the keyboard part is used to edit input for activation based on real time with integration of CMOS on IC DS 1307. we will use the arduino, LCD and RTC 1307 to show the control time.

3.1Arduino description

Arduino is a open source computer hardware and software that designs and manufactures single-board microcontroller meant to make the applications more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around an 8-bit ATMEL AVR microcontroller or a 32-bit arm. Current models consists of USB interface 6 analog inputs pins and 14 digital I/O pins that allows the user to attach various extension boards.

The arduino UNO is a micro controller based on ATMEGA328. It has 14 digital i/o pins in which 6 can be used as PWM outputs, 16 MHZ ceramic resonator, an ICSP header, a USB connection a power jack and a reset button. This contains all required support needed for microcontroller. In order to get started they are simply connected to computer with USB cable or battery.

Figure 1: Arduino UNO module

There are various types of arduinos in which many of them are third party compatible versions. The most official versions available are arduino UNO R3 and arduino nano V3 both runs at 16 MHZ ATMEL ATmega328p 8-bit microcontroller with 32 KB of flash RAM, 14 digital I/O with 6 analog I/O and 32KB will not sound like as if running windows.

3.2 RTC MODULE

A real time clock module which is fundamentally a time tracking device that gives current time and date. RTC module that comes with Ds 3231 IC have the provision to set alarms. Here we are using an RTC module with DS 1307 based on I2c protocol (two wire protocol). The module provide details such as seconds, minutes, hours, day of week, day of month, month and year including correction of leap year. It can operate either in 12 hour or 24 hour format. Current consumption of this module is nano ampere range. Even a 3 volts battery can power it for 10 years maintaining an accurate clock and without any external power. DS 1307 has memory area of 64 bytes in which first 8 bytes are dedicated to RTC register area and remaining 56 bytes are used as general purpose RAM. The detailed information about current date and time is stored in its register area as binary coded decimal. The module communicates with micro controller using serial communication protocol called I2c. The I2C bus physically consists of 2 active wires. The wires called serial data lines (SDA) and serial clock lines (SCL) are both bi-directional. Each and every device when connected to bus has its own unique device addresses, and it doesn't matter whether it is an MCU or RTC module.

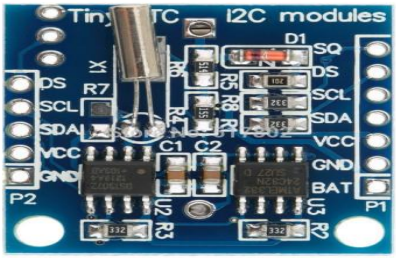


FIGURE 2: RTC MODULE

DS1307 will act as slave in communication network. Arduino starts working by initiating a start condition along with a device address to the slave. There after we need to send the register number in order to access the value inside. The interface to arduino is simple I2C with SDA and SCL pins are connected to corresponding I2C pins of arduino. At the software side we are using the arduino library named wire for I2C communication. This library allows you to communicate with I2C/TWT devices.

3.3 LCD DISPLAY

LCD display module with 20*4 characters is in-built with RW1063 controller IC which are 6800, 4 line SPI or I2C interface options.. Display module is controlled by SPLC780D which is same as common HD44780 can control display module.

We can also control this display easily over a single wire-serial interface using serial enabled LCD backpack.

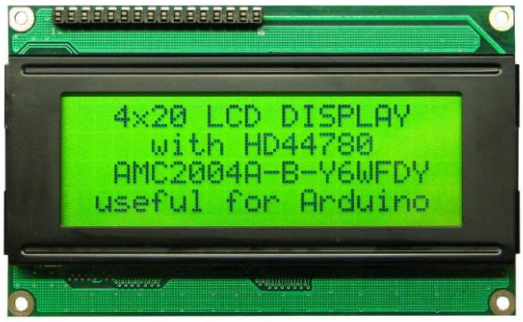


Figure 3: LCD display

Features of LCD:

- Number of characters : 20 characters * 4 lines
- Character table : English-european
- Viewing area :77.0*26.5 mm
- Dot size : 0.55*0.55mm
- Dot pitch: 0.60*0.60mm,
- character size: 2.95*4.75mm
- Character pitch : 3.55*5.35 mm
- LCD type : yellow/Green STN positive, transflective
- Backlight type : yellow/green LED
- Supply voltage for logic : 5v
- Supply voltage for backlight :3.8-4.2v
- Operating voltage : 20 to +70 ^{0} c.

3.4 Relay module:

This is a 5v of voltage and 10A of current with 2-channel relay interface board. With large current it can be used to control various appliances, and other equipments. It can be controlled directly with 3.3v or 5v logic signals from arduino.

There is 1*4(2.54mm pitch) pin header for connecting power (5v to 0v) and for controlling the 2 relays. The pins are marked on PCB.

Figure 4: Relay module

- Gnd- connect 0v to this pin
- IN1 – control relay 1, active low! Relay will turn ON when this input goes below about 2.0V.
- IN2- control relay 2, active low! Relay will turn OFF when this input goes below about 2.0V.
- VCC- connect 5V to this pin.

There is a second 1*3(2.54mm pinch) pin header for supplying the relay side of board with 5v. At delivery a jumper is present on this header selecting the 5v signal from the 1*4 pin to power the relays.

3.5 CIRCUIT DESCRIPTION

The following diagram shows the use case diagram of time operated electrical appliances control system.

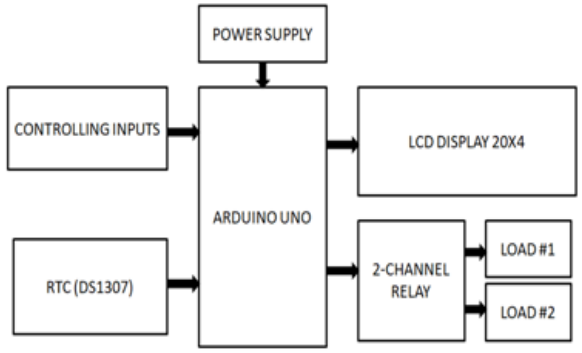


Figure 5: Block diagram

The system admin of time operated electrical appliances control system using arduino has the ability to add or delete the different appliances and its operations. The user can give instructions to existing device, get the status of the device and set the operation of different appliances. Arduino makes it economical to electronically control many more processes. Use case diagrams are central to modeling the output of system and it shows a set of use cases and their relationships. The circuit has two relays to control fan and light and it has keypad (controlling inputs) to enter the orders or parameters and it has LCD to display the instructions and it has the power supply circuit to convert from ac to dc and a arduino is used in automatically controlled devices, the system works when arduino is ON.

RTC module has four wires interface vcc, gnd, serial data line, Serial clock line. Vcc and gnd pins are connected to arduino board 5v and gnd respectively that gives it biasing voltage for its operation. Arduino communicates with RTC DS 1307 using these two pins. Five push buttons are connected to arduino as input. All five push buttons are pulled down to ground through 10K resistors. When any button is pressed, the respective arduino pin gets logic 1 (HIGH) input. Data pins D4-D7 of LCD are connected are to arduino pins 10-13. Two control pins Rs and En are connected to pins 8 and 9 respectively. Control pins RW and VEE are connected to ground. Backlight LED of LCD is given 5v supply.

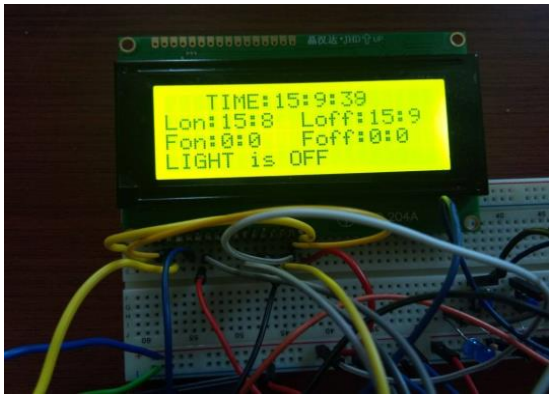
3.6 CIRCUIT OPERATION

The sequence of steps for circuit operation is :

1. When the power is given to circuit through USB, initially the relay and device is OFF.
2. The person has to first set device turn ON time and device OFF time. The initial message is displayed on LCD as “set device ON time”.
3. Now a person has to set the device turn ON time using push buttons. The 5 push buttons have the following functions: button 1 increment hour from 0 to 24, button 2 increment minute from 0 to 60 , button 3 set and entre selected time, button 4 is for fan and button 5 is for light.
4. So by pressing button 1 and button 2, the person will set required the person will set require hour and minute and then press entre button to set device ON time.
5. The message is displayed on LCD as “the device ON time is set to XX:XX:XX”. Similarly, the person has to set device OFF time.
6. When the device OFF time is set again the message is displayed on LCD as “the device OFF time is set to XX:XX:XX”.
7. After 2 seconds the circuit operation starts.
8. Arduino reads current time from RTC module and displays it on LCD as “Time:-XX:XX:XX”. Along with this LCD also displays set device ON time and device OFF time as Lon and Loff and Fon and Foff.
9. It continuously checks if current time is and device ON time are same. When they match, it turns on relay and so the device by sending high on digital pin 7. The message displayed on LCD as “device is ON”.

a) ON time

10. Now when the current time equals to device OFF time the device is turned OFF by turning OFF the relay. The message displayed on LCD is "the device is OFF".



b) OFF time

4. RESULT

The electrical devices connected in factory, home or any place consume electrical power, and there is absolute necessity of saving power. It is necessary to control electric devices more effectively and efficiently at anytime from anywhere. So this project is built for sole purpose of efficient control of electrical appliances. The operation of the circuit depends on time and can be used in different appliances to control the device based in different time. This system can be used in industrial applications and home. This design reduces the human effort or human interaction and make life very easy without compromising on efficiency of appliances and using this system one can also save time and thus it can works independently as an automated circuit and it can monitor some hazardous and real time implementation and deployment of system has a huge potential of minimizing energy wastage in various appliances such as domestic and industrial electrical applications.

5. CONCLUSION

In this paper, the proposed architecture is implemented with low cost and flexible electrical control system. Time operated electrical appliances is a locally customized device capable of switching electrical devices with respect to time and can be used for both home and commercial cafeteria purposely to prevent electrical hazards and also generate post operations of attached devices. It can be used in various industries to control the devices based on different time.

6. FUTURE SCOPE

In future development we can control some hazards parameters like over heat , LPG gas loss. We can also use voice announcement or voice feedback system for electrical appliances.

REFERENCES

[1] www.instructable.com>technology>arduino

[2] https://sites.google.com/site/wayneholder/low-power –techniques-for-ardunio.

[3] http://www.engineersgarage.com

[4] https://www.engineersgarage.com/contribution/rtc-based-device-timer-using-arduino

[5] https://www.arduino.cc

[6] https://randomnerdtutorials.com/guide-for-relay-module-with-arduino

[7] www.winstar.com.tw/products/charcater-lcd-display-Module/20*4-lcd-display.html

[8] www.electronicshub.org

[9] https://www.ijsr.net/archive/v5i5/NOV136743.pdf

[10] William c. mann smart technology for aging, disability and independence: the state of science, john wiley and sons.