

Automatic Washroom Light Controller

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Abstract— This paper presents the electronic triggering of automatic washroom light switching which replaces manual switching of washroom light. Using microprocessor and NPN transistor the switching control is done. It has been established that automatic washroom light controller using motion sensor was commercially productive but with few drawbacks listing high power consumption and cost effective which has been replaced by automatic electronic triggering.

Index Terms— Automatic controller, Voltage divider, electromagnetic relay, ATMEGA series microprocessor

1 INTRODUCTION

In this dynamic world, the first objective of following paper strains on the economic condition of power consumption.

Especially for countries like India where power production and demand is craving its peak, it is necessary to develop such system and devices that can be produced commercially with minimized power consumption to meet the future power requirements. In view of energy crises throughout the world, judicious planning for effective utilization of devices, technology using different renewable resources is essential. In the booming technological world home automation has become the most popular as well as economic in saving electrical in once daily life. This paper represents the simple operation of an intelligent electronic microprocessor that is programmed to control the washroom light using an electromagnetic relay coil.

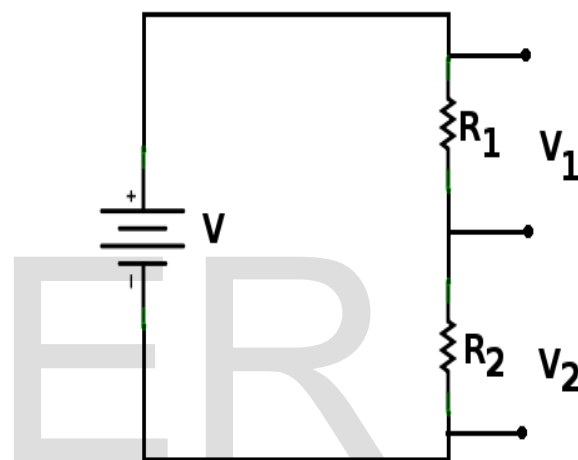
Our earlier research work on automatic washroom light controller was fuzzy based technique using reed switch, electromagnetic relay coil on door hinges which was replaced by this paper. The aim of this paper is minimizing power consumption and cost effective.

2 THEOREMS AND PROOFS

2.1 Variation of sensitivity of TX-RX sensors

The prime theorem used for varying the sensitivity of the TX-RX sensors so as to clearly define for the microprocessor is voltage divider rule.

Voltage Divider Theorem. A voltage divider is also known as potential divider. It is a simple electrical circuit that contains a high resistance across a voltage source. We obtain the variable voltage output across the resistance by varying position of sliding contact on the resistance. This output voltage is a fraction of source voltage. Voltage divider rule is applicable for both AC and DC voltage source.



Voltage Divider Circuit

Proof.

$$V_{out} = V_1 (I R_2 / (R_1 + R_2))$$

$$= V_1 R_2 / (R_1 + R_2) [1]$$

$$V_{out} = V_1 (I R_2 / (R_1 + R_2))$$

$$= V_1 (R_1 \parallel R_L) / (R_1 + R_2 \parallel R_L) [2]$$

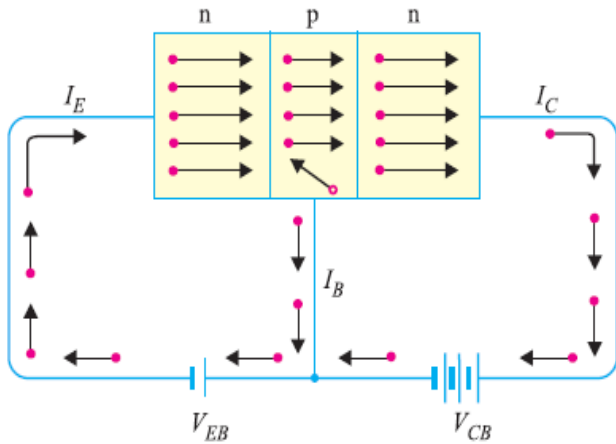
2.2 Feeding controlling signal through NPN transistor

For controlling, the DC operated electromagnetic 12V relay on NPN transistor is used as a switching element. The transistor is configured as common emitter so as to amplify signal as well as to control the relay.

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[1] Output Voltage under no load (open circuit)

[2] Output Voltage under load



3 METHODOLOGY

3.1 Breadboarding TX-RX IR sensors strip

Our work on the proposed idea was to connect the transmitter and receiver face to face so as to receive the transmitted signal fully.

3.2 Programming microprocessor using Arduino Kit

For the successful experimentation of the TX-RX sensors the microprocessor chip ATMEGA328 chip is used and programmed using Arduino Kit and corresponding software.

3.3 Designing NPN transistor connection

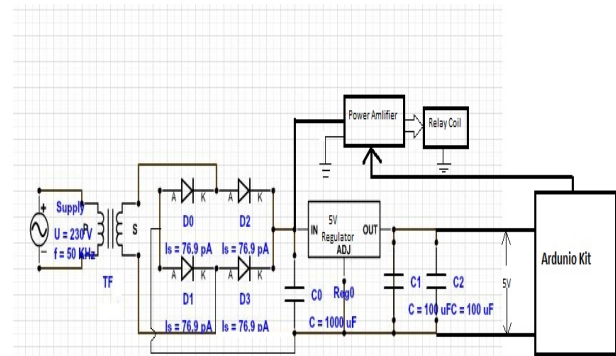
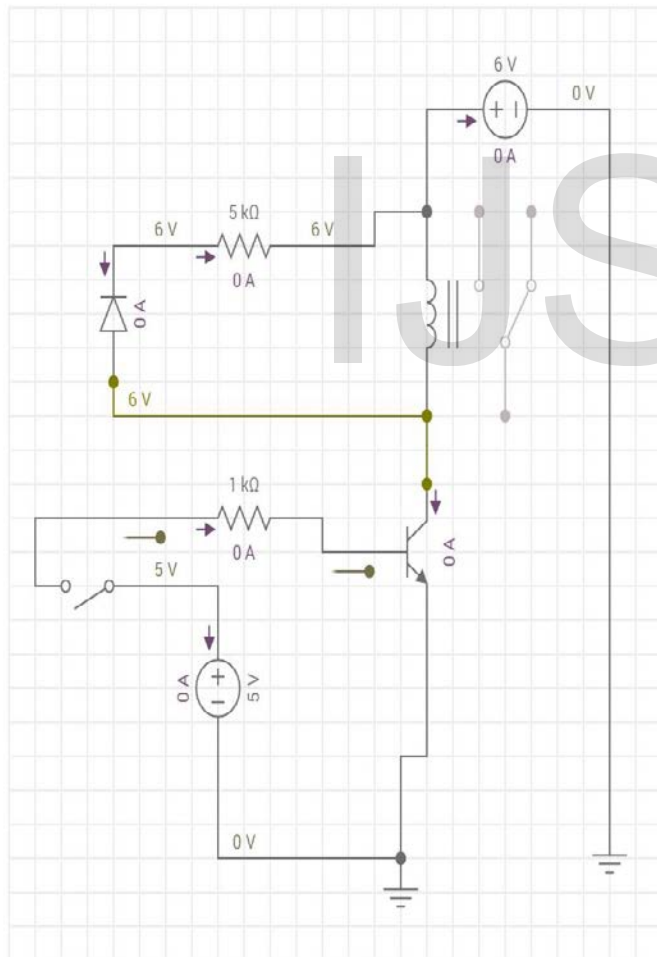
Before making the final connection, the biasing of the NPN transistor was necessary to be simulated in the simulator for controlling the relay coil according to our required needs.

3.4 Power feeding DC operated electromagnetic relay using NPN transistor

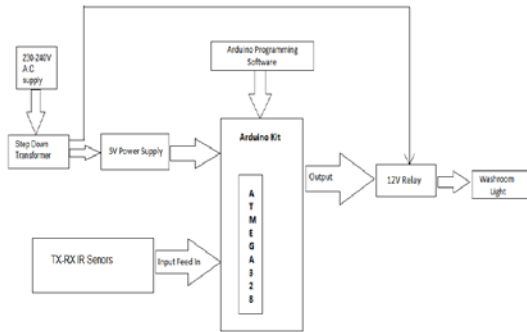
Our next step was to amplify the 5V output signal of Arduino through a CDIL BD139 NPN transistor and feed the controlling signal to the relay coil. The relay is powered through an external power source.

3.5 Power supply to the microcontroller and relay

Our final step was to provide regulated power to the microcontroller using voltage regulator chip and to electromagnetic relay.



3.6 Flowchart



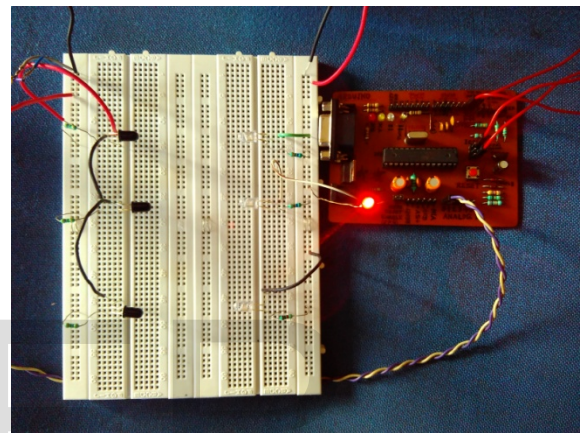
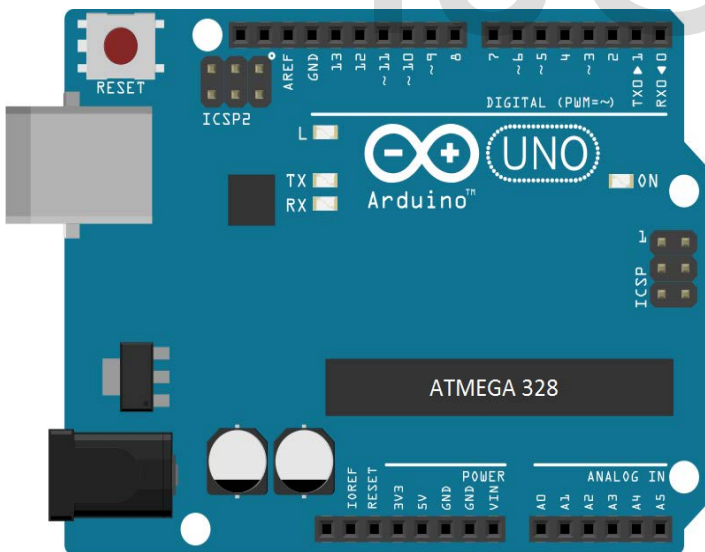
4.3 List of electronic elements

Sl.no	Item Specifications	Quainty
1	TX-RX Sensors	3 pair
2	1k resistor	3
3	4.7M resistor	3
4	CDIL BD139 NPN transistor	1
5	12V dc operated relay	1
6	5k resistor	1
7	PN4007 diode	1

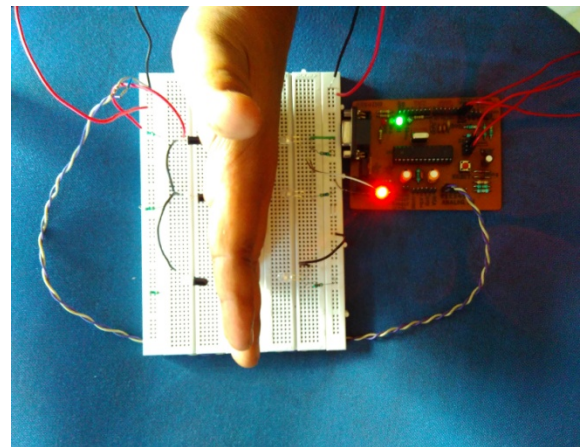
4 HELPFUL HINTS

4.1 Arduino Kit Figure

Arduino kit is a compact programming controller circuit generally used by circuit developers basically used to program various microprocessor chip, feed various analog and digital inputs, provide necessary analog and digital outputs, provide necessary analog and digital output as well as to simulate various electronic circuits.



As there is no object obstructing the sensors the light switch is open.



When the object obstructs the sensor strip the light switch becomes closed and the switch becomes on

6. FUTURE ENHANCEMENT

In the research we have designed a system to give complete solution for automatic switching of washroom light. The wastage of time for manual switching and energy can be eliminated and is one of the important criteria in once daily life. Using this research unit we can also automate residential lightning and could seyp in small to big industries.

7 CONCLUSION

The proposed system "Automatic Washroom Light Controller" has been successfully designed and tested.

It has been developed by integrating feature of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

8 END SECTIONS

8.1 Appendix

Colour Coding of resistance

Color	Digit	Multiplier	Tolerance (%)
Black	0	10^0 (1)	
Brown	1	10^1	1
Red	2	10^2	2
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	0.5
Blue	6	10^6	0.25
Violet	7	10^7	0.1
Grey	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
(none)			20

8.2 Acknowledgment

This work was supported by our respected electric departmental faculty Mr. Debashis Jana of Camellia Institute of Technology under West Bengal University of Technology. The work was also very much supported by our beloved class mate Shubhojit Kundu.

8.3 References

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