



POWER SAVER STREET LIGHTING USING MICROCONTROLLER USING ATmega16

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Abstract:

Street lights remain illuminated for whole nights and most of them used for lighting-up of highways are high energy consumption lamps. Preservation and sustainable use of energy and resources is an important factor of planning and development these days as Natural resources are depleting day by day, which pose a risk of scarcity and non-availability of the same for our presiding generations. There is an acute need for devising a well thought out plan to prevent wastage of electricity. Perhaps, the government should think of implementing automatic street light control systems using LDR (light dependent resistor). This review paper illustrates the street light illumination system automated by the movement (frequency) of vehicles on that particular street. The crux of this paper is to emancipate the necessity and usage of street light control systems which combines various technologies is Timers, Photodiodes, Light Emitting Diodes (LED), and IR Sensors.

Keywords: Microcontroller; LED; Gear Motor; LDR; IR Sensor; Power.

Cite This Article: Karan Sharma, Kunal Mandil, and Nancy Gupta. (2018). "POWER SAVER STREET LIGHTING USING MICROCONTROLLER USING ATmega16." *International Journal of Engineering Technologies and Management Research*, 5(2:SE), 1-8. DOI: 10.5281/zenodo.1200274.

1. Introduction

The inspiration of this research was obtain from the wastage of power and The shortage of power in an ever increasing power demand scenario in India. "What will be the solution in order to reduce the deficit power?" The concept of making this plan is to substitute a device for street lamps that do not eat Brobdingnag (a quantity of strength) and efface darkness from myriad of places with very tremendous depth of sunshine effectively is challenging every engineer to run in the direction of this difficulty. Present Street lighting fixtures is one among the many but of profound importance and luxury obligations of a metropolis. Lighting fixtures will account for 10–38% of the full energy invoice in regular cities international. [1]. Atmega16 is partner in nursing 8-bit high average overall performance microcontroller of Atmel's mega AVR family with low strength consumption. Atmega16 is based totally on extended computer architecture (reduced instruction set computing). For proper functionality, the control logic has been tested in Proteus software. With the use of LDR are there is an automatic switching to switch on the LEDs at dusk and switch off at dawn. Though this minimizes the power usage, it is not optimal and reliable. [3]

2. Objective

We need to conserve and save lots of energy. As we know that, of most of the energy sources we rely on, like coal and gas can't get renewed. Once we have used them up they're gone forever. Saving them is extraordinarily necessary, in preference to victimization the power in spare instances is ought to be converted. For the duration of this project, we're averting the problem by having a companion - a computerized gadget that turns on and rancid the light during the given time or as soon as the near mild falls under a selected intensity. Every controller has an accomplice LDR this is employed to be aware of the near light. If the ambient light is underneath a selected value lights will grow to ON state eventually. A light detector is interfaced to the AVR microcontroller; as soon as it gets dark the semiconductor diode will switch to ON mode and once the sensors discover light the semiconductor diodes are programmed to get OFF. The operation of relay is moreover based on illustrious functioning of microcontroller and also on the code written in c language in AVR programmer. Computerized light management may be a sincere and powerful idea. By victimization of this approach guide, works are one hundred percent removed. The purpose of this mission is to regulate the light using LDR.

3. Description of Components

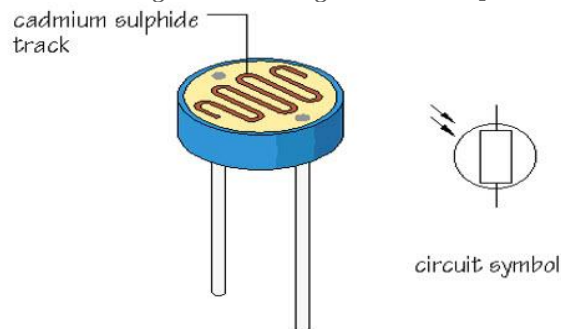
In this research the list of hardware components used are given below:

- LDR (Light dependent resistor)
- Power supply
- Voltage regulator
- ATmega8 Microcontroller
- IR Sensor
- Capacitor
- Resistor
- Diode
- LED (Light emitting diode)

3.1. LDR

LDRs or light dependent resistors are extraordinarily beneficial especially in light/dull sensor circuits. Usually the resistance of an LDR is extremely high, however while they're lit up with light resistance drops dramatically. Electronic onto sensors are the gadgets that alter their electric characteristics, in the presences of seen or invisible light. The recognized devices of this kind are the light based electrical tool (LDR), the image diode and also the phototransistors. Light based resistors because the name indicates rely upon light for the version of resistance. [2]

Practical LDR is shown in below figure.

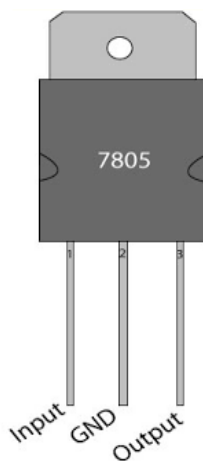


3.2. Power Supply

The 12v adapter is hooked up to the energy jack to provide the strength provided to the relay. Another 220v electricity delivery is connected to the load. To make a 5v DC regulated power supply we generally tend to connect a voltage regulator that offer the electricity supply to the atmega16 microcontroller and peripheral objects. With inside the atmega16 microcontroller the VCC pin is tenth and ground pin is 11th.

3.3. Voltage Regulator

Usually, we tend to begin with an unregulated power supply starting from 9Volt to 12Volt DC to form a 5Volt power supply, IC 7805 voltage regulator as shown in figure has been used. The IC 7805 is easy to use. Merely connect the positive lead form unregulated DC power supply (anything from 9VDC to 12VDC) to the input pin, connect the negative lead to the common pin and then activate the power, a 5 V supply from the output pin is to be achieved.



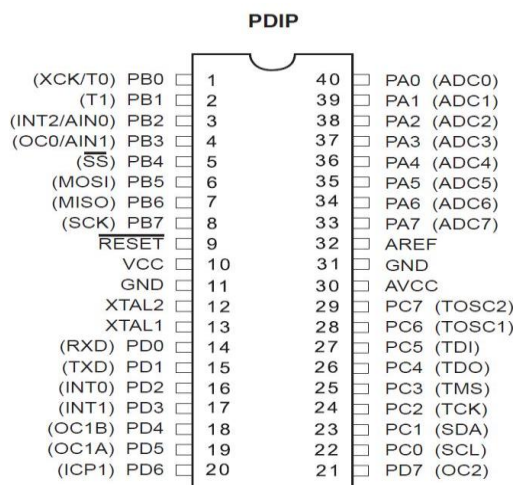
3.4. Atmega16 Microcontroller

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing). Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.

PIN Details:

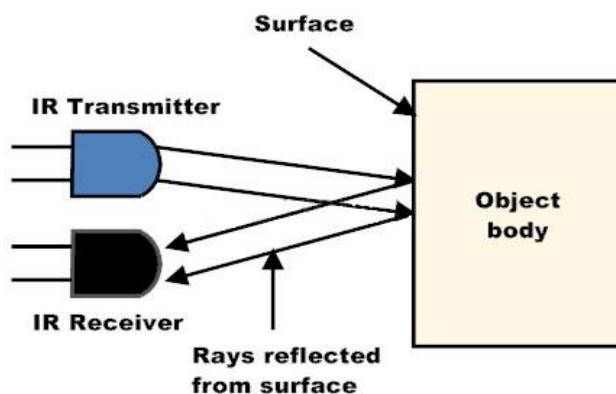
PIN1	I/O , T0 (Timer0 External Counter Input),XCK : USART External Clock I/O
PIN2	I/O, T1 (Timer1 External Counter Input)
PIN3	I/O, AIN0: Analog Comparator Positive Input , INT2: External Interrupt 2 Input
PIN4	I/O, AIN1: Analog Comparator Negative Input, OC0 : Timer0 Output Compare Match Output
PIN9	Reset Pin, Active Low Reset
PIN10	VCC=+5V
PIN11	GND
PIN12	XTAL2
PIN13	XTAL1
PIN14	(RXD) ,I/O PIN 0,USART Serial Communication Interface
PIN15	(TXD) ,I/O Pin 1,USART Serial Communication Interface
PIN16	(INT0),I/O Pin 2, External Interrupt INT0
PIN17	(INT1),I/O Pin 3, External Interrupt INT1
PIN18	(OC1B),I/O Pin 4, PWM Channel Outputs
PIN19	(OC1A),I/O Pin 5, PWM Channel Outputs
PIN20	(ICP), I/O Pin 6, Timer/Counter1 Input Capture Pin
PIN21	(OC2),I/O Pin 7,Timer/Counter2 Output Compare Match Output
PIN22	(SCL),I/O Pin 0,TWI Interface
PIN23	(SDA),I/O Pin 1,TWI Interface
PIN24-27	JTAG INTERFACE
PIN28	(TOSC1),I/O Pin 6,Timer Oscillator Pin 1
PIN29	(TOSC2),I/O Pin 7,Timer Oscillator Pin 2
PIN30	AVCC (for ADC)
PIN31	GND (for ADC)
PIN33-40	PAx: I/O,ADCx (Where x is 7 – 0)

PIN Configuration:



3.5. IR Transmitter – Receiver

The infrared transmitter LED is connected across a 5V supply in series with a resistor of 270 ohm, while the infrared receiver photo-diode is inversely connected across the 5V supply through a resistance of 10K. The purpose of the IR sensor is to sense the movement of vehicles and the required power LEDs correspondingly. The IR pairs are placed just before the LED to light the street just before the vehicle reaches a particular point.



3.6. Resistor

A resistance may be a passive two-terminal electrical element that implements electric resistance as a circuit part. Resistors act to cut back current flow, and, at a similar time, act to lower voltage levels within circuits. The current through a resistor is in direct proportion to the voltage across the resistor's terminals.

3.7. Capacitor

A capacitor originally known as a condenser, is a passive 2-terminal electric element used to keep electricity electrically within the form of an electrical field. The kinds of sensible capacitors range extensive, but all incorporate at the very least 2 electric conductors (plates) separated through a nonconductor (i.e., insulator). The conductors are frequently thin movies of metal, aluminum foil or disks, and many others. The 'non-conducting' dielectric acts to increase the capacitor's charge capacity. A dielectric are frequently paper, glass, ceramic, mica, air and so forth. Capacitors are huge used as components of electrical circuits in several not unusual electrical gadgets. Unlike a resistance, a capacitor would not dissipate power. Rather, a capacitor stores energy inside the kind of an electric powered discipline among its plates.

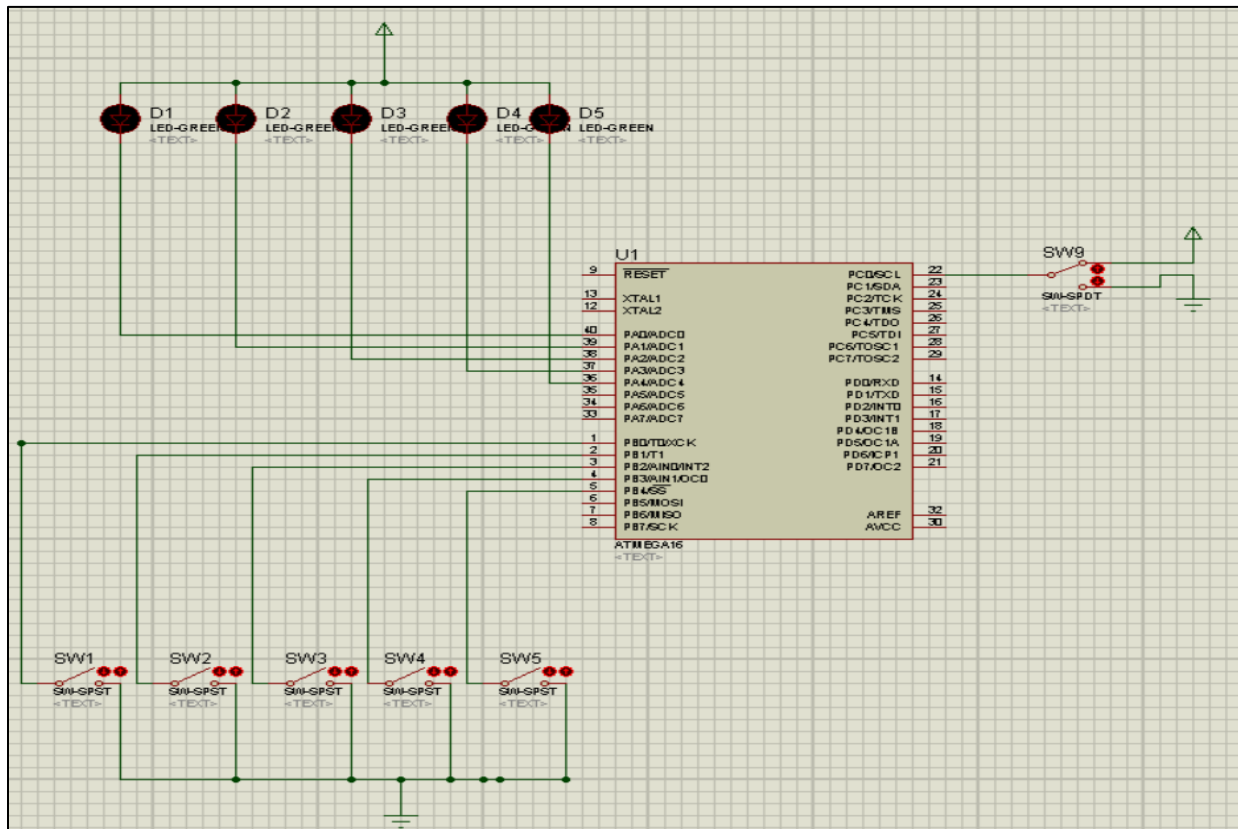
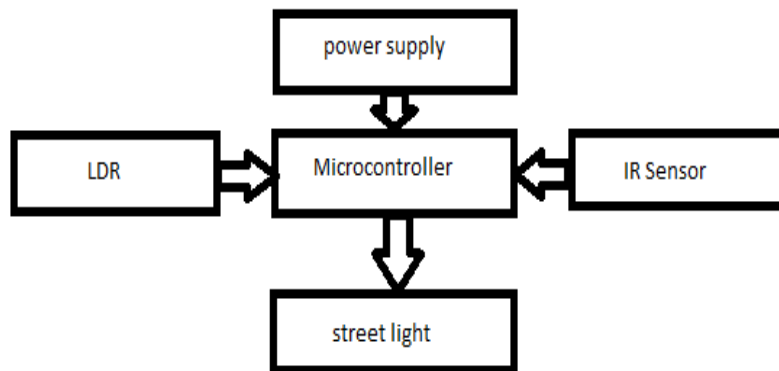
3.8. Diode

A diode is a simple device that permits the flow of current only in one direction. Thus it can be said to act somewhat sort of a switch. A particular 2 arrangement of diodes will convert AC to pulsating DC, thus it is generally also referred to as a rectifier. It is derived from "diode" which implies a device having 2 electrodes.

3.9. LED

In LED electric power is converted into optical electricity. These are instances of electroluminescence, the machine wherein emission of photons takes place with the aid of the recombination of more electrons and holes in an instantaneous band gap semiconductor. The precept blessings of using these are the low electricity consumption, longer lifetime, strong construct, smaller size and plenty of others.

4. Circuit Diagram and Block Diagram



5. Softwares Used

- ISIS Professional v6.02
- CodeVisionAVR v2.60 Evaluation.

6. Conclusions and Recommendations

This paper elaborates the layout and creation of computerized street management device circuit. The proposed system uses Microcontroller Atmel ATmega16. The testing of logic has been done in Proteus software. The Circuit works properly to show whether lamp is ON/OFF. After designing the circuit that controls the lighting on the streets, thus we learned that LDR sensors and photo-electrical sensing factors are the 2 main constraints for running the circuit. If these two are satisfied the circuit can do the favored work in steps with precise programming. Every sensor controls the turning ON or OFF of the lighting fixtures column. The street lighting has been with achievements of being managed by means of microcontroller. With instructions from the controller the lighting fixtures are going to light up inside the places of the motion once it's dark

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