Automatic Night Light Control by Using Arduino UNO

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Abstract— **Our manuscript aims to develop a system which will lead to energy conservation and by doing so, we would be able to lighten few more homes. A circuit with LDR sensor, Arduino UNO as a main processor, and few of electronic components is designed and implemented to control the electricity based on night.Night light control has been designed and constructed based on LDR sensor as the lightrange sensing device. The microcontroller (MCU) ATMega8/168/328 allows dynamic and faster control and the LDR makes the system user-friendly.** Sensed LDR and AC light levels are simultaneously.

Keywords— **Arduino UNO, LDR, Relay module, AC light**

I. INTRODUCTION

This circuit may perform something samplefor example in our case switch an AC lightON/OFF andmay be extended to controlled a light affected process. The lights are in working functionality over the whole night that consumes a lot of energy and reduces the lifetime of the electrical equipment such as electric bulb etc. In this regard, controlling lighting system using Light Dependent Resistor (LDR).It is a sensor which is a particular kind of resistor whose resistance decreases when exposed to light.Likewise, it offers high resistance in dark.

This project design tocontrol night light system by using Arduino UNO and LDR. An LDR or light dependent resistor is also known as photo resistor, photocell, photoconductor. It is a one type of resistor whose resistance varies depending on the amount of light falling on its surface. When the light falls on the resistor, then the resistance changes. These resistors have a variety of functions and resistance. For instance, when the LDR is in darkness, then it can be used to turn ON a light or to turn OFF a light when it is in the light.

II. BACKGROUND THEORY

Arduino is at the heart of the circuit as it controls all functions. Light Dependent Resistor(LDR) is the sensor which varies the resistance upon the falling of light. The resistance of LDR decreases with the increasing intensity of light and vice versa. The LDR gives analog output values and connected to the analog pin(A0) on the arduino .The output from LDR is used to control the intensity of bulb.. This project is based on Arduino UNO which communicates here with LDR sensor, AC light, and relay**.** We can divide this Arduino based controllingnight light into three sections.The first senses the light by using LDR sensor, second section converts the lightrangevalue by Arduino, last section of system controlling ON/OFF bulb.[1]

Microcontroller can be regarded as a single-chip special-purpose computer dedicated to execute a specific application. As in general-purpose computer, microcontroller consists of memory (RAM, ROM, and Flash), I/O peripherals, and processor core. However, in a microcontroller, the processor core is not as fast as in general purpose – computer, the memory size is also smaller. Microcontroller has been widely used in embedded systems such as, home appliances, vehicles, and toys etc. There are several microcontroller products available in the market, for example, Intel's MCS - 51 (8051 family), Microchip PIC, and Atmel's Advanced RISC Architecture (AVR). We discuss Arduino UNO and LDR sensor in this section.

III. THE PROPOSED CONTROLLING AC LIGHT

The Arduino UNO accepts inputs from the LDR sensor, which allows the range of the light and then the controller will give the action to maintain ON/OFF bulb.All of these can be summarizedin a diagram as shown in Fig. 1.
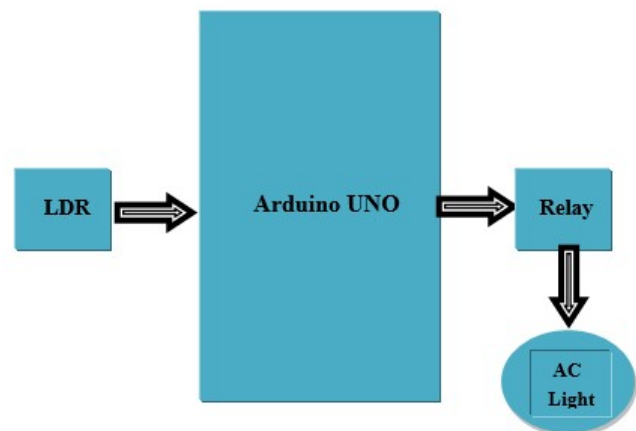

Fig. 1 System Block Diagram of AC light control using Arduino UNO

A. Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an

ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Arduino UNO is used as a main processing unit. A0 of Arduino UNO connected LDR. Pin 3 is connected to relay and output of bulb.
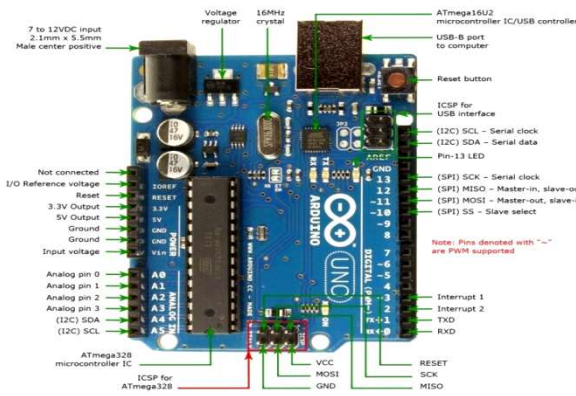

Fig. 2 Arduino UNO

B. Light Dependent Resistor (LDR)

LDR is an abbreviation of Light dependent resistor. It is also known as photoresistor or photocell. Its symbol is shown in the below Fig. 3.

Fig. 3 Symbol for LDR

LDR Sensor is used for the detection of light, internally it has a resistance which is sensitive to light as shown in the symbol. Whenever light falls on the LDR sensor, its resistance start decreasing and when it comes to dark then its resistance start increasing. Using the value of resistance one can easily detect whether there's light or not. It is normally used in light activated switches. For instance, you have seen the automatic street lights, which go ON when its night and automatically go OFF when its day time. In those street lights, LDR sensors are used.

As I explained above, it has an internal resistance which is very sensitive to light intensity and varies according to it.So, one thing is quite clear that LDR sensor is an analog sensor. It gives us different values depending on the light intensity falling on it. Let's have a look on the simplest circuit of LDR sensor, which is shown in the below Fig.4.
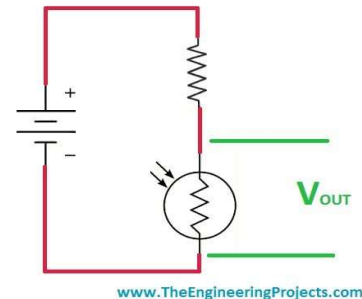

Fig. 4 Simplest circuit of LDR sensor

Now if you check the above image you can see we have placed a resistor in series with the LDR sensor and have applied a voltage source across them.Now when the light will fall on the LDR sensor, its resistance will go LOW and in return the voltage across the LDR will also go LOW and as the LDR will come in dark, the resistance will go HIGH and in return the voltage will also go HIGH. Its the simplest working phenomena of LDR sensor. Now if you are using the LDR sensor with some microcontroller then what you need to do is simply give this intermediate connection of resistor and LDR to microcontroller. [2]

C. Potentiometer

A potentiometer is a three terminal resistor in which the resistance is manually varied to control the flow of electric current. Potentiometers are also sometimes referred as pots. Increasing or decreasing the resistance of the potentiometer controls the flow of electric current. If we increase the resistance of the potentiometer, large amount of electric current is blocked and only a small amount of electric current is allowed. On the other hand, if we reduce the resistance of the potentiometer, a large amount of electric current is allowed and only a small amount of electric current is blocked. The American standard and the international standard symbol of potentiometer is shown in the below Fig.5.

Fig. 5LED circuit diagram

D. Relay

We can control High Voltage electronic devices

using relays. The 5V Relay module has three high voltage terminals (NC, C, and NO) which connect to the device you want to control. The other side has three low voltage pins (GND (0V), VCC (+5V), and S(Signal)) which connect to the Arduino board [4]. A Relay is actually a switch which is electrically operated by an electromagnet. The electromagnet is activated with a low voltage, for example5 volts from a microcontroller and it pulls a contact to make or break a high voltage circuit.
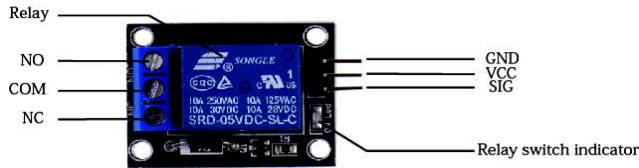

Fig. 6. 5V Relay Module

IV. HARDWARE IMPLEMENTATION PROCESS

The microcontroller-based automatic night light by using LDR sensor is designed by both hardware and software controlled. The whole reading and controlling is done by Arduino UNO software. A0 pin of Arduino UNO is configured by LDR input pin and pin3 is a digital output to send relayfor ON/OFF bulb.

The resistance of the LDR varies with the amount of light falling on it. The resistance increases when there is little light around and decreases in bright light. The darker it is, the higher the voltage drop across the LDR. The maximum resistance of each LDR can vary depending on the kind of LDR but it's usually between 1kΩ and 10kΩ though it could go way higher.

The potentiometer and LDR form a Potential Divider circuit. As it gets darker, the resistance of the LDR increases and the voltage drop across it increases. This voltage is sent to Pin A0 of the Arduino which converts the measured analog voltage to a number between 0 and 1023. Depending on your connection, the higher the voltage drop across the LDR, the closer the number is to 1023.
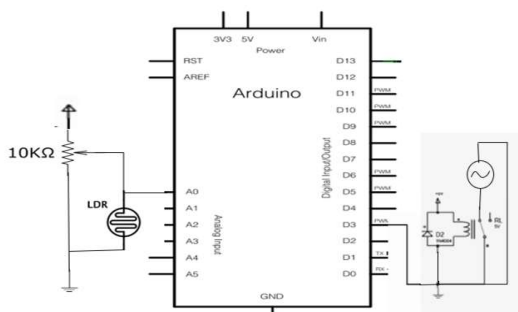

Fig. 7   Overall Circuit Diagram

Connect the +5V VCC pin of the arduino to the one end of LDR fixed on the breadboard. Connect other end of the LDR to the resistor (10kΩ) and from this end of LDR itself connect the wire to the analog pin (A0) from the arduino and the other end of the resistor is connected to ground and thus forming a potential divider circuit (POT). can also be used in its place to det. the best resistance for LDR. Connect the power supply to the ArduinoUNO.

V. SOFTWARE PROCEDURE FOR CONTROLLING THE WHOLE SYSTEM FUNCTION

ARDUINO 1.8.4 the open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board. Refer to the Getting Started page for Installation instructions.

VI. SIMULATION CIRCUIT

The circuit presents the design, construction, development and control of AC light. The idea is based on the problem occurs in human's life nowadays by improving the existing technology. The microcontroller based automatic AC light is applied to upgrade the functionality to embed automation feature. The LDR will automatically switch on according to the environmental lights [6]. The circuit is using a microcontroller to control the light according to the light intensity variation. The practicalof the system as shown in Fig.8 and Fig.9: the light is turn ON when thelight falls on the LDR sensor, its resistance start decreasing the AC light is OFF and when it comes to dark then its resistance start increasing at this time AC light is turn ON.
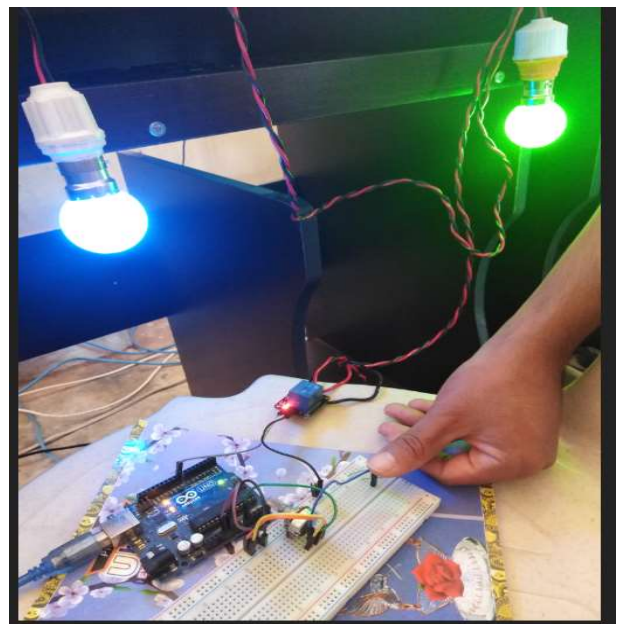

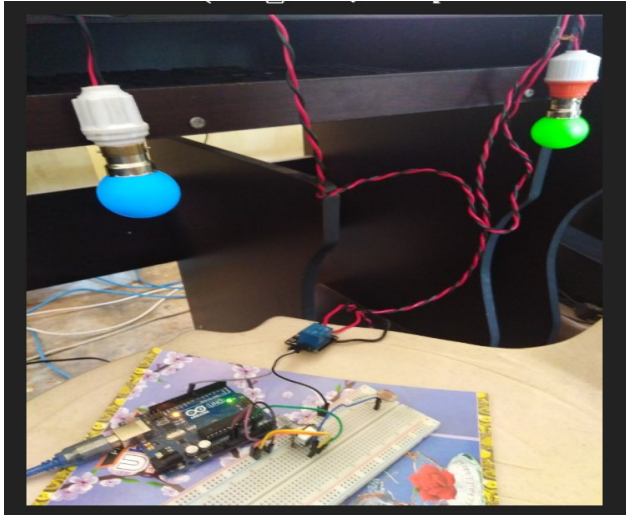Fig. 8The LDR is in darkness the bulb is turn ON

Fig. 9 The LDR is in the light the bulb is turn OFF

VII. CONCLUSIONS

In this paper, whose light will turn on once it is exposed to darkness. So, it's a light that will come on when it gets dark such as at night time. This is extremely useful for people who may live in a house that have vision problems and need the lights to automatically turn on when it gets dark. It's also very useful for elderly people who live in a home who may have difficulty walking to turn on lights when it becomes dark. In our circuit, we will turn on a lamp as soon as the level of light reaches a certain level of darkness. Thus, the place where we place this circuit will always be illuminated, either by the natural light of the day or by the lamp of this circuit turning on when it becomes dark.

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