Development of Automatic Light Control System for Energy Efficient Buildings

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ABSTRACT: "AUTOMATIC LIGHTING CONTROLLER", controls the amount of lighting in a room by constantly monitoring the level of luminance in a room. Lights are then controlled such that required illumination is available in the room. It can be applied effectively in commercial buildings, homes, colleges etc. For example, on a normal day when there is a bright sun the lights will be OFF. And on a cloudy day the illumination levels will be low the controller calculates the required lighting by checking the illumination level and turns ON the lights.

Keywords:Atmega 328, Microcontroller,LDR(Light dependent resistor,LCD(Liquid crystal display)

I. INTRODUCTION

In the present day scenario, where the energy crisis is a major concern, energy conservation is one big step for solving the problem of energy demand. As a part of energy conservation, we have come up with a way to reduce the wastage.

Based on the project title, "AUTOMATIC LIGHTING CONTROLLER", controls the amount of lighting in a room by constantly monitoring the level of luminance in a room. Lights are then controlled such that required illumination is available in the room. It can be applied effectively in commercial buildings, homes, colleges etc.

On a normal day when there is a bright sun the lights will be OFF. And on a cloudy day the illumination levels will be low the controller calculates the required lighting by checking the illumination level and turns ON the lights.Thus we can reduce the unnecessary wastage of energy.

II. COMPONENT PARTS

A) ARDUINO DUEMILANOVE BOARD(ATMEGA 328)

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicating with software running on your computer (e.g. Flash, processing, maxmsp.) The boards can be assembled by hand or purchased preassembled; the open-source ide can be downloaded for free. The arduino programming language is an implementation of wiring, a similar physical computing platform, which is based on the processing multimedia programming environment.

B) SENSOR (LDR)

LDRs(light dependent resistor) are used as sensors. LDR is a variable resistor whose resistance is inversely proportional to the intensity of the incident light. As it is a passive transducer, a potential divider circuit is used to obtain the corresponding voltage value from the LDRs. The higher the intensity of light, lower the LDR resistance and hence lower the output voltage (vout) and vice vers.

C) LIQUID CRYSTAL DISPLAY

LCD (liquid crystal display) screen is an electronic display module and find 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

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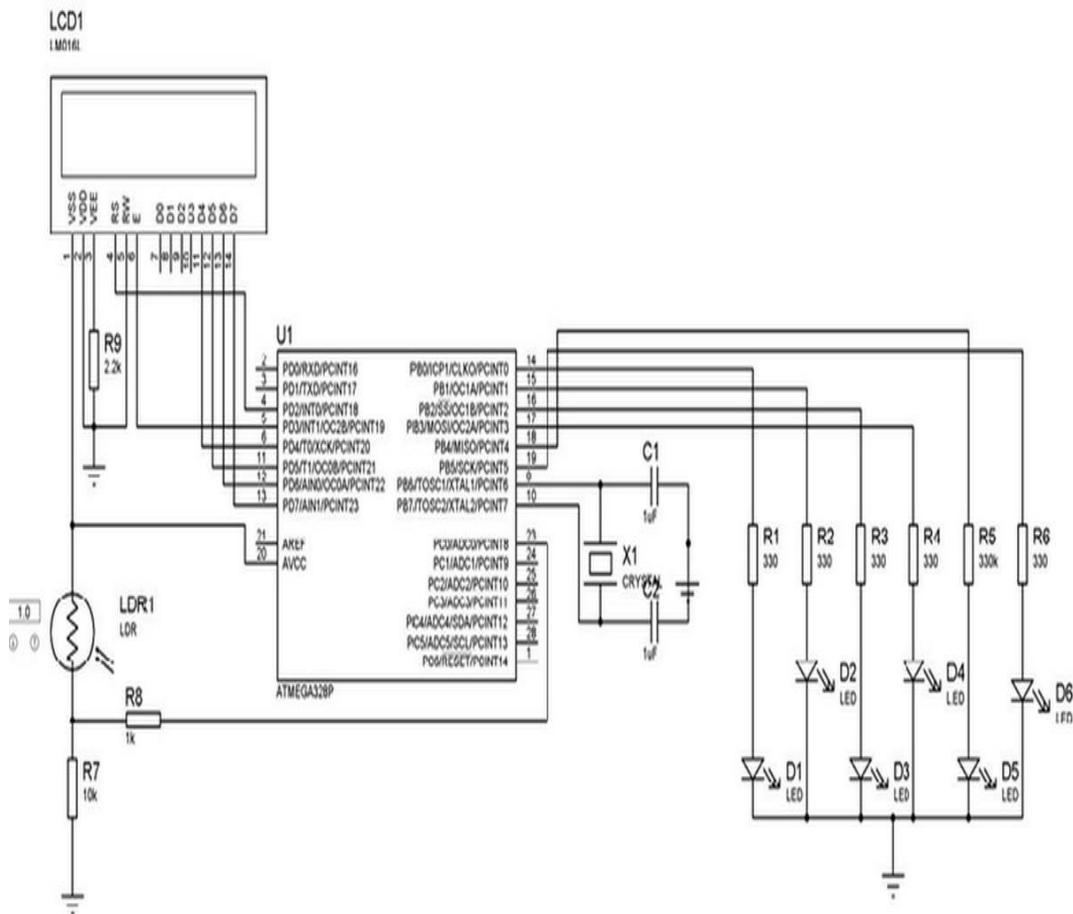
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programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

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.
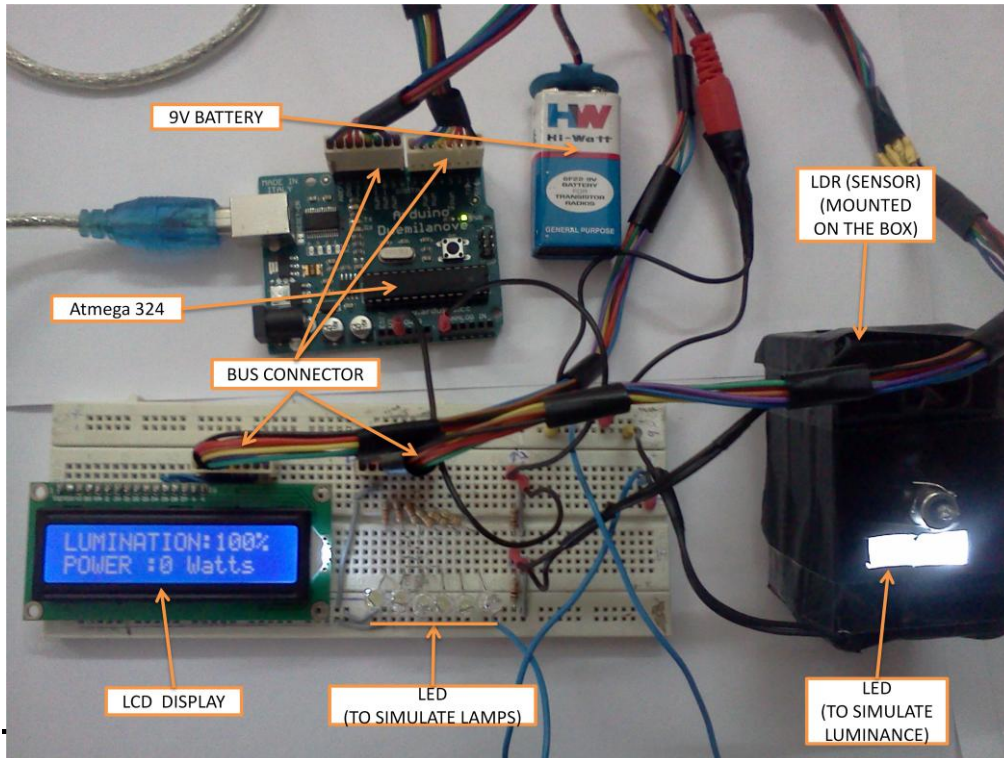
The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ascii value of the character to be displayed on the LCD.

III. CIRCUIT DIAGRAM

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IV. WORKING

Connections are done as shown in the diagram. First, the intensity of light in a room is tested and it is converted to corresponding digital values using the analog to digital convertor (ADC). The values are noted and minimum and maximum values are set.

Initially, during the reset condition, the LCD displays the title "MINI-PROJECT". This is displayed repeatedly until interrupt is given. (Interrupt here is the light intensity).The value of light intensity is read by the Light Detecting Resistor (LDR) and gives out corresponding voltage value, which is fed to analog port (A0) of arduino platform. The value is then processed and then converted to percentage (minimum set value corresponds to 0% and maximum set value corresponds to 100%).

The number of LED to be lit is pre-programmed and is set as follows:
If LUMINANCE = 100 %, number of LEDs to be lit = 0.
If LUMINANCE < 90%, number of LEDs to be lit = 1.
If LUMINANCE < 70%, number of LEDs to be lit = 2.
If LUMINANCE < 50%, number of LEDs to be lit = 3.
If LUMINANCE < 30%, number of LEDs to be lit = 4.
If LUMINANCE < 10%, number of LEDs to be lit = 5.
If LUMINANCE = 0%, number of LEDs to be lit = 6.

The energy consumed is also monitored by counting the number of bulbs lit. Wattage of the bulbs connected can be pre set.

LCD.print(lum***10**);   //Here the wattage per lamp is set to 10W.

In this way, the necessary number of bulbs to be lit in a room is controlled by the light intensity in the room. Hence, energy conservation can be effectively carried out in this present scenario of energy crisis.

V. CONCLUSION

The following project has been developed as part of energy conservation and management. The main focus was how to reduce the energy consumption by minimizing the wastage, turning of the lights when not required automatically by monitoring the light availability in a room. Light intensity in the range of 90 - 100% is optimum for normal sight.If intensity >90%, no lighting required.Subsequently for every 20% drop in intensity a 10Watts lamp is turned ON to maintain optimum lighting.

Application of this project can be in any field involving lighting like
  Industries: This required constant lighting for optimum working conditions.
  Schools/colleges: Which require good lighting condition for better study environment.
  Offices/commercial buildings etc.

ACKNOWLEDGMENT

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