LASER SECURITY SYSTEM

MINI PROJECT REPORT

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

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This project deals with a model of laser security alarm system design. Laser security systems used to be difficult to install and rarely available to anyone other than the super-rich. Now, there are dozens of different security systems on the market that utilize lasers and can effectively protect everything from small apartments and businesses to large areas of property. Most home laser security systems consist of two parts: a basic alarm unit and an infrared motion detector. Laser based security system is a type of security and alarm system that uses laser light and a light sensor. Why a laser to be used? It is known that a laser light goes through long distance without any scattering effect (disturbing) and it is only visible at source and the destination point so it can be used as mediator between source and destination but to analyses the source a sensor is need, here the use of LDR is applicable.

Just analysis is not enough alerting should be done in general alerting is sound effect so here buzzer act as alerting. Making use of this, a laser security system is designed. Its working There is a laser diode that generates the laser beam which continuously strikes over the Light dependent resister sensors. When any person crosses the path, it inhibits laser to reach LDR and the sensor generate a low which is read by controller to power on the buzzer.

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LIST OF ABBREVIATIONS

RAM	-Random Access Memory
EPROM	-Erasable Programmable read-only memory
GPIO	-General Input and Output Purpose
LED	-Light Emitting Diode
USB	-Universal serial bus

CHAPTER 1

1. INTRODUCTION

Need of security is the basic necessity of any individual. The feeling that we are safe and everything around us is all right is imperative for a peaceful living. But in this unsafe world, when crime, terror and threats are on their peak, how can one attain that sense of security? Here, laser security system provides us with a solution and for this reason more and more people are installing them in order to stay safe and secure. Various electronic security systems can be used at home and other important working places for security and safety purposes. Laser Security alarm is a device used for security purposes. It has a wide application in fields of security and defense starting from the security of simple house hold material to a very high valued material of an organization. They once used to be expensive solutions for security needs. Owing to cost cutting and fast technological advancements, this form of security system is becoming more affordable Because laser light doesn't spread much, it can be sent it a long way and still have enough energy in a small area to trigger the security system detector. Because it's a single wavelength, it can put a blocking filter on the detector to let laser light through without letting background light onto the detector.

Laser light travels in a straight line. For instance, to protect the front of the yard, putting the laser at one comer and the detector at the other corner would do the job. That's not a very practical configuration, though. More typically, if it is needed to protect the perimeter of a room, or at least the enhances. So laser security systems start with a laser pointing to a small mirror. The first mirror is angled to direct the beam to a second small mirror, and so on until the final mirror directs the beam to the detector.

1.1 AIM

The aim of the project was to design and implement a laser security system with attached display.

1.2 AREA OF PROJECT
(EMBEDDED SYSTEM)

An Embedded System can be best described as a system which has both the hardware and software and is designed to do a specific task. A good example for an Embedded System, which many households have, is a Washing Machine. We use washing machines almost daily but wouldn't get the idea that it is an embedded system consisting of a Processor (and other hardware as well) and software. Embedded Systems can not only be stand-alone devices like Washing Machines but also be a part of a much larger system. An example for this is a Car. A modern-day Car has several individual embedded systems that perform their specific tasks with the aim of making a smooth and safe. Some of the embedded systems in a Car are Anti-lock Braking System (ABS), Temperature Monitoring System, Automatic Climate Control, Pressure Monitoring System, Engine Oil Level Monitor etc.

Examples of embedded systems:

Embedded systems are used in a wide range of technologies across an array of industries. Some examples include:

Automobiles:

Modern cars commonly consist of many computers (sometimes as many as 100), or embedded systems, designed to perform different tasks within the vehicle. Some of these systems perform basic utility functions and others provide entertainment or u ser-facing functions

Mobile phones:

These consist of many embedded systems, including GUI software and hardware, operating systems (OSes), cameras, microphones, and USB (Universal Serial Bus) I/O (input/output) modules.

Industrial machines:

They can contain embedded systems, like sensors, and can be embedded systems themselves. Industrial machines often have embedded automation systems that perform specific monitoring and control functions.

Medical equipment:

These may contain embedded systems like sensors and control mechanisms. Medical equipment, such as industrial machines, also must be very user-friendly so that human health isn't jeopardized by preventable machine mistakes. This means they'll often include a more complex OS and GUI designed for an appropriate UI.

GPS Systems:

The GPS is a navigation system that uses satellites and receivers to synchronize data related to location, time, and velocity. The receiver or device that receives the data has an integrated embedded system to facilitate the application of a global positioning system. The embedded GPS devices allow people to find their current locations and destinations easily. Thus, they are gaining rapid momentum and becoming the most widely used navigation tools for automobiles.

1.3 HOW DOES AN EMMBEDED SYSTEM WORKS?

Embedded systems always function as part of a complete device -- that's what's meant by the term embedded. They are low-cost, low-power-consuming, small computers that are embedded in other mechanical or electrical systems. Generally, they comprise a processor, power supply, and memory and communication ports. Embedded systems use the communication ports to transmit data between the processor and peripheral devices -- often, other embedded systems -- using a communication protocol. The processor interprets this data with the help of minimal software stored on the memory. The software is usually highly specific to the function that the embedded system serves.

The processor may be a microprocessor or microcontroller. Microcontrollers are simply microprocessors with peripheral interfaces and integrated memory included. Microprocessors use separate integrated circuits for memory and peripherals instead of including them on the chip. Both can be used, but microprocessors typically require more support circuitry than microcontrollers because there is less integrated into the microprocessor. The term system on a chip (SoC) is often used. SoCs include multiple processors and interfaces on a single chip. They are often used for high-volume embedded systems. Some example SoC types are the application-specific integrated circuit (ASIC) and the field-programmable gate array (FPGA).

Often, embedded systems are used in real-time operating environments and use a real-time operating system (RTOS) to communicate with the hardware. Near-real-time approaches are suitable at higher levels of chip capability, defined by designers who have increasingly decided the systems are generally fast enough and the tasks tolerant of slight variations in reaction.

1.4 CHARACTERISTICS OF EMMBEDED SYSTEM:

The characteristics of embedded system are different from those of a general purpose computer and so are its Quality metrics. Some of the characteristics of an embedded system that make it different from a general purpose computer:

1.5 APPLICATION AND DOMAIN SPECIFIC:

An embedded system is designed for a specific purpose only. It will not do any other task.

Example: A washing machine can only wash, it cannot cook.

1.6 REACTIVE AND REAL TIME:

Certain Embedded systems are designed to react to the events that occur in the nearby environment. These events also occur real-time. Example: An air conditioner adjusts its mechanical parts as soon as it gets a signal from its sensors to increase or decrease the temperature when the user operates it using a remote control.

1.7 OPERATION IN HAREH ENVIRONMENT:

Certain embedded systems are designed to operate in harsh environments like very high temperature of the deserts or very low temperature of the mountains or extreme rains.

1.8 DISTRIBUTED:

Certain embedded systems are part of a larger system and thus components of a distributed system. These components are independent of each other but have to work together for the larger system to function properly.

1.9 PRINCIPLE:

There are three essential components to a laser security system: a laser, a detector and sensing circuit. The laser is a concentrated light source that puts out a straight line, 'pencil beam, of light of a single color. The detector is sensitive to light and puts out a voltage when the laser light hits it. The detector is connected to the sensing circuit. When the laser beam is interrupted and cannot reach the detector, its voltage output changes, and the circuit sense the change and put out a warning signal

1.10 WORKING:

The project basically works on the principle of interruption. If by any means the LASER light is interrupted the alarm will start unless it is reset with push-button. The laser is a concentrated light source that puts out a straight beam of light of a single color.

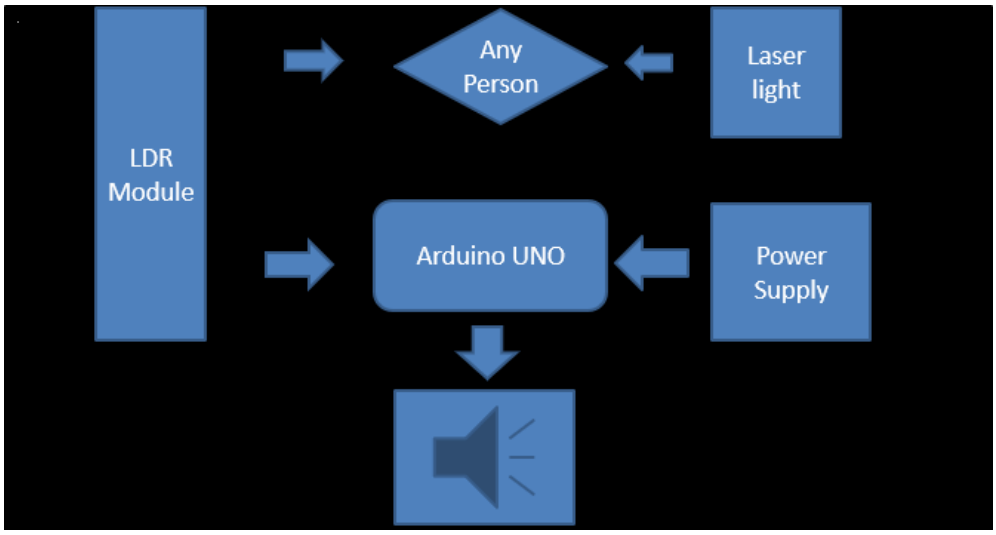
With a laser security system, you use a series of laser beams and detectors across your yard and around your house with a series of mirrors as well. The laser beam will shoot out from one area and will reflect off a series of mirrors across your yard until it's directed into the detector

There is a laser diode that generates the laser beam continuously stricks over the light depend the LDR sensor. When any person or any thinks are crosses the path, it inhibits laser to reach LDR and the sensor generate a low which is read by controller to power on the buzzer.

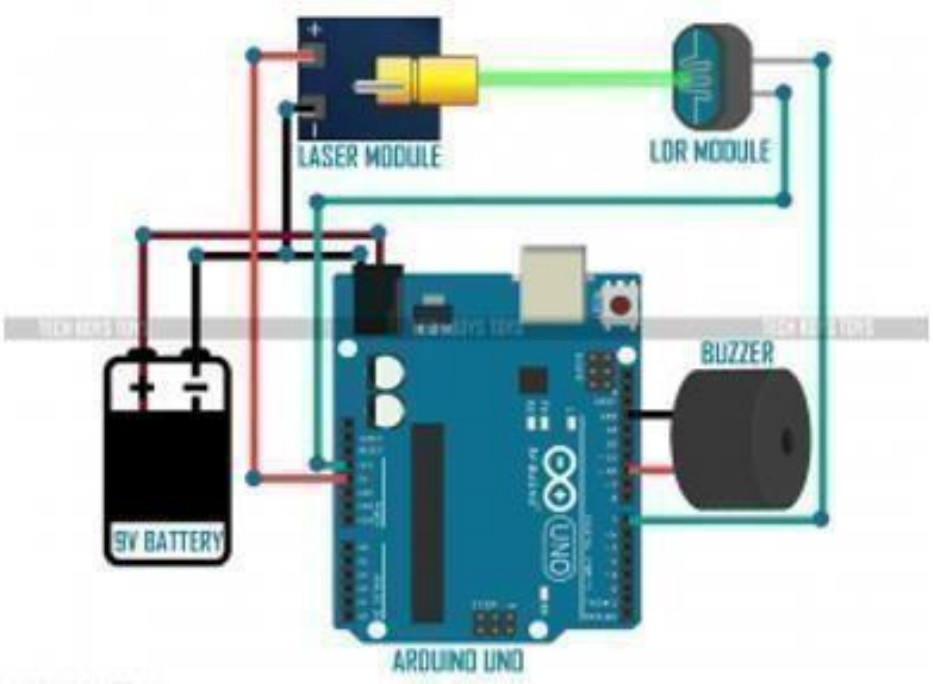
CHAPTER 2

2. DIAGRAMATIC VIEWS

2.1 BLOCK DIADREAM



2.2 HARDWARE DIAGREAM



Circuit diagram

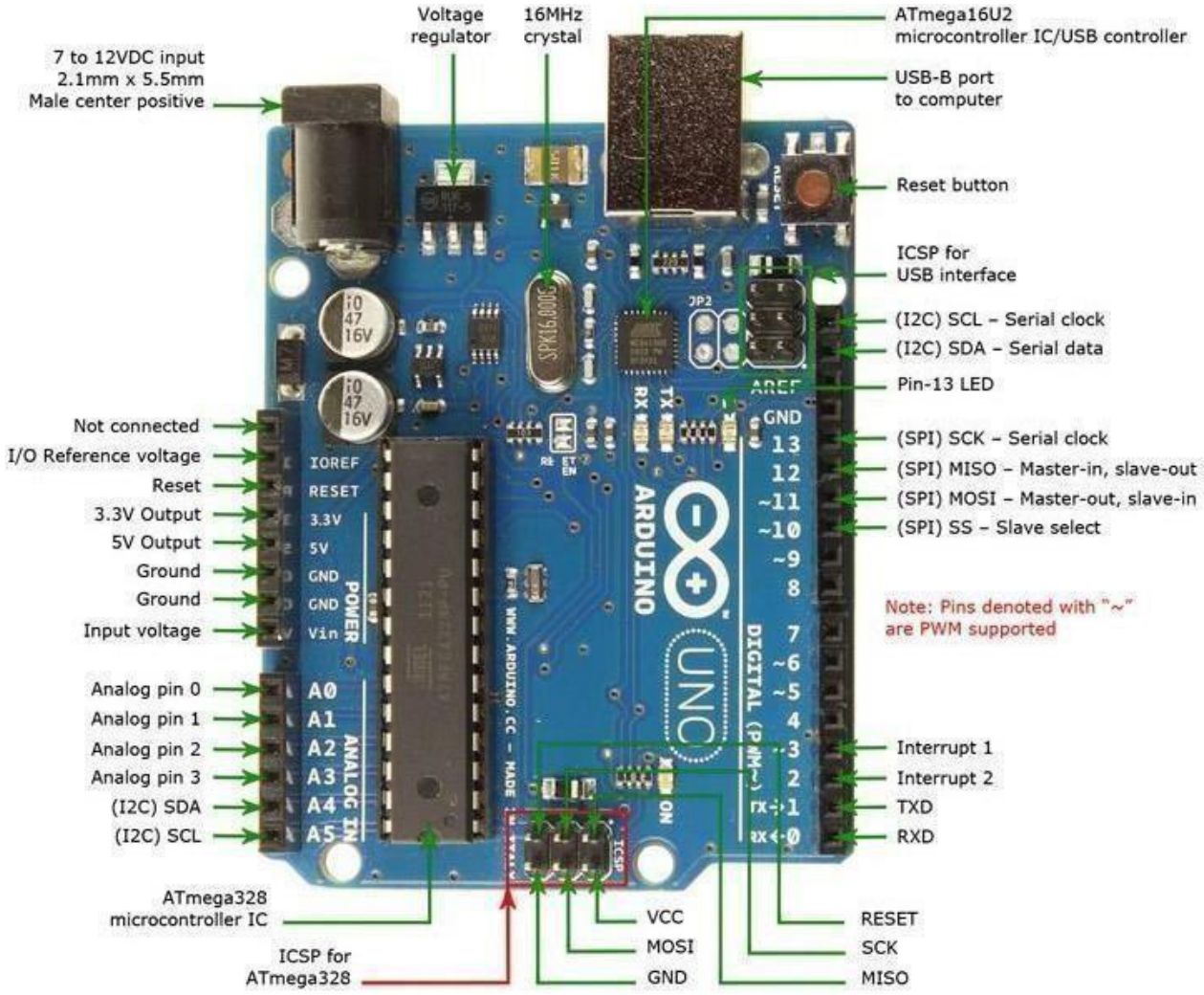
CHAPTER 3

3. COMPONENTS REQUIRED

SL.NO.	NAME OF THE COMPONENT	QUANTITY
1	ARDUINO UNO	1
2	LASER LIGHT	1
3	COLLING FAN	1
4	POWER SUPPLY	-
5	LER MODULE	1
6	5V BUZZER	1

3.1 CONTROLLER DESCRIPTION: (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 ceramic resonator, 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 a AC-to-DC adapter or battery to get started.



Arduino Uno

Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable.

- **VIN means** the input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

- **5V means** This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. Wedon't advise it.

- **3V3 means** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

- **GND means** Ground pins.

Memory

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- **Serial:** 0 (RX) and 1 **(**TX**).** Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- **External Interrupts:** 2 and 3**.** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See theattach Interrupt() function for details.
- **PWM:** 3, 5, 6, 9, 10**,** and 11. Provide 8-bit PWM output with the analog Write() function.

- **SPI:** 10 (SS), 11 (MOSI), 12 (MISO), 13 **(**SCK**).** These pins support SPI communication using the SPI library.
- **LED:** 13**.** There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference() function. Additionally, some pins have specialized functionality:

- **TWI:** A4 or SDA pin and A5 or SCL pin**.** Support TWI communication usingthe Wire library.
- **AREF:** Reference voltage for the analog inputs. Used with analog Reference().
- **Reset:** Bring this line LOW to reset the microcontroller. Typically used to adda reset button to shields which block the one on the board.

Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library. The Arduino Uno can be programmed with the Arduino software (download). The ATmega328 on the Arduino Uno comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer.

It communicates using the original STK500 protocol (reference, C header files). You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available.

USB Overcurrent Protection

The Arduino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

Physical Characteristics

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Four screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

3.2 LASER:

A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for "light amplification by stimulated emission of radiation". A laser differs from other sources of light in that it emits light coherently.

Spatial coherence allows a laser to be focused to a tight spot, enabling applications such as laser cutting and lithography. Spatial coherence also allows a laser beam to stay narrow over great distances (collimation), enabling applications such as laser pointers. Lasers can also have high temporal coherence, which allows them to emit light with a very narrow spectrum, i.e., they can emit a single colour of light. Temporal coherence can be used to produce pulses of light as short as a femtosecond.

Laser

Applications:

- Medicine: Bloodless surgery, Laser healing, surgical
- treatment, kidney stone treatment, eye treatment,
- Industry: Cutting, welding, material heat treatment, marking parts, non-contact measurement of parts.
- Military: Marking targets, guiding munitions,
- missile defence, electro-optical countermeasures
- (EOCM), alterative to radar, blinding troops.
- Law enforcement: used for latent fingerprint detection in the forensic identification field.
- Research: Spectroscopy, laser ablation, laser annealing, laser scattering, laser
- interferometer, lidar, laser capture micro dissection, fluorescence microscopy.

- Product development/commercial: laser printers, optical discs (e.g. CDs), barcode
- scanners, thermometers, pointers, holograms, bubble grams.
- Laser lighting displays: Laser light shows.
- Cosmetic skin treatments: acne treatment, cellulite and striae reduction, and hair removal

3.3 BUZZER:

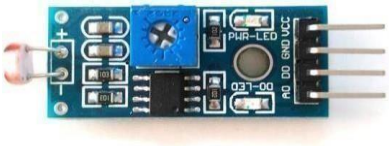
A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, and piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

The buzzer consists of an outside case with two pins to attach it to power and ground. When current is applied to the buzzer it causes the ceramic disk to contract or expand. Changing his then causes the surrounding disc to vibrate. That's the sound that you hear. Adjust the potentiometer to increase or decrease the resistance of the potentiometer.

If you increase the resistance of the potentiometer then it will decrease the Volume of the buzzer. If you decrease the resistance of the potentiometer then it will increase the Volume of the buzzer.

Buzzer

3.4 LDR MODULE :



LDR module

LDR sensor module is a low-cost digital sensor as well as analog sensor module, which is capable to measure and detect light intensity. This sensor also is known as the Photoresistor sensor. This sensor has an onboard LDR(Light Dependent Resistor), that helps it to detect light. This sensor module comes with 4 terminals. Where the “DO” pin is a digital output pin and the “AO” pin is an analog output pin. The output of the module goes high in the absence of light and it becomes low in the presence of light. The sensitivity of the sensor can be adjusted using the onboard potentiometer.

CHAPTER 4

4. SOFTWARE REQURIED

4.1 ARDIUNO IDE SOFTWARE

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension. into the editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Arduino IDE Software

4.2 ARDIUNO IDE SOFTWARE EXPLAINATION

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

The Upload button compiles and runs our code written on the screen. It further uploads the code to the connected board. Before uploading the sketch, we need to make sure that the correct board and ports are selected.

We also need a USB connection to connect the board and the computer. Once all the above measures are done, click on the Upload button present on the toolbar.

The latest Arduino boards can be reset automatically before beginning with Upload. In the older boards, we need to press the Reset button present on it. As soon as the uploading is done successfully, we can notice the blink of the Tx and Rx LED.

4.3 APPENDIX

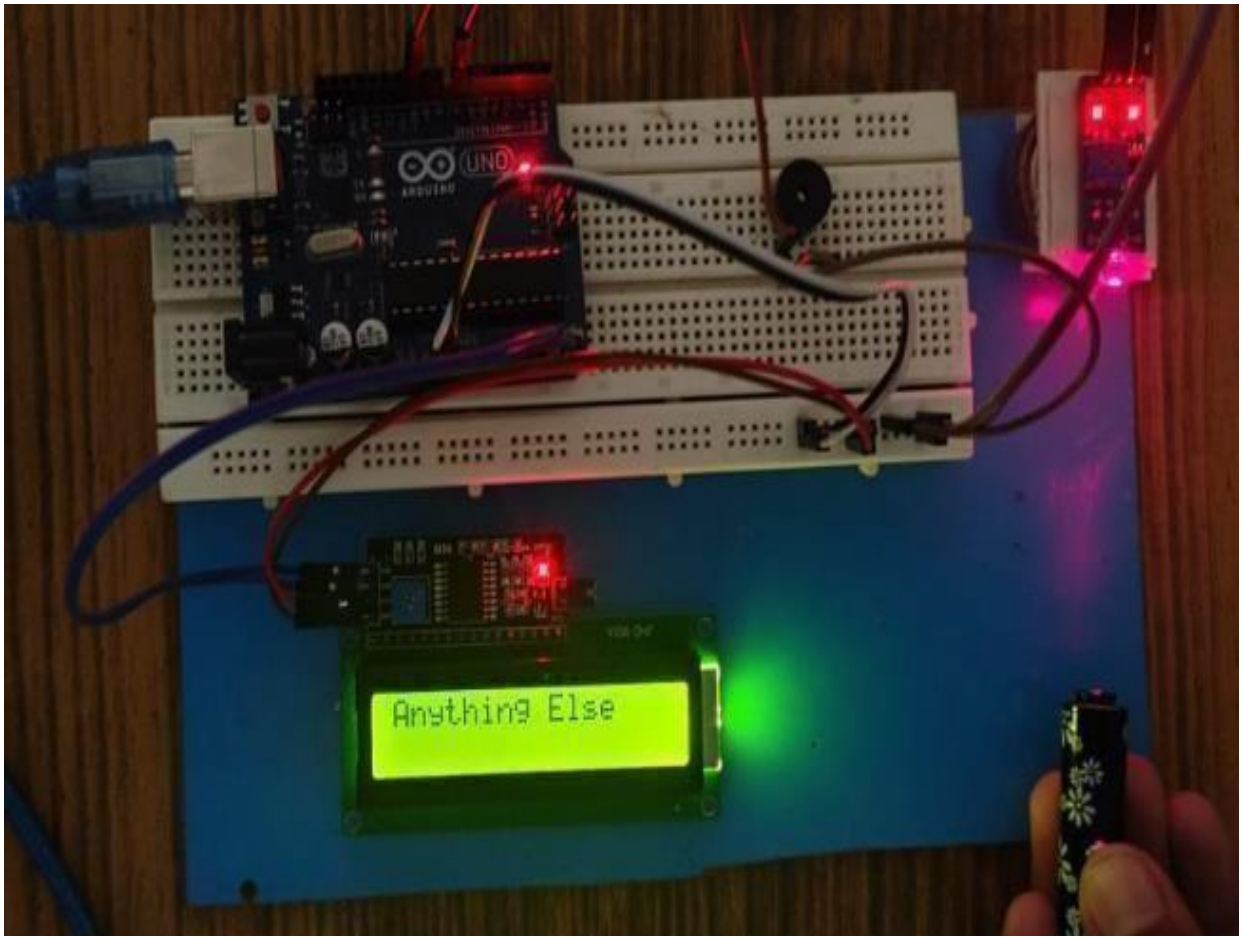
```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);

void setup() {
  lcd.init();
  lcd.begin(16, 2);
  lcd.backlight();
  lcd.setCursor(0, 0);
  lcd.print("   WELCOME TO   ");
  lcd.setCursor(0, 1);
  lcd.print("   PRO IDEAS    ");
  delay(2000);
  lcd.clear();
  pinMode(10, OUTPUT); //Buzzer Pin
  pinMode(7, INPUT); // LDR Sensor
}
void loop() {
  if (digitalRead(7) == !LOW ) // If LDR densor Digital LOW then Buzzer will be
turn on for given Time
  {
    digitalWrite(10, HIGH);
    delay(1000); //Value 3000 for 3 seconds
```

```
 lcd.setCursor(0, 0);
    lcd.print("Person Inter");
    //lcd.clear();
  }
  else {
    //lcd.clear();
    digitalWrite(10, LOW);

    lcd.setCursor(0, 0);
    lcd.print("Anything Else");
  }
}
```

4.4 REAL TIME IMAGE



CHAPTER 5

5. CONCLUSION

Laser security system provides us the security against any crime, theft in our day to day life and so people are installing them in order to stay safe, secure and sound. Various electronic security systems can be used at home and other important working places for security and safety purposes. It is a great opportunity and source of saving man power contributing no wastage of electricity. The "Laser Security System" is an important helping system. Using this system robbery, thefts & crime can be avoided to large extend. Avoiding thieves results in the safety of our financial assets and thereby this system provides us protection against all.

The Laser & LDR system is highly sensitive with a great range of working. The system senses the light emitted by the Laser falling over the LDR connected with the circuit. Whenever the beam of light is interrupted by any means, it triggers the alarm or siren. This highly reactive approach has low computational requirement, therefore it is well suited to surveillance, industrial application and smart environments.

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