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Laser Based Smart Security Apparatus Using Arduino

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Abstract: ***Our paper deals with the plan and execution of a LASER based smart security system for discovering burglar. The principal edge of using the Laser system is that the burglar is unmindful of the fact that a security system is fix in the entry points like doors and windows since laser rays can travel long distances and are almost imperceptible. When someone go through the laser ray the circuit senses the cutoff and stumble the alarm. The alarming sound does not stop until someone turns it off manually after scrutnizing. It is one of the most economical security apparatus that can be used for indoors as well as outdoors. This apparatus centre of attention is on sending a photo of the burglar into the registered email address for sustainable verification with the help of LDR and WIFI module. It is quite competent and need very minimal power.***
Important terms: Arduino, LDR module, WIFI module, Piezo buzzer, message alert, laser module security

I. INTRODUCTION

Researches across the world are using improved technology to find a solution of trespassing and thefts. When talking of home automation and security, laser based security system has always been considered as one of the easiest and cheapest form of implementation. Researchers from Bangladesh have designed a laser based security system for inland agriculture such as prawns and shrimps. Here, the number of laser beams barred is decided by LDRs which are in turn connected to Arduino board. The Arduino Board is programmed in such a way that it will take decisions whether to send an alert to a desired number. Laser rays go long distances without scattering and are almost invisible so this characteristic can be used to build an invisible boundary of a sensitive area. If anyone wants to build such an area with a single beam, mirrors can be used which will reflect the beams accordingly. This has a low energy consumption and gives high performance. Laser security systems are useful in high command security places and the installation process is also very easy. Security of home and personal possessions is a major lookout now. With increasing intrusion and thefts, companies are investing a considerable amount of money on home security. Thus, to handle these problems, light dependent resistors are used as the main component in the laser based security systems. Researchers from Malaysia have developed a multilevel home security system which consist of different sensor nodes as input elements while the output elements respond to the signals received from input elements. The sensor nodes include an alarm, presence detecting circuit and a camera. The idea of securing the border from illegal entries, smuggling of weapons has also been coined. This is achieved by implementing advanced technologies like object detection, object identification, distance sensing and activity tracking. In case the microcontroller senses any kind of intrusion, it will send an SMS message to the registered mobile number. The microcontroller can also switch on and off the electrical appliances in the house according to the SMS message received from GSM modem of the user. Researchers from China have developed a system using WSN and GSM technology. It can detect theft, fire, leaking of gas and send message to the owner. The hardware consists of single chip C5081F310, wireless receiving and sending chip CC1100 and Simens TC35 GSM module. Employing sensors like PIR, Sensor camera, GSM for detecting the presence of intruder becomes very expensive when integrated with LCD panel or camera. Thus, researcher Suresh.S and his team have an affordable Home Automation System by employing PIR, temperature and humidity sensors to sense change in motion, temperature and humidity. Here, all the activities are maintained by Atmega microcontroller. During any intrusion, the owner of the house is informed by sending a text message through GSM module.

II. IMPORTANT COMPONENTS

A. Arduino Uno Microcontroller

Arduino Uno is a microcontroller based on ATMEGA 328p. It consists of 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, ICSP header, reset button, USB connection and a power jack. A microcontroller is programmed using C and C++ language. It provides a low cost, easy way to implement, reliable approach for professionals to create devices which interact with environment using sensors and actuators. Such devices include small robots, motion detectors and thermostats. Programs written in Arduino integrated development environment is known as sketch. Sketches are saved on computers using the file extension .ino.

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B. Laser Ejecter Module

Laser is a device that emits light using a process called optical amplification which is based on stimulated emission of electromagnetic radiations. Laser is a red light which has a wavelength of 650nm. The working voltage is 3-5V DC and working current is less than 25mA. It is used in various fields which consists of military, medical and technological spheres. Lasers emit light coherently. Spatial coherence enables laser beams to stay narrow over long distances which facilitates them to be used as a laser pointer. Lasers may also exhibit temporal coherence due to which they have a narrow spectrum.

C. LDR Module.

LDR is a light dependent resistor where the resistance of photo resistor decreases with the increasing intensity of incident light. It is used in the detection and measurement of intensity of light. It consists of both analog and digital output pins. It also possesses a potentiometer knob that can be regulated to alter the sensitivity of LDR towards light. The operating voltage of LDR is 3.3V-5V. There are various applications of LDR which include lighting switch, camera shutter control LDR controlled transistor circuits. LDR receivers can be interfaced with Arduino boards to get the desired results.

III. METHODOLOGY

It is a simple prototype which ensures proper safety and security of the house. The prototype constitutes an Arduino UNO microcontroller, a loud piezo buzzer, few connecting wires, an ESP WIFI module for internet access, a spy cam, a laser emitter module, a receiver LDR module and lastly a DC adapter for power source.

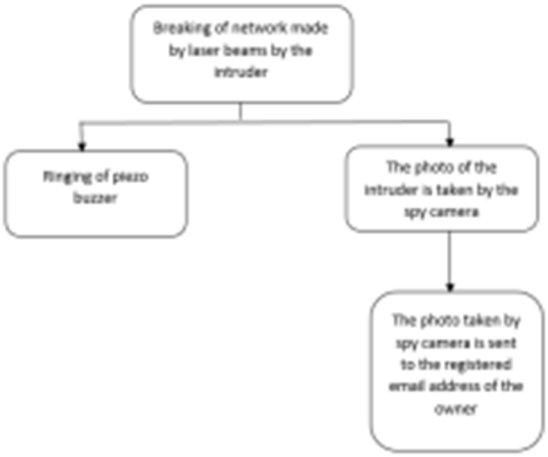


Figure.1. Schematic diagram of the proposed algorithm

With the help of the microcontroller we create a laser circuit using the laser emitter module and LDR module.

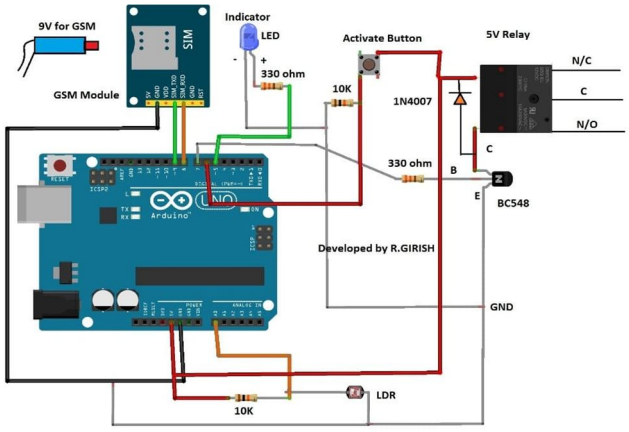


Figure.2. Hardware configuration of laser system

Simply the emitter emits the laser line and the LDR receives the bright striking laser light.



Figure.3. The setup of the main circuit

As per his/her convenience the laser line can be extended with the help of small mirror pieces, as mirror perfectly reflects laser lines. Like this the entire area of a door or a window or specific stealthy entry points can be covered with multiple reflecting laser lines emitted from a single source.



Figure .4. The laser ray is discontinued by theintruder.

As soon as an intruder tries to enter the monitored entrance, the laser circuit breaks and a loud buzzer starts buzzing very loudly with just a delay of a few nanoseconds.

Then a fixed spy camera takes the photo of the intruder and sends it to the registered email address for valid proof. This whole algorithm runs with the help of a few computer codes written in C language. The input voltage for the hardware is only 12V, hence it is very cost efficient and user friendly. This little device can be installed in any of the important rooms of an institution, for example the examination cell, the director's office, special laboratories which requires permission and many more. This device can work flawlessly and in future it can be proved as a smart choice for home security.

IV. CONCLUSION

This is our first approach towards innovation in home automation using laser technology. This is a user friendly, low cost and robust system which runs using few lines of codes. The concept is easy to implement in offices, industries, apartments and restricted areas. The results procured are encouraging, yet many improvisations may be included to increase the accuracy of the system.

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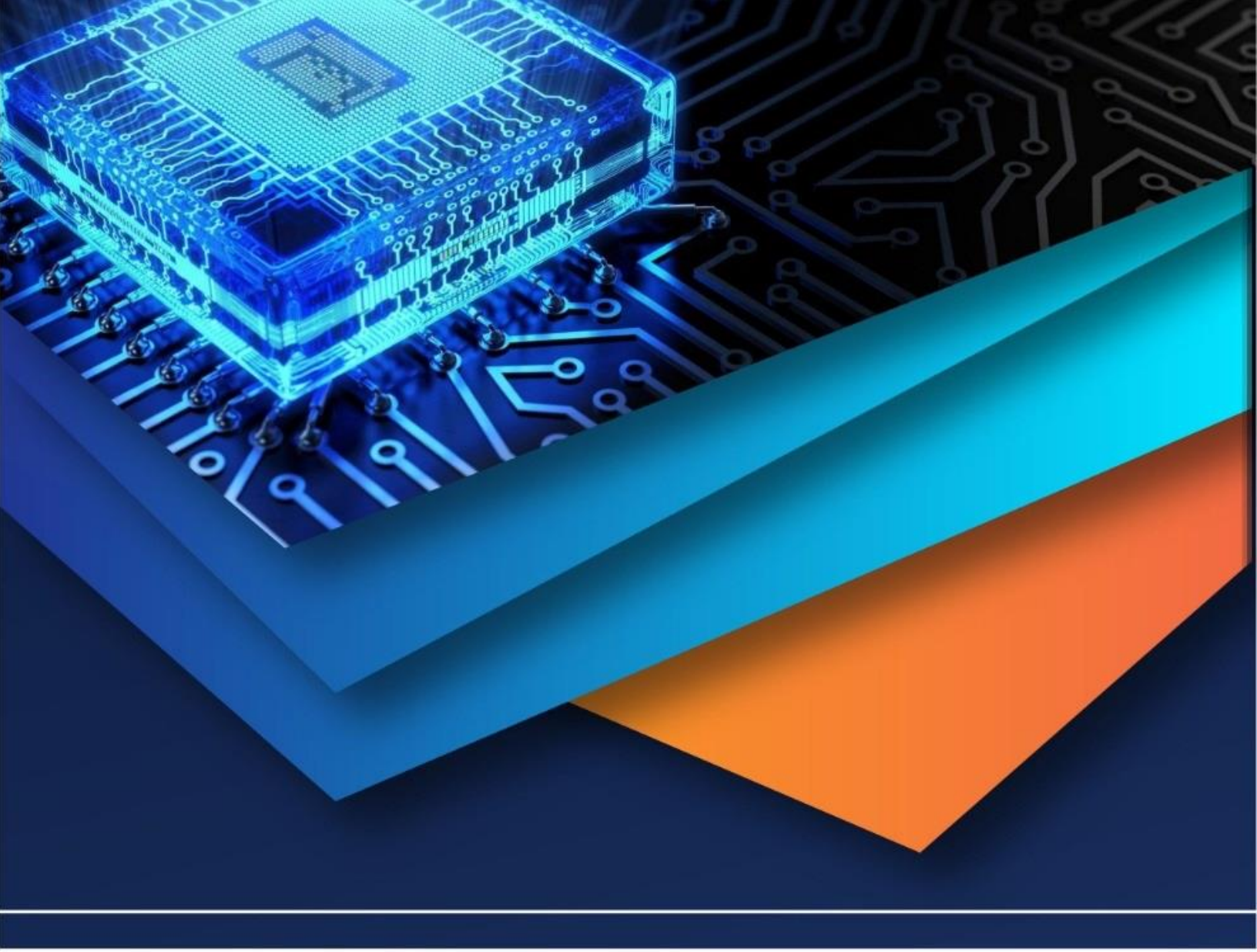
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