Laser Disrupted Security System via Image Capturing

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Abstract – Our work uses a laser for the detection of an intrusion in the security. Four glass walls will be used to represent a room such as a bank's vault. The laser will be deployed from an angle which will bounce off multiple times through the mirror placed on two parallel walls. Due to this multiple reflection of the laser beam, many beams would be generated and there by representing a web of laser beams.

One beam would be picked which when obstructed will not hamper the overall quantity of laser beams left. This specific laser beam will host the LDR (light dependent resistor). As long the laser beam hits the LDR the circuit will remain closed, and when an intrusion occurs the laser beams will be cut and there by opening the circuit. The opening of the circuit will trigger one off three things. First a visual representation of an intrusion, a LED (light emitting diode) will glow representing an intrusion. Second an auditorial alert will be observed by a buzzer being triggered representing the intrusion. And third, a Camera will capture image of the intruder, and this image will be sent to the authority via Email. The image capturing and email process will be done by the "Raspberry Pi zero" hardware and "Raspberry Pi zero" camera. Other hardware includes, a LDR circuit kit which will house a LDR, a potentiometer, two LED one representing a closed circuit (green LED) and the other representing of an intrusion (red LED). A switch to activate or to deactivate the complete set up, a battery for power supply and finally a high intensity laser.

1. INTRODUCTION

This project represents a marriage between electronics and any programming language. All security systems have a combination of hardware and software, here hardware represents the electronics and the software represents the programming. Our projects focuses on this exact aspect. We achieve to use a laser induced LDR system embedded with an image capturing device which will result in the end user getting to know about a breach. The project also includes an Email updater, this will automatically send an Email to the user upon a breach. Implementations of this project will include in bank vaults, museums containing precious art, or even in a personal home vault.

1.1 Raspberry Pi Zero

Raspberry Pi zero is electronic hardware equipment will help to manage, execute and perform many number of projects. Raspberry Pi Zero consists within its self-many other small hardware, they are:

- 1GHz, single-core CPU
- 512MB RAM
- Mini HDMI and USB On-The-Go ports
- Micro USB power
- HAT-compatible 40-pin header
- Composite video and reset headers
- CSI camera connector

Figure 1: Raspberry Pi Zero

1.2 Laser

Optical amplification is the process that emits light, this light is called laser, light based on the stimulated emission of electromagnetic radiation. "light amplification by stimulated emission of radiation" LASER. At Hughes Research Laboratories Theodore H. Maiman made the first laser in 1960.Light coherently allows a laser to be different from other sources of lights, temporally and spatially. What helps to focus on a tight spot is Spatial coherence, hence laser cutting and lithography applications are possible. What helps a laser beam to

stay narrow over great distances is spatial coherence, hence laser pointers are possible. Having high temporal coherence, lasers can emit light with a very narrow spectrum, i.e., they can emit a single color of light. Pulses of light as short as a femtosecond can be made with Temporal coherence.

Figure 2: Laser

1.3 LDR Circuit

LDR stands for light dependent resistor, it is an electronic component which opens and closes a circuit based on the light falling on it. Further the circuit may contain more components such as buzzer, LED's etc.

When the light falls on the LDR the circuit is closed, here the buzzer will be inactive and so will all the other components. The moment no light falls on the LDR the circuit will be complete, thereby ringing the buzzer and other components to their assigned tasks.
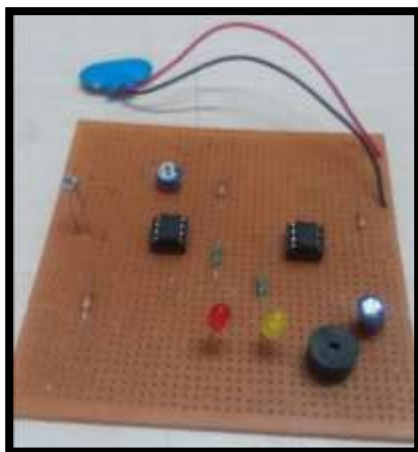

Figure 3: LDR circuit kit

1.4 Buzzer

An audio signaling device, which may be mechanical, electromechanical is called a buzzer, or piezo. Alarm devices, timers, and confirmation of user input such as a mouse click or keystroke are the typical uses of buzzers. In 1831 by Joseph Henry invented the electric buzzer. Doorbells were the primary applications until they were replaced by musical chimes, because of a softer tone.

The Piezoelectric buzzers were invented by Japanese manufacturers and applied into many products during the 1970s to 1980s.
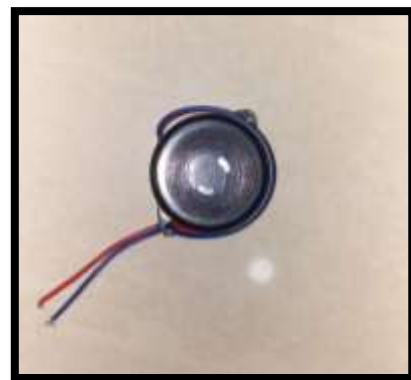

Figure 4: Buzzer

1.4 Raspberry Pi Camera

Raspberry Pi camera is the image capturing device in this project. It is a non OIS 5Mp camera which connects to the Raspberry Pi zero for the power supply and shutter timer.

Features:

- Interface: CSI
- 5 Megapixel OV5647 sensor
- Max. Resolution: 2592 x 1944
- Support 1080p30, 720p60, and 640x480p60/ 90 video
- CCD Dimension: 1/4 inch
- Diagonal: 72.4 degree
- Sensor best solution: 720p,1080p
- Dimension: 60mm x 11.5mm x 5mm

Figure 5: Raspberry Pi Camera

2. Benefits

1. True detection and alerting incase on an intruder.

   This system will provide a true detection in case of an intruder as this system has three fail safes which will provide safety

2. Alerting through different means, sound & email.

   Visual representation of intrusion by LED's, sound representation by a buzzer and plus e-mail update with image of the intruder.

3. Quick response can be taken since real time email will be sent by the system to the end user.

   If an intrusion occurs, the camera will capture the intruder's picture and send an alert with the image to the user's e-mail address.

3. Applications

   I. Hospital.
  II. Museums.
 III. Home.
  IV. Office.
   V. Police evidence room.

4. Convenient

The entire system will be connected over an internet network, thereby no matter when the intrusion occurs the system will be able to detect the threat. The email will be directly configured into the Raspberry Pi processor so that the captured image will be only sent on that email and nowhere else. And also the entire system can be turned on and off through a single switch which can be placed as the user's desire.

5. Profitable

Such a system is fairly easy to construct and has very less monitory restrictions. All the hardware can be procured from various places without difficulty. The parts are cheap, and have good ergonomic status.

It needs only 9V of power supply, with this little power supply, instruments such as buzzer, the processor, LDR kit can work and thereby saving electricity while being profitable.

6. Conclusion

A security system is only as effective as its maker's creativity. Less number of systems in the security will result in a less effective security system. More number of systems in one large system such as this project will surely result in a higher and a more effective method of securing one's vault, wealth, art and even family.