~LaserSec: Laser Security

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LASER— **Light Amplification by Simulated Emission of Radiation. A device that generates an intense beam of coherent monochromatic light. This project utilizes a continuous LASER beam pointed towards a LDR (Light Dependent Resistor) to determine if an area has not been trespassed. A piezo-buzzer generates noisy tones to indicate that the LASER in contact with the LDR has been interrupted. A SIM800L GSM Module pushes notifications via text and can receive commands to activate or deactivate features of the security system. An LCD constantly shows status messages of the system's current state and actions successfully done from SMS commands.**

Keywords— **Laser, GSM Module, LDR, Piezo Buzzer.**

I. INTRODUCTION

Security is a prime issue of concern because there has been a rapid growth of crime rates in the country and people want to be safe in their own home. Many people have underestimated the need of taking appropriate home security measures. A burglary or theft can lead to devastating consequences, both emotionally and financially. One of the best ways to prevent on getting your house intruded is a well-designed security system. Since technology develops fast and becomes cheaper, it is possible to implement a low-cost, reliable and user-friendly security system for your home. The project that we have worked on is a Laser Security System, it is designed to detect intrusion or unauthorized entry in the area and able to trigger an alarm and notify you whenever the security is breached. The system is composed of a LASER pointer that is used as a LASER beam and it is directed to the Light Dependent Resistor (LDR) and any interruption of the beam by a trespasser will trigger the alarm. Since we're living on an era where cell phones are dominating the communication world, we have implemented an additional feature where the owner can send commands like turning off the alarm through text and they will able to receive notifications whenever the trespasser has triggered the alarm.

II. METHODOLOGY

The team tested the circuit on a breadboard and has utilized a Sim800l GSM module for sending and receiving text messages. A LASER is directly beamed to the LDR. The LDR measures the amount of light and when it drops to a certain threshold, currently set at 900, would mean that the LASER beam has been interrupted.

At startup, the status of the modules would be virtually deactivated such that the LASER is turned off, the LDR is not continually checked, the buzzer is silent, and the SMS module is waiting for owner registration, and the LCD shows standby messages.

Initially, the system is waiting for a text containing the word "REGISTER" so that it could set the owner. The registered owner alone can execute commands such as activation, deactivation, and rearm. The team tested the circuit on a breadboard before it was soldered in a universal printed circuit board. The circuit is shown in Fig. 1.
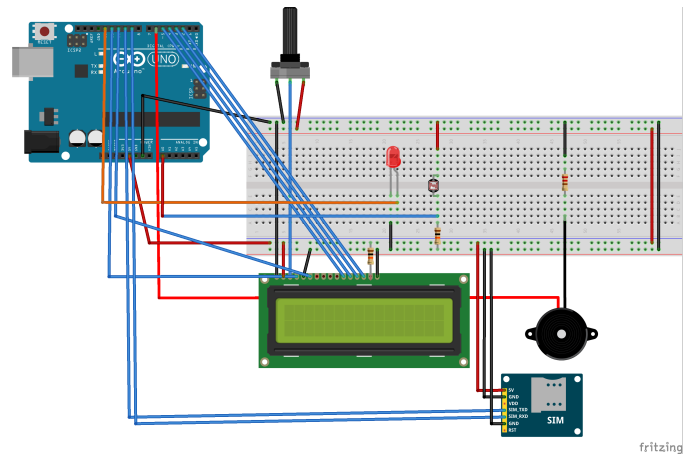

Fig. 1 Circuit tested on a breadboard

III. RESULT AND DISCUSSION

The system works fine as expected. However, we ran into difficulties such as network operator SIM card blocks for unknown reasons.

A. Supported Commands

The system supports limited commands listed in Table 1 along with descriptions of what the commands can do.

Table 1
List of Valid Commands

Command	Action Taken
REGISTER	Registers the phone number of the sender as the owner of the device to be used by functions like command authorization and notification recipient.

HELP	Sends a list of commands to the device owner.
ALARM ON	Activates the buzzer.
ALARM OFF	Deactivates (silences) the buzzer.
SYSTEM START	Activates the system – virtually turns on the LASER beam, actively monitors the LDR, and activates the buzzer.
SYSTEM STOP	Deactivates the system – virtually turns off the LASER beam, silences the buzzer, and disables LDR monitoring.
SYSTEM REARM	Resets the system to active watch mode when a LASER interrupt has happened.

The system provides feedback of its current state through an LCD. Whenever an SMS command is executed, feedback in the form of an SMS reply is also provided.

It may be worth noting that the Sim800l has its own technological limitations wherein it cannot shield itself from external interferences that can sometimes lead it to malfunction. There are cases where it cannot detect the network, spontaneous disconnections from the network during runtime, and SMS will sometimes send slower than usual. For unknown reasons, it fixes itself by repeatedly resetting the Arduino board.

B. Flow Chart

The program starts by initializing variables to default virtual 'off' values and initializing the GSM module. The loop checks the status of variables and acts accordingly depending on the status of the variables to activate the system, alarm, and SMS notifications.

It constantly watches the GSM module's serial comms to get incoming messages and parse keywords and the sender number to be validated and used in the succeeding methods.

The parsed keywords will be executed by the system with validations put in place to safeguard against unregistered senders. The loop ends by wrapping up all executions and validations to send a comprehensible feedback message to the original message sender depending upon his intent in sending the keyword – may it be supported or unsupported.
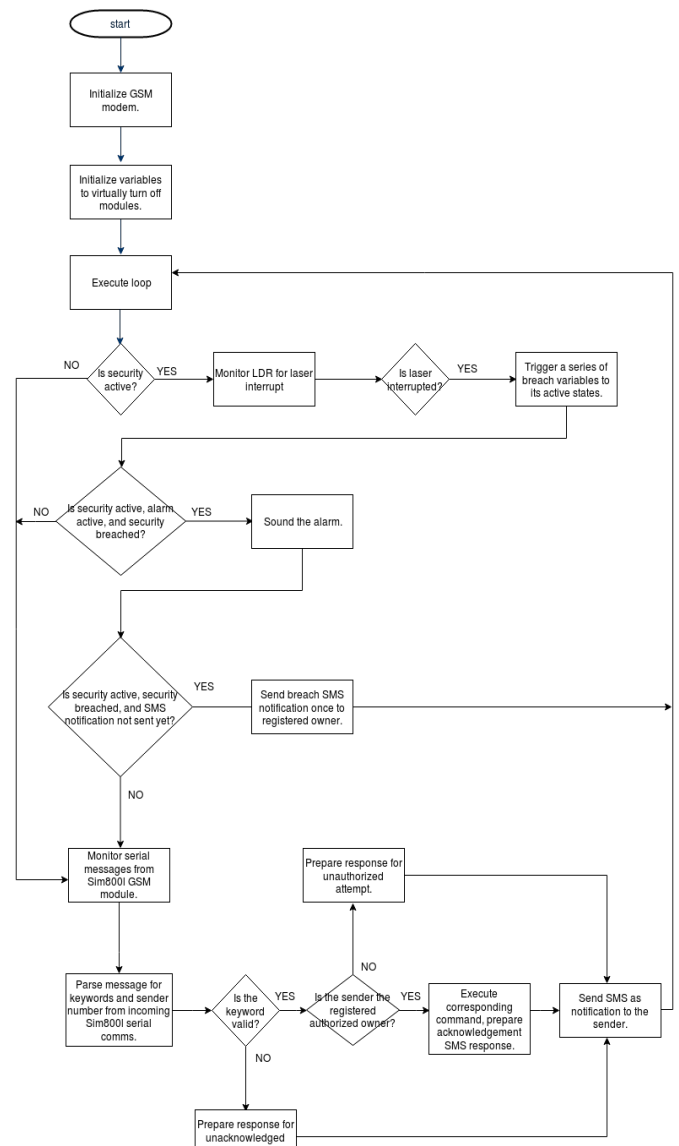

Fig. 2 Program Flowchart

IV. CONCLUSIONS

After overcoming the problems with the components used and debugging the code, we have successfully designed a laser security system that is functioning. When there is an unauthorized entry that crosses the laser beam and interrupts the light contact from the LDR, the alarm is triggered and you receive a text from the GSM module that your security has been breached. What makes the laser alarm security more impregnable is that the user has to register via text messaging so that they will be authorized to send commands on the security system. To improve the design of this laser alarm system, we could make the security boundary for coverage of a larger area by using the single laser light and mirrors at every corner for laser light reflection. We could upgrade the system by adding features like cameras that record and capture the moment when the alarm is triggered, and also

update the code to add a password whenever the user sends commands to have more security.

Laser security systems are a high tech technology that used to be a part of home security only available to the wealthy, but we were able to make the project to be more cost effective.

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