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RESEARCH ARTICLE

An Electronic Security Monitoring System Using GSM Communication

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Abstract

Home security and monitoring are two significant parameters to safeguard the household components. An eye is to be focused specifically to perform the above two parameters. An electronic eye may substantially improve the safety mechanism of the living house. Security threatening in the absence of the house owners is increasing day-by-day. This study considered sensor assembly to detect the unauthorized entry using IR sensors, glass breakage detection sensor, locker security switch, panic switch and LDR sensors. A microcontroller (ARM 7) is used to process the acquired signals from various sensor levels. Accordingly an SMS will be send to the house owner using Global system for mobile communication (GSM). Max 232 line drivers were used to translate the data serially from ARM7 to GSM. The proposed methodology produced significantly favorable results.

Keywords: Electronic eye, security threatening, microcontroller, IR sensors, GSM.

Introduction

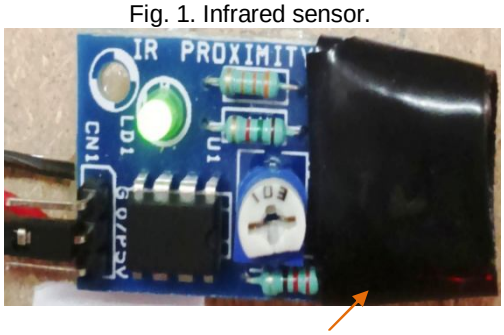
Security is alarming every individual to safe guard their belongings and properties. The theft chances are increasing with the advancement of technology. Security persons are also unable to curtail the theft chances due to tiredness and human mistakes. Theft attempt may enable the nearby security person by triggering the buzzer automatically and also sending the message quickly to the concerned persons to make them alert with the support of GSM technology. The automation of the security monitoring system using electronics assembly is enabling to develop a mechanism to curtail the theft chances at any desired points. Bangali and Shaligram (2013) proposed a traditional home security system which gives the signals in terms of alarm. However, the GSM based security systems provides enhanced security as whenever a signal from sensor occurs, a text message is sent to a predefined number to take necessary actions. Nandeesh *et al.* (2014) projected a mechanism that secures people from leaking of raw gas and fire at home and industries. This system used GPS and GSM Technology. GPS finds location and sends location information where the fire occurs to nearest fire station and police station and also opens emergency windows. Agarwal and Nayak (2012) proposed construction of home security system which has a password protected door lock with an LED based resistive screen input panel and also focused to detect any obstacle while monitoring the windows and doors at night or when away using IR sensors. Fire alarm system uses temperature sensor LM35 which senses sudden considerable increase in temperature and raises alarm. Lee *et al.* (2013) described a multilevel home security system which consists of different sensor nodes, priority interrupt controller (PIC) and universal asynchronous receiver and transmitter (UART). Keeping the above facts in view, this study also focused on Graphical User Interface (GUI) which enables the function of capturing images and sending emails. The captured images are delivered to the house owners and the police forces to prevent the thieves' invasion.

Materials and methods

Infrared sensor (IR): To detect the intruder, IR sensor is used at the entrance door and at the exit door (Fig. 1). The sensor is positioned to detect the intruder within '5' ft distance. The thermal radiation emitted by the object (Intruder) is detected by the infrared sensor. An emitter (IR light emitting diode) and a detector (IR photo diode) were used in this study. The change of resistance at the photo diode is recorded and its magnitude is proportional to the output voltage signal. This change is subjected to the received IR signal magnitude. The output signal at the IR detector is measured (5 V) when there is no light input. When light source input is seen on the IR detector, the output voltage is (3.5 V) measured. IR sensor is directly interfaced to the microcontroller. A 3.5 V at the IR sensor output causes to send SMS to the concerned authority using Global system for mobile communication (GSM).

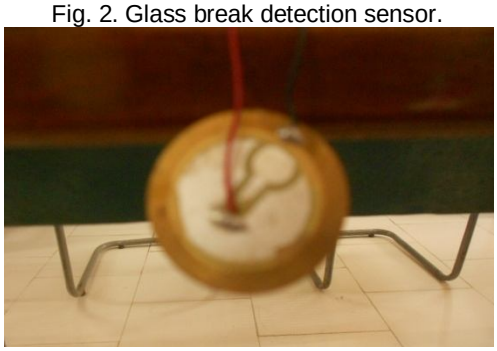
Glass break detection sensor: The vibrations while breaking the glass is to be detected using ceramic piezoelectric buzzer plate used as a glass breaking sensor (Fig. 2). A thin metal plate is inbuilt with in piezo ceramic disc which senses the vibration and generates a sound wave. The vibrations induced due to glass breakage are proportional to the voltage signal. The sensor draws an output signal of 0.56 to '0.58 V when glass is not break.

Fig. 1. Infrared sensor.



IR transmitter and receiver.

Fig. 2. Glass break detection sensor.



The sensor draws an output signal of 0.25 V to 0.30 V when the glass is broken. This sensor is interfaced to the microcontroller for further operations. A 0.25 V to 0.30 V at the sensor output causes to send an SMS to the concerned authority using GSM.

Light dependent resister (LDR): An LDR is used as a sensor to sense the intensity of light in the particular room. The lights will be in the 'OFF' state during the day time since the intensity of the light is high. The lights need to be 'ON' when the intensity of the light is low. This will be controlled by interfacing the LDR to the microcontroller (Fig. 3). The microcontroller will trigger the relays to energize the light devices. When lights are switched 'ON' an SMS will be sent to the concerned authority using GSM. An amount of light falls on the LDR will influence the change of resistance.
The resistance is estimated with RL = 500 Lux
A 3.3K Ω resistance is used to connect the LDR to 5 V.
$V_{0 =}$ 5 X RL/(RL+3.3)
Light Intensity measured is 10 Lux
RL = 500X10 = 5000 Ω
V_0 = 5 X 5000/(5000+3.3)
V_0= 10.39 V.
The output voltage of the LDR is estimated as 10.39 V. If the voltage output is greater than 10.39 V, then the lights will be 'ON' and an alert message will be send to the concerned person.

Communication: GSM is used to communicate the state of the house/room with the concerned authority (Fig. 4). The controller output is given to the GSM with the support of Line drivers (MAX 232) and Recommended standard (RS)-232 C serial communication device.

Fig. 3. LDR sensor.

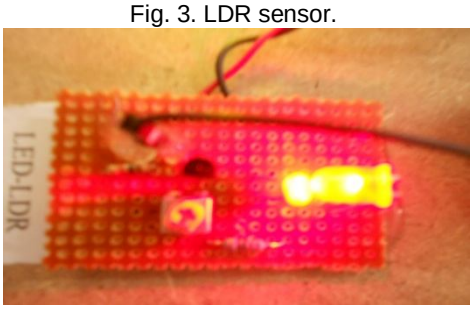


Fig. 4. GSM communication device.

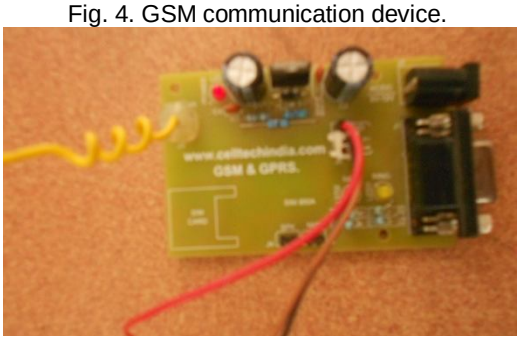
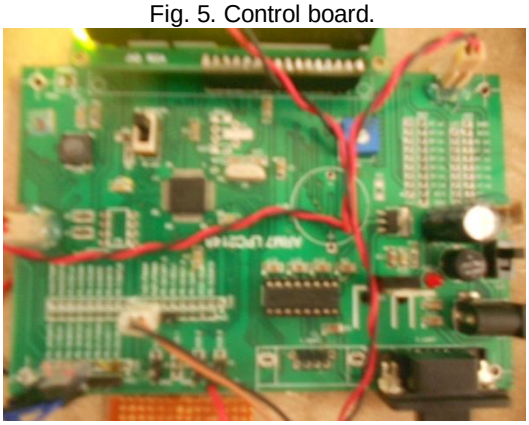


Fig. 5. Control board.



MAX 232 will convert TTL to Rs-232 standards for serial data transmission (Fig. 5). ARM 7 Microcontrollers is used to enable the input and output devices.

Soft code implementation
Algorithm
Step 1: Initialize the ports
Step 2: Initialize port 1_0 with IR sensor
Initialize port1_1 with glass break sensor
Initialize port1_2 with LDR sensor
Initialize port 1_3 with Locker switch
Initialize port 2_0 with Buzzer
Define the sending address "9848960527"
Step 3: Read the data from PORT1_0 (IR Sensor)
If
The voltage level = 3.5 volts
Then
Enable the buzzer
Send an SMS "IR sensor detected "to 9848960527
Else if

Read the data from PORT1_1 (glass Sensor)
If
The Voltage level ≥ 0.25 Volts
Then
Enable the buzzer
Send an SMS “Glass Break detected “to 9848960527
Else if
Read the data from PORT1_2 (LDR Sensor)
If
The voltage level > 10.39 Volts
Then
Enable the buzzer
Send an SMS “LED LDR detected “to 9848960527
Else if
Read the data from port1_3 (Locker Switch)
If
The switch is ‘ON’ logic ‘1’is given to microcontroller
Then
Enable the buzzer
Send an SMS “I am accessing your locker please send me your password “to 9848960527
Else
Repeat Step 3

Results and discussion

The developed working model is tested in real time applications. This mechanism is applied to the Head of the Department (HOD), Electronics and Communication Engineering cabin to test the reliability of the product. An IR sensor detected the entry of the person and the state of the sensor is communicated to the HOD mobile with the support of GSM. Figure 6 represents the message intimation to the concerned authority. Figure 7 represents the glass break detection state of the sensor to the HOD (Authorized person) mobile. The state of the light intensity levels in the specified HOD (Authorized person) room is also able to monitor with the developed model. Figure 8 depicts that status. If any unauthorized person is trying to open the personal locker, a switch provided to the locker cause to send the request for password to the HOD. Sending the password or alerting the security depends upon the situation. Figure 9 represents the request received and password messages for enabling the locker system. The results produced are forced to rely on the proposed methodology to be implemented for automating the security levels of the home and even banking systems.

Conclusion

Safe guarding the personal and public properties without supervision of the human being is aimed with innovative technology this mechanism. The study produced more favorable findings to implement this kind of security support to home and banking systems. So that theft can be curtailed with the response of the security persons. In future, this system can be powered with wireless spy camera system to transmit the status of the security levels to the authorized persons. Image and data processing is proposed to be implemented in near future.

Fig. 6. Message from IR sensor to the authorized person using GSM.

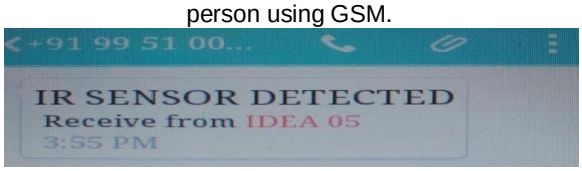


Fig. 7. Glass break detector sensor to the authorized person using GSM.

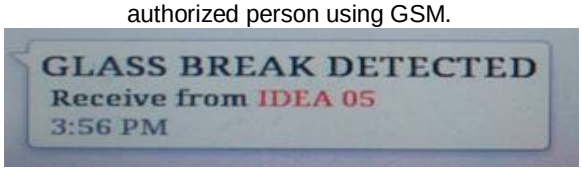


Fig. 8. LDR sensor to the authorized person using GSM.

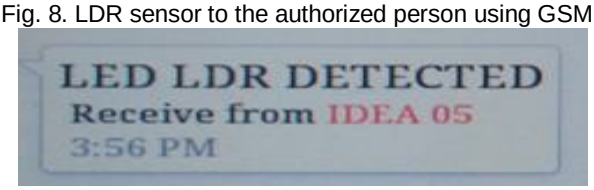
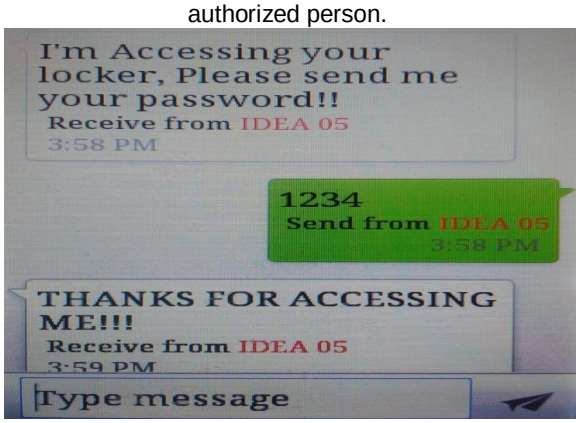


Fig. 9. Locker accessing information received the authorized person.



Acknowledgements

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