Intelligent Home security using GSM communication module

Abhinav Gupta

Department: Mechanical Engineering,
VIT UNIVERSITY, Vellore, Tamil Nadu, India

ABSTRACT: Home security is essential for part for a safe home. This paper aims in developing a low-cost and intelligent security system using thermal heat, passive IR and proximity sensors. Arduino Uno board which act as a microcontroller unit receives continuous data from all these sensors and processes them. The arduino will trigger an alarm and alert messages will be sent to user's mobile via GSM in case of untoward situations. Sensor LM35 (temperature sensor) is used to prevent fire damage to human life by detecting temperature change beyond a certain limit. Proximity sensor uses Hall Effect principle to detect any intrusion through doors and windows whereas the low-power Passive Infrared (PIR) detectors take advantage of pyro-electricity to detect a human body that is a constant source of infrared radiation. Use of artificial intelligence to generate patterns of intrusion based on map of the house and entrance will help in configuring the device individually thereby further increasing the safety of the house. Hence the device serves the purpose of safety and security.

KEYWORDS: Hall-effect proximity sensor, LM35, PIR sensor, Arduino Uno, GSM, Artificial Intelligence.

1 INTRODUCTION

These days with increasing risk of fire accidents and new ways of burglary safety and security of any living or working place is one of the most primary concerns. These forces the security system manufacturers to use modern technology have enhanced safety as well as security.

One of the most primary concerns Safety and security of any living or working place.

CCTV surveillance which is major part of security systems are very costly and many of these systems do not trigger any alarm if intrusion or fire is detected. Thus a cost-effective and fast-reactive security system is needed.

Hence the design explained in this paper is a prototype of such system which consists of a microcontroller unit- Arduino Uno board and a SIM300 GSM module; three sensors- LM35 temperature sensor, PIR sensor and Hall-effect proximity sensor. Arduino Uno is used in processing and controlling the system which receives and processes the data from every sensor. The GSM unit act as an interface between arduino and user's mobile and is responsible for communication between them thereby enabling mobile phone user to control it from anywhere in the world if the GSM network is available to switch on/off the system and to receive the alert messages. The thermal sensors will be placed at fire-prone areas like kitchen and around geysers. They will continuously send the temperature values to processing board. If the temperature value violates the limit value then arduino will trigger an alarm and send an alert message to the mobile station. PIR sensors will be installed in the drawing room and those rooms security is essentially important. They detect the presence of human in the home and generate pulses which are captured by the arduino. According to the pulse received by microcontroller, an alarm is triggered and a call is established to mobile station through a GSM modem thus warning the presence of a burglar in the home to owner-occupier. The proximity sensors can be attached to doors, windows or any possible access points too. The sensor will detect if there is an unwanted intrusion through any of these points, it will generate pulses to be read by arduino and then the procedure similar to that of PIR sensor is followed, establishing the connection to mobile station through a GSM modem and thus warning the owner.
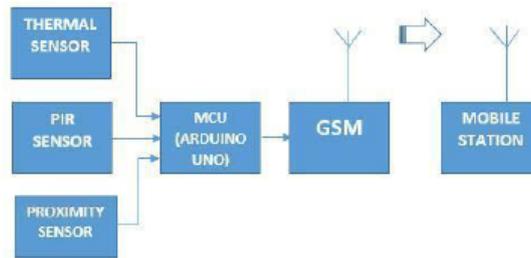
2 BLOCK DIAGRAM

Fig.1: Block diagram of prototype

The block diagram of the working system is shown in figure 1. As mentioned above, the system comprises two units. The microcontroller unit and three sensors. The data from the sensors is continually processed by the microcontroller and an alert is sent to the mobile station via GSM module if something values reach its respective extremes as eg. temperature limit in case of a temperature sensor.

3 WORKING CIRCUIT

The system will remain in off (silent) mode initially. It can be activated by simply sending a particular SMS from the phone to GSM. By taking into account the time taken for complete evacuation, system may take a while to activate all the sensors once the message to turn on is received. After the activation the system will work as follows.

3.1 PROXIMITY SENSORS

These sensors are attached to the windows and doors will get activated once a burglar tries to intrude or gain excess through any open any door, window or any of the weak spots in the house. The alarm will be set on and alert message will be sent to user's phone.

3.2 PIR SENSOR

Taking into conisation that the burglar is able to get into the house without being detected due to malfunctioning of proximity sensor and enters into the coverage region of the PIR sensor, then output pulses are generated this enhances the security system are doubly layered system are notoriously tough to break. These pulses are then taken as input by arduino unit. To avoid false triggering the unit then waits for a pre-defined time of maximum 30 seconds and checks for that signal again. This is done to avoid false triggering. If signal still exists, then the same protocol as that of proximity sensor is followed.

3.3 TEMPERATURE SENSOR

The temperature sensor LM35 will constantly send the room temperature values to arduino. If temperature value crosses marked level of extremity, say 45°C, arduino unit will triggers an alarm and will sends a warning message to mobile station through GSM.

3.4 USE OF ARTIFICIAL INTELLIGENCE FOR EXPANSION OF THE LEVEL OF SECURITY

Pre-defined data (map of house, pictures of objects inside the rooms) will be captured and sent to the manufacture. Through an appropriate algorithm intrusion points (weak points) will be detected and marked before installing the device. This will help in configuring the device appropriately as per the requirement. For instance if CCTV is installed inside the house it specify its rotation time. Further in case of circuit damage it will send the data to the cloud server and process the last taken data for the chances being that it might be a hit from burglar.
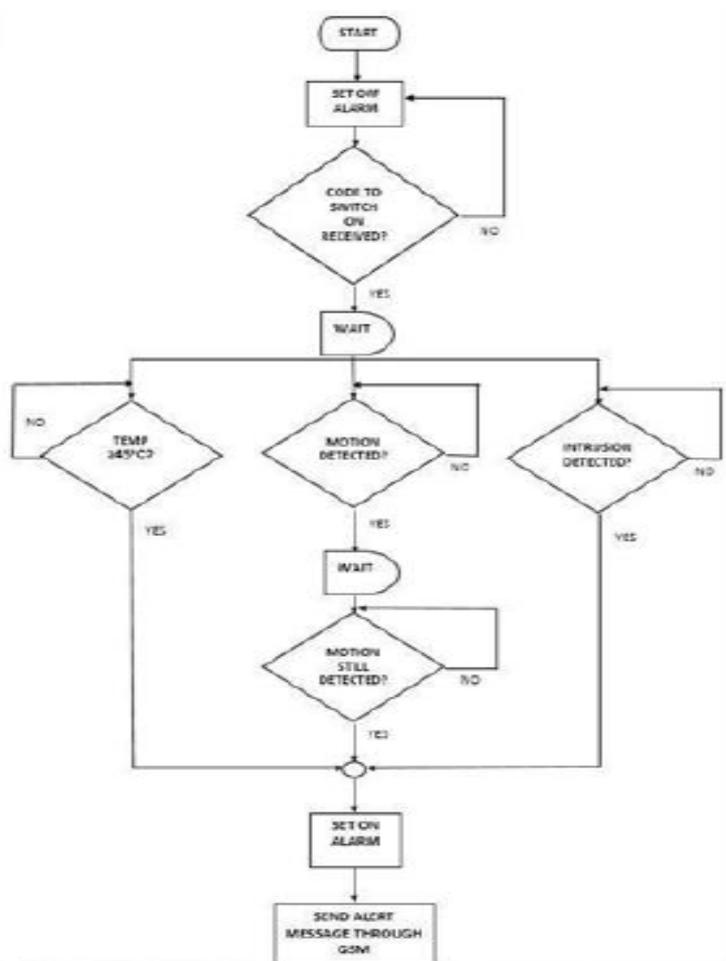
Fig. 2: Working Algorithm

Figure 2 shows the algorithm of system's working. The use can deactivate system as per his/her will by just sending a particular deactivation message through his phone.
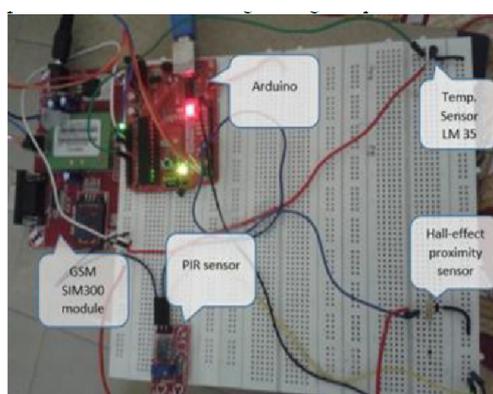
Fig. 3 Snapshot of the circuit

4   CONCLUSION

In this paper using easily available programmable sensors like the PIR and Hall Effect proximity sensor the importance of home security measures are elaborated. Further the work on advanced security measures including the face detection

technique with the help of CANNY's edge detection is under development. Use of artificial intelligence to detect the patterns and generate weak points inside the house will enhance the security system. Also to eliminate any occurring ambiguities in the current system this system can be improvised with the inclusion of Voice Pattern Analysis using IC APR9600 (voice recording IC) with advanced Digital Signal Processors and finger print reading which can be added to the current installation of security system. Also the work for developing a smart GUI using an Android application and an efficient alogoritm to dectect patterns is under the purview with Ethernet servers using an HTTPS internet website, so as to communicate with the standalone system from anywhere. This will also help in the versatility and bring down the operation cost

REFERENCES

[1] Q. Qu, Z. Guohao, W. Baohua, "Design of Home Safeguard System Based on GSM Technique", Electronic Engineer, vol. 32, no. I I, pp. 76-78, Nov. 2006.

[2] M. Shankar, 1. Burchett, Q. Hao, B. Guenther, "Human-tracking systems using pyroelectric infrared detectors", Optical Engineering, vol. 10, no.45, pp. 106401 (01-10), Oct. 2006.

[3] M. Moghavvemi and C.S. Lu, "Pyroelectric infrared sensor for intruder detection," in Proc. TENCON 2004 Conf., pp. 656-659.

[4] Renewable Energy UK. (2010, Aug.). Find out how to integrate PIR (passive infra red) sensors into renewable

[5] Subash Luitel, "Design and Implementation of a Smart Home System". bachelor's thesis, Dept. Electronics and communication engineering, Helsinki Metropolia Univ. of Applied Sciences, 2013

[6] AH180micropower omnipolar hall-effect sensor switch datasheet
available online at http://www.diodes.com/datasheets/AH180.pdf

[7] SN-PIR sensor datasheet available online at http://www.cytron.com.my/datasheet/sensor/PIR_UserManualv1.pdf