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Prototype Home Security System using Arduino

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Abstract - *According to data from statistics, home burglary has increased in recent years, Therefore, it has been necessary to design specific security systems for homes. Many companies offer these systems at very high costs, which makes their use impossible. For this reason, a prototype called PHSS (Prototype of Home Security System) has been designed. The prototype consists of an Arduino UNO controller, a PIR sensor and a GSM module, one of its main features present in the prototype is the ability to send an alert message to the owners' mobile phones in case of intrusion into the home and that can be easily installed by the user.*

Key Words: GSM, Arduino, Security, Home, Prototype, PIR

1. INTRODUCTION

Citizen security is a human right, constitutionally recognized collective incidence, essential for the proper functioning of society and one of the main criteria to ensure the quality of life [1]. At the national level the feeling of insecurity has increased since 2011, where 17 percent of the population in Mexico felt unsafe in their own homes, for 2017 the percentage increased to 21.2% [2].The robbery at home invitation is considered in Mexico as a crime to the patrimony, this crime is one of the most frequently committed in our country, according to the Executive Secretary of the National Public Security System, it is one of those with the highest incidence compared to other crimes against property [3].

Various publications have shown that the incidence of theft decreases when homes have security systems. An electronic security is defined as a series of technological components interconnected with each other, that are managed from one or several central units whose function is to increase the degree of protection of any type of installation [1]. These systems can be used against fire, gas detection, closed circuit television, anti-theft and intrusion, etc...

Currently, electronic anti-theft and intrusion security systems have increased their demand and application both at an industrial and residential level [2], because security is considered one of the most important basic needs for human development [3].

The equipment and components that are part of an electronic security installation send or receive information using electrical or electromagnetic signals [4]. These systems can be classified into: Wiring, which communicates with the central through conventional cable systems, pair cables, coaxial, fiber optics, etc. Wireless: they use encrypted infrared or radio frequency signals to send information with the panels.

Different strategies have been used for the development of these security systems, for example, Anitha [5], developed a prototype for the home using an Arduino uno controller to interact with the components, a Reed magnetic sensor to monitor the status of one of the doors in the house, a buzzer as an alarm system and an ESP8266 WIFI module to connect and communicate through the internet. For their part, Cuzco-Carrión and Layano Vallejo [6], propose a low-cost remote security system that uses AT commands, which will allow the user to observe what is happening in their home through real-time monitoring using video cameras. and its visualization through a web page.

2. OBJECTIVE

Develop a home security system prototype, simple but highly efficient that has the function of sending an SMS message to the homeowner´s mobile number in the event of an intrusion alert, to prevent property damage and provide protection for family members. The prototype is based on Arduino, Pir motion detection sensor and GSM module. Home security systems are an important feature of modern home installation that must be affordable, reliable and effective.

2. METHODOLOGY

The core of the security alert system is made up of a PIR Type sensor that detects movement by sensing the difference in levels of infrared or radiant heat emitted by surrounding objects, these sensors have a typical range of 6 to 9 meters, being a considerable range for operation. The PIR sensor will be connected and previously calibrated in the Arduino program that will be in charge of receiving the readings and subsequently communicating with the GSM module through a serial signal to send an SMS message to the preprogrammed mobile phone

number. The structure and components of the alarm are described below.

2.1 Hardware required

- Arduino UNO device.
- PIR motion detection sensor.
- GSM module for SIM900A.
- SIM from any telephone company.
- Desktop PC or laptop with preloaded Arduino program.
- 9V DC power supply.

2.1.1. Arduino Uno Device

The Arduino Uno device (Fig-1 a) is a programmable card with 14 digital input/output pins, of which 4 can be used for PWM outputs, 6 analog inputs, a 16 MHz ceramic resonator, a female USB connector (Fig-1 b), a Power Supply Jack, an ICSP connector and a reset button

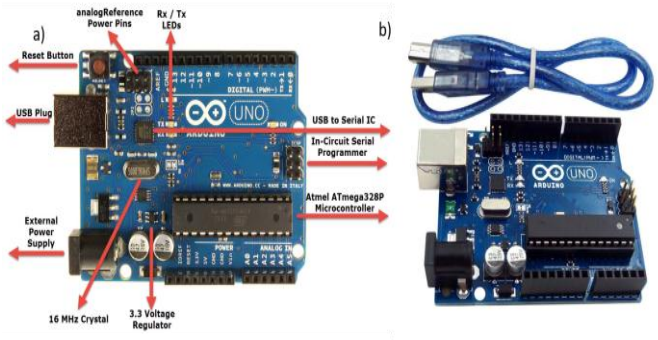

Fig- 1: Arduino UNO microcontroller. a) general scheme of the microcontroller; b) Arduino UNO and interface USB.

2.1.2 Pir sensor

The PIR (Fig-2). It is a pyroelectric device that detects movement. Senses changes in infrared levels emitted by nearby objects and outputs a signal to the Arduino device. An important point to note about PIR sensors is that the output will be high when it detects motion. The sensor output goes low from time to time, even when there is motion which can mislead the microcontroller into thinking there is no motion. This problem should be dealt with in Arduino programming by ignoring low output signals that have a duration shorter than a predefined time. This is done assuming motion in front of the PIR sensor is continuously present.

Fig- 2: Pir-sensor

2.1.3 GSM Module (SIM 900A)

SIM 900A is the GSM/GPRS module with an incorporated RS232 interface (Fig-3). It has a double band GSM/GPRS system that works with frequencies of 900 / 1800MHz. With the help of RS232, modems can connect to PC or microcontroller by a series cable. With this module it is possible to make voice calls, SMS and have internet access. There are on board connections for microphone and headphones where we can make or receive calls.

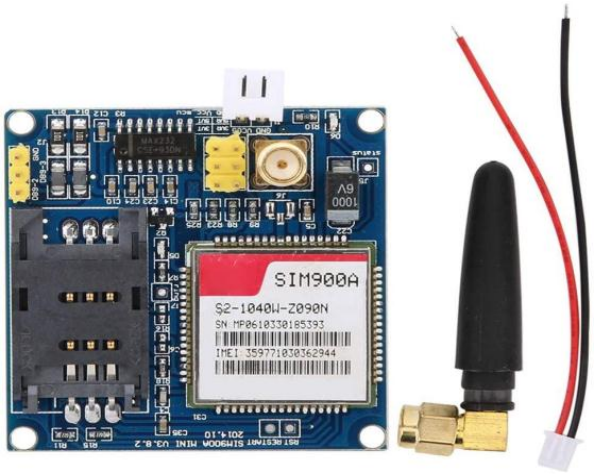

Fig- 3: SIM900A GSM RS232

2.1.4 PC or Laptop with Arduino UNO Software

In this preloaded software in the PC or laptop (Fig.4) is where to create the operation code for the Arduino UNO device which is connected by USB Type-A cable to micro-USB to upload it to the Arduino device.

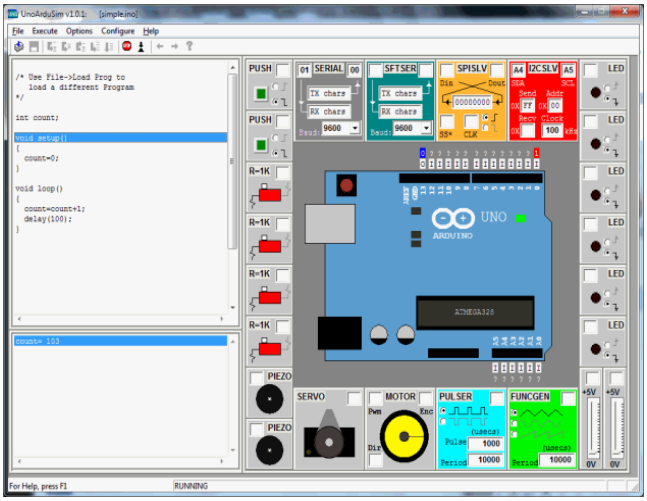

Fig- 4: Software Arduino UNO 1.0.1 and graphic interface.

2.1.5 Power supply 9V DC

Commute 9V DC Font is an electronic device commonly called Power supply. Source of power or commute font. In electronics it's defined as the instrument that converts alternating current into direct current in one or many outputs.

2.1.6 Circuit design

According to the flowchart process (Fig-5) and the electric circuit (Fig- 6) of this prototype is based on an Arduino UNO device, the PIR module has a digital output pin where it connects to any of the digital I/O pins of the Arduino. The GSM module connects to the Arduino device by Rx and Tx pins that are located in the device. It's important to keep in mind to upload the code into the device, the GSM module has to be disconnected because it could interfere with the serial communication with the Arduino IDE.

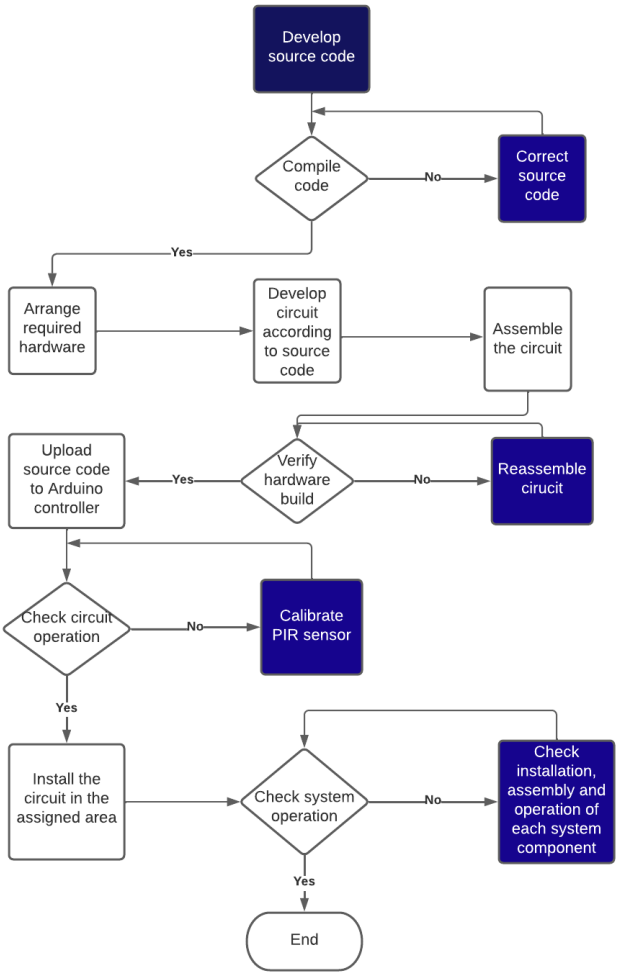

Fig- 5: Flowchart

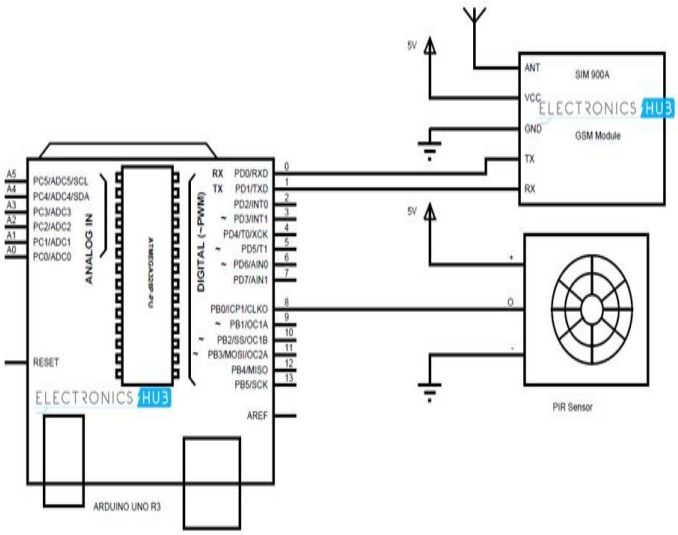

Fig- 6: Circuit Diagram

3. CONCLUSION

According to the implementation the main objective of the security system is to improve the security conditions using Low-cost equipment, implementation procedures that require basic knowledges in electronics and computing, as well as, easy install and configuration to cover the security needs in our home, in a small business or area with the option that the materials can be purchased easily online or in a store and its installation doesn't require professional tools.

REFERENCES

[1] D. Sharelis, D. Ferrer and V. Leidenz, "Sistema de seguridad y telecomunicaciones a través de radiofrecuencia (RF) para el sector la picola de Maracaibo estado Zulia", Universidad Privada Dr. Rafael Bellosos Chacín, República Bolivariana de Venezuela. August 2016, pp. 129[On line] http://virtual.urbe.edu/tesispub/0102004/.

[2] B. Mudlaff, S. Babicz and J. Smulko, "Anti-theft lab security system based on RFID," Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej, 2016, vol 56, pp. 123-12, ISSN 2353-1290.

[3] V. Ion, H. Andrei, E. Diaconu, M. N. Ardeleanu and A. C. Gheorghe, "The analysis of the electrical characteristics for an anti-theft alarm system," *13th International Conference on Electronics, Computers and Artificial Intelligence (ECAI)*,Jul. 2021, pp 1-6. doi: 10.1109/ECAI52376.2021.9515183.

[4] J. R. Fernadez, Circuito cerrado de televisión y seguridad electrónica, Ed. Paraninfo, S. A., 2018.

[5] A. Anitha, " Home security system using internet of things," IOP Conference Series: Materials Science and Engineering, 2017, vol 26, pp. 1-11, doi:10.1088/1757-899X/263/4/042026.

[6] G. L. Cuzco-Carrión and W. A. Layana-Vallejo, "Sistema de alarma, automatización y control de equipos a distancia a través de línea telefónica y página web," Universidad Politécnica Salesiana, Ecuador. Jul. 2012, pp 166. https://dspace.ups.edu.ec/bitstream/123456789/4120/1/UPS-GT000375.pdf

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