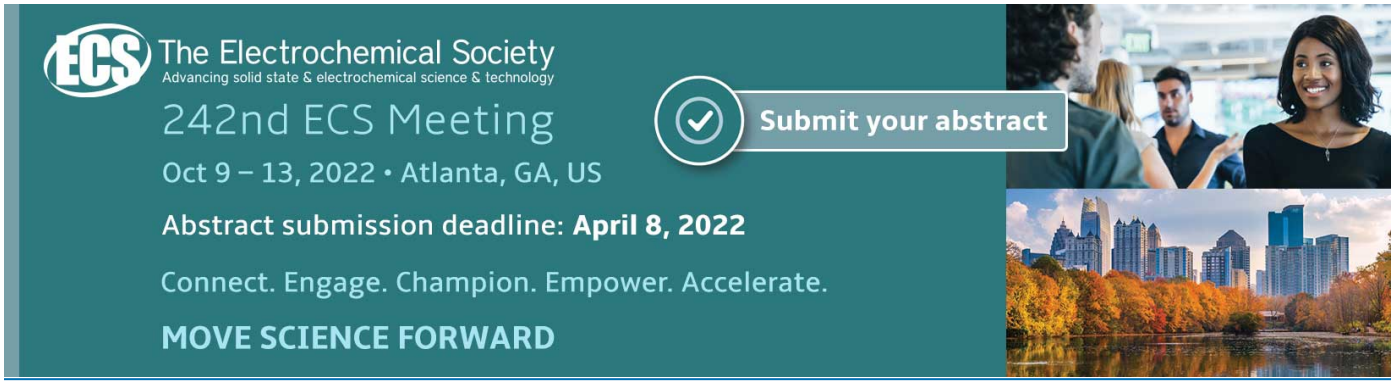
Arduino Based Security System using Passive Infrared (PIR) Motion Sensor



Arduino Based Security System using Passive Infrared (PIR) Motion Sensor

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Abstract. Technological advancements are so fast as of now to make individuals need consistently to be inventive and trigger to make something new which can be applied and can utilize rapidly and for all purposes and control from close range and distance. There has been drastic increase in theft and burglary, robbing of houses, stores, shops and banks etc. This has also increased the number of violence and crime related activities which occur on a daily basis, in which lots of lives and monetary loses have been recorded. This research focuses on how to configure a simple home security framework using a PIR sensor(Passive Infra-Red) in light of a microcontroller. This safety will work if the PIR (Passive Infra-Red) sensor recognizes any individual that would not like to go into the house, and afterward themicro-controller process and instructs a mobile phone to send an alarm signal in theform of Short Message Service (SMS). After the program was successfully uploaded to the circuit, a test was carried out to determine if the PIR worked perfectly and it came out with positive results as it detected motion. As a motion was detected, the sensor became active, therefore gave a signal to the Arduino which gave an output signal to the led and thereby making the buzzer to sound an alarming noise.

Keywords: Arduino, Passive Infrared, GSM Module, Security, microcontroller

1. Introduction

A security framework that can have the option to recognize and screen the zone and respond viably to security danger is in incredible need. Because of the expanding number in wrongdoing and theft, the requirement for a proficient security framework is fundamental. There are now loads of security frameworks in the realm of innovation as of now, in the market for both indoor and outdoor applications, for example, Ultrasonic identifiers, CCTV, microwave indicators, photoelectric finders, infrared locators and so forth [1-3]. Anyway the greater part of these frameworks of being costly in the market, or they require increasingly electrical force development, more memory space of usage of the account framework and complex circuity, and so on. Accordingly an answer for conquer these issues could be by utilizing a sensor of minimal effort which can identify the interlopers, and other security astonishingly inside the sensor's discovery run and creates and yield [4].

This yield is can likewise be utilized to additionally flagging and actuating other security gadgets like caution framework, helping framework and other comparable security danger gadgets. Which means this framework can spare force utilizations on the grounds that these segments get activated just when there are gate crashers and security dangers in the sensor's discovery run. A Passive Infrared radiation motion sensor is security based system that saves the power consumption and the memory space of the recording system. [5] Passive Infrared Radiation (PIR) sensor detects the change in infrared radiation of warm blooded moving object in its detection range. According to the change in infrared radiation,

there will also be a change in the voltages generated which was amplified and then used to turn ON webcam or lighting through a relay system.

The use of motion detectors goes back to ancient societies that developed agriculture and motion detection of people and things can be traced back to the early decades of the 20th century, with many of the same principles still in use today [6]. The objective of this work is to develop a simplified version of a PIR sensor which can be installed on campus and houses for lightening systems, shops and malls for security systems and other major applications and places all over the globe. In order to understand the full ideal of this project, we need to review the history of motion detection and how it came to surface between the 20th and 21st century.

2. Design and Methodology

The Passive infrared motion sensor with Arduino was designed using the Arduino IDE software. The software is used for programming the Arduino and PIR circuits. For the programming, C language was used due to the fact that Arduino Nano uses C for its programming. The program was written, compiled and uploaded to the Arduino Nano. Several essential parts are required in the implementation of this project. It is thereby split into several subprojects so as to make the testing, troubleshooting and implementation of the whole system easier. It consists of the following components in Figure 1.

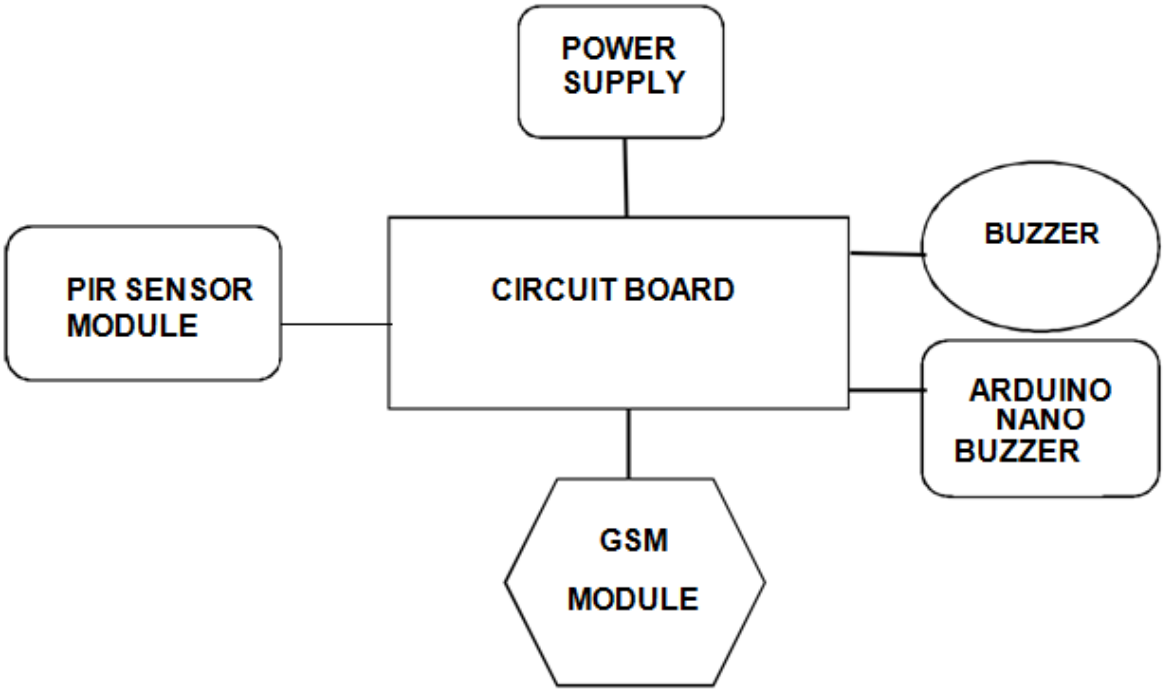

Figure1: Block Diagram for PIR motion sensor alarm

The Arduino Nano is a lot of like the Arduino UNO. They utilize a similar Processor (Atmega328p) and consequently the two of them can have a similar program. One major distinction between both is the size UNO is twice as large as Nano and consequently consumes more space on your venture. Additionally Nano is breadboard agreeable while Uno isn't. To program an Uno you need Regular USB link where with respect to Nano you will require a smaller than normal USB link. The Arduino board is structured so that it is very simple for beginners to begin with microcontrollers [4]. There are three different ways by which you can power up your Nano, by connecting the mini USB jack to a telephone charger or PC through a cable and it will draw power required for the board to work. The

VIN pin can be provided with an unregulated 6-12V to control the board. The on-board voltage controller manages it to +5V. In the event that you have a managed +5V gracefully, at that point you can legitimately give this o the +5V pin of the Arduino. There are 14 digital Pins and 8 Analog pins on the Nano board. The digital pins can be utilized to interface sensors by utilizing them as info pins or drive loads by utilizing them as yield pins.

Most PIR modules have a 3-pin connection at the side or bottom. The pin-out may vary between modules. One is described as the ground pin, the other is the signal pin, and the last pin is for power. Power is usually 3-5VDC input but may be as high as 12V. The PIR acts as a digital output, it can be high voltage or low voltage, so all you need to do is listen for the pin to flip high (detected) or low (not detected) by listening on a digital input on your Arduino. Power the PIR with 5V and connect ground to ground. Then connect the output to a digital pin.

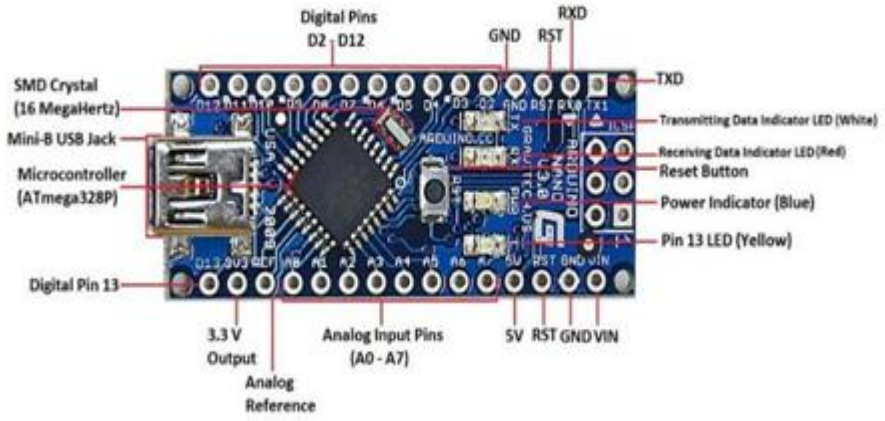

Figure 2: Arduino Nano Diagram

3. Result and Discussion

This research was constructed into two phases: design and soldering of the circuits, and the packaging of the project. During the soldering process, continuity test was carried out at intervals to ensure that no bridging occurred in the process of the soldering. Also, during the software programming phase, uploading the code into the circuit was to be done with precaution to avoid error in the code and uploading failure. Figure 3 shows the already built circuit in its sketchy format showing the connected wires from the Vero board to the Arduino, PIR and GSM module. Upon powering the system, the PIR draws power from the battery and is indicated by the LED's present on the sensor.ArduinoPIR code in the Ide. There are 3 stages in the programming aspect, declaration stage, set-up stage and Loop stage. The declaration stage is a means of identifying each of the pins and giving them their specific functions with time. The set-up stage is the phase that instructs command to each of the specific pins in the circuit and how they are going to work. These pins have been ordered by the program to send signal and receive signal. Take the led for example that uses a digital pin which sends signal out when a motion has been detected.

The input defines that Arduino should receive signal. While the output orders it to send signal out. The Gsm works with signal connection, transmitting and receive signal both simultaneously. Once the set-up has been completed, the Sensor can now work effectively. The loop stage is then assigned for the codes to work repeatedly when there is detection. After the program was successfully uploaded to the circuit, a test was carried out to determine if the PIR worked perfectly and it came out with positive results as it detected motion. As a motion was detected, the Sensor became active, therefore gave a

signal to the Arduino which gave an output signal to the led and thereby making the buzzer to sound an alarming noise. Figure 4 shows a successful outcome of the motion test. The image here displays a repetition command for when there is detection and when there is no detection. When a motion is detected, the screen displays "Motion-detected warning break-in at home" as security alert information.

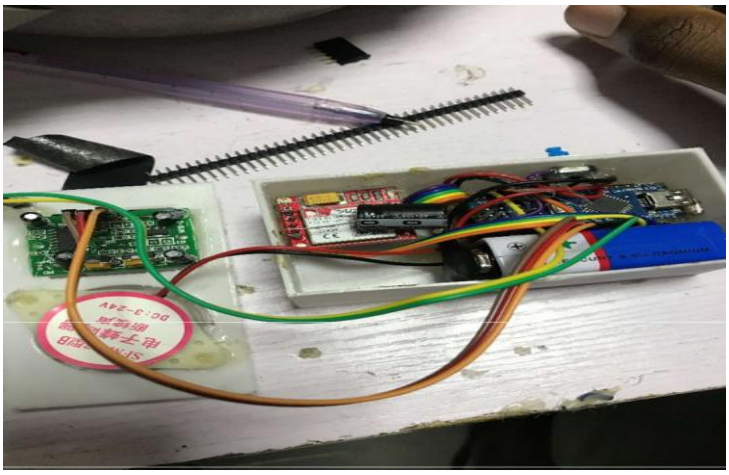

Figure 3: Built circuit of the motion sensor

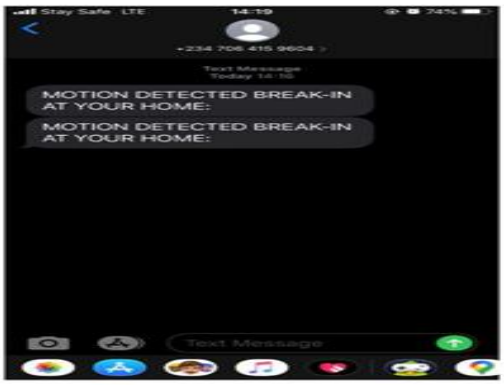

Figure 4: Successful motion detection

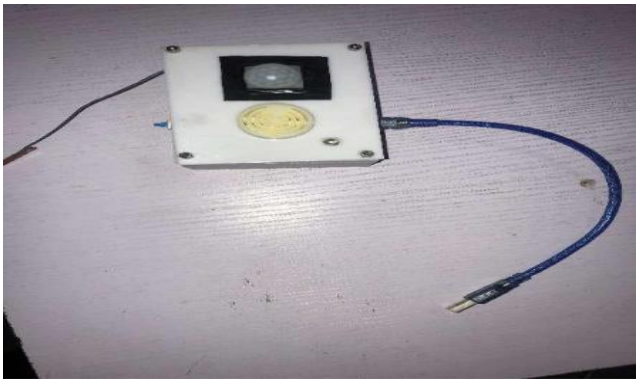

Figure 5: Complete build-up of the project

Figure 4 and 5 shows a successful result of the function of the Gsm module in the Circuit. During the programming set-up stage, a phone number was assigned and stored in the code, therefore when there is a break-in and motion is detected, the sensor sends a message to the house/shop owner. After the build-up in Figure 5, the first casing appeared to be small for all the components to fit in, therefore another casing had to be printed which took a few hours. And it was required to use the specified voltage of 5 V as that is the required optimal power to run. Also, there was no current observation in the circuit due to the addition of the capacitor to store excess electrical current. And observation was the time delay for the buzzer to sound after detection, due to the fact that it must first send a SMS to the owner.

4. Conclusion

Advancement in innovation and technology has significantly improved security in our regular day to day existence. This research focuses on how to configure a simple home security framework using a PIR sensor (Passive Infra-Red) in light of a microcontroller. This safety will work if the PIR (Passive Infra-Red) sensor recognizes any individual that would not like to go into the house, and afterward the micro-controller process and instructs a mobile phone to send an alarm signal in the form of Short Message Service (SMS). This work has shown that utilization of Sensors ought to be utilized in shops and homes in Nigeria and African nations in this way. This task can be of acceptable use and be mass produced economically to be applied in different houses, shops, and even in vehicles.

Acknowledgment
The authors appreciate the full conference support received from Covenant University, Nigeria.

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