

Arduino - Based Human Motion Sensor Alarm System

A Proposal

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Executive Summary

Nowadays, security becomes the best solution to overcome dormitory intruder problem when owner is not in the dormitory. As we know there are many types of security system which is too expensive and difficult to use. For that reason, an effective security system at low cost is built where user can also program the security system by their own. This device is focusing of developing a security system for dormitory and other establishment with an active infrared motion detector which is controlled microcontroller.

The overall project is divided into two parts; the first part is concern on the hardware development where all electronics component are connected via Electricity and Mini ups Back-up power source. A Passive infrared Sensor is the input components. While buzzer and RGB are the output components where it gives feedback. The second part is the software programming to operate the hardware structure. The process of downloading and executing the program is done using Kodular Mobile Application software to the microcontroller is capable to control the Passive InfraRed (PIR) Sensor for the security system.

Chapter I

1.1 Introduction

The CCTV or the Closed-circuit television is being used as a security purpose to protect our establishment and valuable things. The Faj Dormitory is using CCTV for the security purposes and also for the monitoring of the return time and getting in and out of the residence in the said dorm. Reviewing the CCTV, it can be inconvenient to the owner and it consume time and at the same time the owner would not be notice immediately if something happens. The dormitory is also using a low security level like the using of padlocks and other door lock equipment. It's one of the main reasons we would like to keep our security level alert.

Security system is a method by which something is secured. Securing our home is very necessary to avoid unwanted things to happen like robbery and other crime. It is very important to have an upgraded security in our homes because most of our importance things like money, jewelleries and other important valuable things without security.

Passive Infrared Sensor (PIR) is a device used to detect motion by receiving infrared radiation. When a person walks past the sensor, the PIR Sensor will allow you to sense motion almost the way it's used to detect whether a motion has moved in or out of the sensor range. PIR Sensor only can detect a motion but has a limited range only.

The propose system entitled "Arduino- Based Human Motion Sensor Alarm System" consist of different features such as Arduino UNO (R3), PIR Sensor Detection, GSM Module and Bluetooth Module.

1.2 Project Context

The present security system of the Faj Dormitory is used of CCTV and also a low security level such as padlock for the uses of gates and other door lock equipment inside the premises.

The present system of the Arduino - Based Human Motion Sensor Alarm System are using padlock and other door lock equipment for security purposes and for the monitoring of the residence of getting in and out. With this present system, it will not immediately notify the owner if the unauthorized movement entered in restricted area. And with the low security level used by the said dormitory it can be easily entered by the intruder.

The Arduino - Based Human Motion Sensor Alarm System is to detect a motion of unauthorized person in the dormitory during curfew hours. Once the dormitory use the device it is being protected against intruders or any act of criminals.

1.3 Purpose and Description

The client have the authority to manage and access to the system and the one who receive the SMS and call-in case the sensor detect some motion. The client request that the device and CCTV will be put in one place.

The proposed system will give several benefits to the owner of the dormitory by giving an upgraded security, the owner can immediately be notified if someone is trying to entered the premises, it can detect an intruders or suspicious persons before they will entered the dormitory. Through this propose system the owner can really monitor the getting in and out of the tenants especially those who doesn't follow the curfew.

The Arduino - Based Human Motion Sensor Alarm System is a security device to maintain its security of the dormitory from its unauthorized personnel and to ensure the safety of the tenants.

1.4 Objective of the Study

1.5 Main Objective

The main objective of this project is to develop an Arduino-Based Human Motion Sensor Alarm System to enhance the security of the said dormitory.

1.6 Specific Objective

- To develop a module that will detect unauthorized movement in restricted area, the PIR Sensor will activated particularly in curfew hours.
- To develop a device that will notify the owner through send SMS and calling.
- To develop a module that will alarm if some intruders want to enter the area.

1.7 Scope and Limitations

1.7.1 Scope

This device is exclusive for Faj Dormitory using an Arduino UNO. It can run via Electricity and Back-up power source. This device can detect motion using the PIR sensor in the restricted area and also can send a call and SMS notification. The client request that the device and CCTV should be put in one place.

1.7.2 Limitation

This device can only detect motion in restricted area. This device is applicable within 24 hours of the Faj Dormitory. Only the owner has the authorization to activate the device. The CCTV is not connected to the device. It can't be detecting the wide area only the 6 meter from its starting point or where the PIR sensor is being installed. The motion can detect only the height of the person due to its time constraint.

Chapter II

REVIEW OF RELATED LITERATURE AND SYSTEMS

This chapter examines the current project's relationship to previous similar researchers and literature. Support on the conceptual framework of the study relating between the previous literature and past studies on the motion detection alarm system. The related literatures on its existing applications will be used as reliable source of the study. This serves as guide and example to the proponents for the development of the device. The proponents believe that through the integration of the collected works, the study will be justifiable.

2.1 Related Literature

2.1.1 Vehicle Security System using Motion Sensors

According to (Venkatesh, 2019) lot of advancements in science and technology have been observed in last decade. Children used to play in cars and by mistake they lock themselves in the car. As the parents were unaware of this, children face the problem of suffocation which may lead to their death. This concept is developed to avoid this kind of disasters by using the advanced technology such as motion sensors. When the sensor detects any abnormal motion in the vehicle the oxygen is supplied inside the vehicle through oxygen cylinders. The propose system is using Pir motion sensor which has micro-controller and Bluetooth or Wi-Fi connected devices when the child has locked inside the vehicle the motion sensor detects the motion the oxygen cylinders valve opens with the help of the micro-controller and there by supplies the oxygen inside the vehicle so it provides some more time to the owner for rescue child.

2.1.2 Space Security System using Motion Sensor and Notification of Short Message Service with Arduino-Based

According to (Darmawan, 2016) CCTV has disadvantages because CCTV only records without giving a notification if there is human movement in the room after the store's operating hours end. Therefore we need a security system that can provide up-to-date information in real time to detect human movements within the store when it is outside its operating hours. The system was built using Passive InfraRed Sensors (PIR) which are connected to the microcontroller as the central control system to detect human movements outside the store's operating hours based on the results of design and testing, this system can be used properly and provides real time notifications to users. When the sensor detects human movement outside the store's operating hours, the system will send an SMS notification to the shop owner's mobile number.

2.1.3 Design and implementation of motion detection alarm and Security system

According to (Iyapo, 2018) the need for an effective and reliable intrusion detection with an alarm system have become vital necessity because of the frequent and rampant cases of burglary. Attack on homes offices, factories, banks etc. is on the increase. This project is built using an embedded microcontroller system capable of detecting motion of an intruder in a restricted area and then triggering an alarm system, motion detector system, however passive infrared sensor detected the motion of the person using the person body heat. The passive infrared (PIR) sensor which is the motion detector used in this project is attached to a microcontroller which activates the alarm system and any other attached output device to notify the house owner. The initial testing of the design shows that it worked as expected.

2.1.4 PIR-sensor-based lighting device with ultra-low standby power consumption

According to (Tsai, 2011) in this project we present a way to reduce the standby power consumption of a PIR-sensor-based lighting device. Generally, although a PIR-sensor-based lighting device will turn on when motion is detected and turn off when the motion is no longer present, this device still consumes 1-3 W of power when the lamp is off. In this design the device consumes 0.004 W when the light is turned off, and it is not only easy to set up but also inexpensive. Our circuit supplies the lamp with power when motion is detected; when the motion disappears it turns the lamp off, and the electric power is shut off to reduce the

standby power. We use an MCU receiving signals from a PIR sensor which detects any individual approaching the device. The MCU controls the SSR On/Off when used as a light switch for shutting off the standby power. The MCU monitoring program provides automatic detection of any individual by means of the PIR sensor. The MCU has internal modules to simplify the hardware circuit design.

2.1.5 Palm Size Human and Gas Detection ROBOT

According to (MISHRA, 2018) The aim of this project is to give a practical knowledge about the robots which can be used in destructive and disaster areas like collapsed building where rescue team cannot operate due to a lot of technical problem. By this project we have built the first simplified version of the rescue robot. Normally in the wireless robot the operation is done manually using Bluetooth connection. In this kind of wireless technology we have used sensor which have the expansion of 120 degree. Anybody that is found in this range will be detected by the sensor (i.e. PIRSENSOR).

2.1.6 Smart Home Automation Security

According to (Jose, 2015) the advancement of technology has contributed to the changing concept of security in modern homes. It has changed from a simple lock and key security concept to implementing sophisticated security systems using cameras, microphones, contact sensors, proximity sensors, alarms, silent alarms, etc. By connecting modern homes to the Internet which is very popular today, users can access and control their homes remotely at any time and from anywhere in the world. An increase in processing power of newly-designed processors and the considerable reduction in power consumption, cost, and size of new electronics devices enables people to know and control every aspect of their home, like which door or window is open, which device or light is switched on, and which rooms are occupied. Inhabitants can keep an eye on their home using live video and audio feeds from different parts of their home. They can also be aware of different environmental factors inside and outside their home, like humidity, temperature, and light intensity. In a Wireless Sensor Actor Network, sensors gather information about the physical world or environment around them. Actors perform the appropriate actions on the environment as directed by the user or any other party. Improvements in Wireless Sensor Actor Networks are certainly a contributing factor in the popularity of smart homes. Combining Ubiquitous Computing, Wireless Sensor Actor.

2.1.7 PIR Sensor-based Security System

According to (Zipporah, 2017) a surveillance, from homes to huge industries, plays a significant role in the fulfilment of our security. Aspects such as burglary and theft have always been a predicament. In large industries, personal safety refers to the monitoring of the people's shifting information like activities and behavior to protect, manage, and influence personal details. Surveillance refers to observing over from a distance by use of electronic equipment like CCTV cameras. However, CCTV technology is expensive for average residents to install. Additionally, this kind of system does not notify the user immediately a burglary occurs. This research includes an alarm system to overcome the shortcomings of the regular surveillance systems.

2.1.8 Motion Detection Security Alarm Using Arduino

According to (Mohammad, 2020) in this project, the system are going to make a motion detection security alarm using Arduino uno. It can detect the motion of an intruder with help of a PIR Sensor. It is based on infrared motion sensing that is everybody emits heat energy in the form of infrared rays which are invisible to human naked eye but can be detected using electronic motion sensor. The main objective is that it focuses on detection of motion without any external touch. The applications are as a automatic door bell circuit, in defense applications and other electronic devices. The passive infrared sensor detects the IR radiations emitted from humans within its range and it sends the signal to arduino uno then the led glows and then it triggers buzzer, hence motion is detected.

2.1.9 Development of an Anti-Theft Device using Motion Detection and Body Temperature

According to (Dellosa R. , 2014) the researcher aimed to design, assemble and determine the performance of the anti-theft device using motion detection and body temperature. The study utilized developmental design to observe the functionality of the device. Study showed that the anti-theft device can detect motion from a moving object for those with body temperature like human being, animals. A signal from the sensor circuits will trigger the receiver circuit to produce an audible sound that served as alarm. It was also found out that the output of the study is accurate in terms of detecting moving objects with body

temperature during day and night times. Results showed that the device had a good performance and acceptable in terms of functionality.

2.1.10 Tracking Motion Direction and Distance with Pyroelectric IR Sensors

According to (Farella, 2010) the output of a PIR sensor depends on several aspects beyond simple people presence, as distance of the body from the sensor, direction of movement, and presence of multiple people. In this project, presented a feature extraction and sensor fusion technique that exploits a set of wireless nodes equipped with PIR sensors to track people moving in a hallway. Our approach has reduced computational and memory requirements, thus it is well suited for digital systems with limited resources, such as those available in sensor nodes. Using the proposed techniques, we were able to achieve 100% correct detection of direction of movement and 83.49%-95.35% correct detection of distance intervals.

SYNTHESIS

With the above studies are being mentioned Review Related Literature (RRL), with the concept of Human Motion Sensor Alarm System, is being integrated with Arduino, Infrared Sensor, Bluetooth and other devices that use to implement the system, and that was being connected with the user. As a result, it can assure that the user can give security and safeness for their employee, tenants, and other workers. Below is the table indicating the contribution of the study.

Source/Study	Title	Purpose	Tools used
Venkatish (2019)	“Vehicle Security System using Motion Sensor”	This study presented an assurance and security to its parents upon receiving an alarm in case their children is lock in the car.	<ul style="list-style-type: none"> • Microcontroller • Oxygen Cylinder Valve • PIR Sensor • Wi-Fi
Darmawan, E. (2016) R. Taufan Ed.	“Space Security System using Motion Sensor and Notification”	This paper represents a security that can provide detailed information to detect a movements outside of the store.	<ul style="list-style-type: none"> • PIR Sensor • Microcontroller • GSM Module • RTC Module
Iyapo, K. O. and M. Fansula (2018)	“Design and Implementation of motion detection alarm”	A home based security control system using raspberry Pi and GSM suitable for usage in homes and offices was design and constructed.	<ul style="list-style-type: none"> • Microcontroller • PIR Sensor • Buzzer • GSM Module
Tsai, C., h (2011)	“PIR-sensor-based lighting device with ultra-low standby power consumption”	This study present a power consumption of lamps with the use of PIR Based Lightning Device will saved the flow of energy.	<ul style="list-style-type: none"> • PIR Sensor • Lamp • Microcontroller • Pyroelectric Detectors
Mishra A. (2018)	“Palm Size Human and Gas Detection Robot”	In this paper, present is to give a practical knowledge about the robot which can be used in destructive and disaster areas like collapsed	<ul style="list-style-type: none"> • Bluetooth HC05 • PIR Sensor • Microcontroller • Gas Sensor

		building	
Jose (2015)	“Smart Home Automation Security”	This study present has changed from a simple lock and key security concept to implementing sophisticated security systems using cameras, microphones, contact sensors, proximity sensor, and silent alarm.	<ul style="list-style-type: none"> • Smart Home • Access Control • Data Security • Microcontroller • User Interface
Tarus, Zepporah (2017)	“PIR Sensor-based Security System”	This kind of system does not notify the user immediately a burglar occurs. This research includes an alarm system to overcome the short coming of the regular surveillance systems.	<ul style="list-style-type: none"> • Raspberrypi • PIR Sensor
Delloso, R. (2014)	“Development of an Anti-Theft Device using Motion Detection”	This study aim to provide security and for anti-theft device using motion detection and body temperature.	<ul style="list-style-type: none"> • Switching Circuits • Buzzer • DC Relay • Wires • Microcontroller
Mohammad (2020)	“Motion Detection Security Alarm Using Arduino”	This study can detect the motion of an intruder with help of a PIR Sensor. It is based on infrared motion sensing that everybody emits heat energy in form of infrared rays.	<ul style="list-style-type: none"> • Arduino Uno • PIR Sensor • Buzzer
Farella, E. (2010)	“Tracking Motion Direction and Distance with Pyroelectric IR Sensors.”	In this paper, present a feature extraction and sensor fusion technique that exploits a set of wireless nodes equipped with PIR sensor to track people moving in a hallway.	<ul style="list-style-type: none"> • PIR Sensor • Pyroelectric IR Sensor • Breadboard • Wires

Table 1 - Matrix of the Review Study

Chapter III

Technical Background

This chapter discusses the existing PIR Motion Sensor is done manually. The owner assured that the belongings of the tenant will be unsecured through manual process which is padlock and hiring security guard for the safety of establishment/private property. In addition the existing system is highly risk for unauthorized movement without knowing the person identity. This study proposes a system entitled Arduino-Based Human Motion Sensor Alarm System to solve the manual process into computerized sensor device.

For the implementation for this propose system Arduino-Based Human Motion Sensor Alarm System. The Dormitory needs to have efficient and accurate monitoring device to detect motion for the tenant's security, this system requirement is divided into hardware and software part which is hardware used is Arduino UNO (R3), PIR Sensor Motion, Buzzer, Led light (LED), Jump wire, GSM Module, Bluetooth Module, Mini ups Back-up Power supply and Laptop, and for the software the developers used a Windows 10 operating system and Arduino IDLE is inputted and inserted for the running process.

With the use of this technology and through computerized system, home owner of Faj Dormitory can achieve more safety and security within the premises. The researchers will use Systems Development Life Cycle (SDLC) Agile Model through the first phase Plan, Design, Develop, Test, Release, and Feedback to meet client needs by improving performance.

Chapter IV

Methodology

This chapter discusses the methodology in the development of a model for Human Motion Sensor Alarm System using Arduino. The following are the different phases of the methodology Plan Phase, Design Phase, Develop Phase, Test Phase, Release Phase and Feedback Phase.

4.1 SDLC Model

On system development, the researcher will use the System Development Life Cycle (SDLC) method for the development of the system. The researcher will use Agile Model to explain feasible large scale of software development the sequentially in order to complete the projects shown in Figure 1.

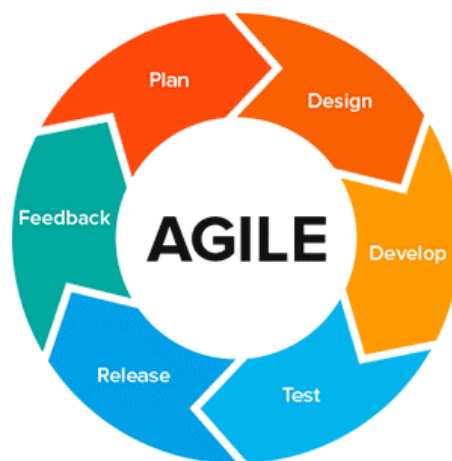


Figure 1. Agile Model

These are the following phase of Agile Model:

- **Plan**

In this phase the proponents discuss the goals and intended user of our device. The researcher was stated to conduct the study. We plan on how to gathered data and organize our time to conduct the research. The researcher will interview the users to acquire necessary information needed in the study. After the interview, the researcher will analyse the data on the related literature and studies. It includes analysing, system and software design, testing, Implementation and Maintenance.

- **Design**

On this phase, the system will be designed based on the requirements needed in the system. The system offers a framework of the design carried out by using block diagram in Arduino-Based Human Motion Sensor Alarm System, the source code is developed using Arduino UNO that makes it easier as it is not difficult to understand, use and navigate by the users.

- **Develop**

In this phase, the researcher will be conducting a run-up testing of their device and giving some orientation to the users on how to use the device. The researcher will be clarified out the step-by-step process of the recommendation functions whether it works properly of the system.

- **Test**

In this phase includes the process of the system to check whether the device or requirements is met by the users to prevent device failure. The proponents ensure that the device should be functional to meet all the requirements of the client and to detect the errors, in addition the device is tested and making sure that it's runnable and successfully developed without any bug.

- **Release**

This phase, the researcher will analyze the performance periodically to ensure the condition of the device whether it can run up properly. This forming part of development it can also observe the progress of the device to support the user and need security activities and backups to the system.

- **Feedback**

In this phase, the propose system entitled “Arduino-Based Human Motion Sensor Alarm System” has been well implemented, the sensors functionality works well it detects motion and the buzzer works well, it alarms when it senses some motion.

4.2 Requirement Analysis

4.2.3 Requirement Elicitation Techniques

The researcher will be utilizing the different ideas in conducting this IT Capstone Project. The research focused on observation, survey and brainstorming in requirement elicitation techniques.

The researcher used an observation technique in helping the researcher by gathering requirements by observing the client by asking questions through survey. It enables the researcher to see the actual situation. Brainstorming is being used to gathered data as possible from the users. Generally, this project is being develop by the researcher to make innovative and to come up with essential point of view.

4.2.4 Requirement Analysis and Documentation

This proposed system entitled “Arduino-Based Human Motion Sensor Alarm System” is a hardware component system that develops and can easy detect an intruder who wants to enter the area and also monitor the tenants.

The completion of the design and development of software will depend upon meeting the following goals and objectives:

1. To develop a module that will allow secure the dormitory.
2. To develop a module that will detect unauthorized movement in restricted area, the PIR Sensor activated particularly in curfew hours.
3. To develop a module that will notify the owner through sent SMS and call.
4. To develop a module that will alarm if some intruders want to enter the area.

Functional Requirements:
<ol style="list-style-type: none">1. The device allows to detect unauthorized movement.2. The device enables to notify the owner through send SMS and call.3. The device allows the owner to alert when someone enter the area.

Table 2. Functional Requirement

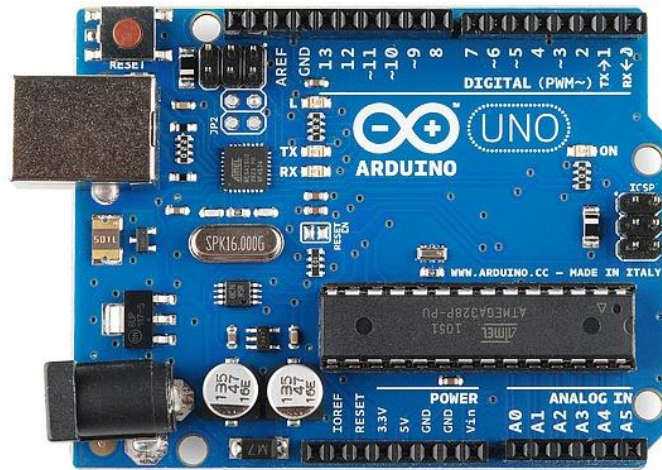
Non-Functional Requirements:
<div><p>1. Operational</p></div> <div><p>1.1 The device will run on via battery and electricity.</p></div> <div><p>1.2 The device will only focus on Motion detection</p></div> <div><p>2. Performance</p></div> <div><p>2.1 The device supports security to the owner and tenants.</p></div> <div><p>2.2 The device support automatic lightning setups.</p></div> <div><p>3. Security</p></div> <div><p>3.1 The device will be activated within 24 hours.</p></div> <div><p>3.2 3.2 Uses of activation of the device should be restricted from other people.</p></div>

Table 2 - Non – Functional Requirement

4.3 Requirements Specification

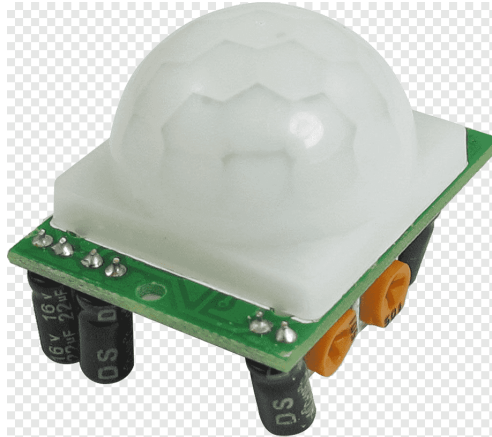
4.3.1 HARDWARE

- **Arduino Uno (R3)**



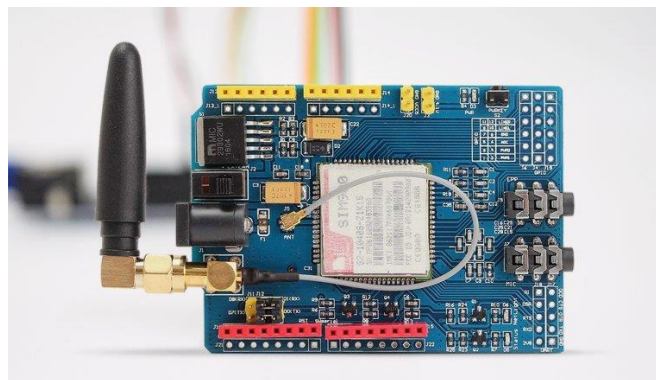
The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

- **Passive Infrared Sensor (PIR)**



A PIR Motion Detector is an electrical device that utilizes a sensor to detect nearby motion. Such a device is often integrated as a component of a system that automatically performs a task or alerts a user of motion in an area. PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out.

- **Quad Band GPRS-GSM SIM800L**



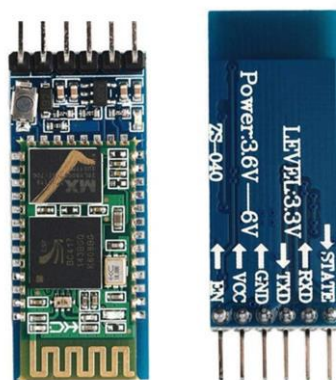
SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity.

- **RGB LED Light**



RGB LED is an LED module that can produce almost any color using these three primary additive colors: Red, Green and Blue. The simplest version of an RGB LED has a combination of 3 separate light-emitting diodes in one package, housed under a clear protective lens. This LED package will have 4 pins, one for each of the three colored diodes and one common anode (+) or cathode (-).

- **HC-05 Bluetooth Module**



HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup which is designed for wireless communication. This module can be used in a master or slave configuration. Its

communication is via serial communication which makes an easy way to interface with controller or PC.

- **Buzzer**



Buzzer is also called a piezo buzzer. It is basically a tiny speaker that you can connect directly to an Arduino. You can make it sound a tone at a frequency you set. The buzzer produces sound based on reverse of the piezoelectric effect.

- **Mini ups Back-up Power**



A mini UPS is a small sized UPS system that provides uninterrupted power supply to electronic devices in case of a power failure or voltage drop/surge to an unacceptable level. It avoids any interruptions in the functioning of connected electronic devices as it maintains their power supply.

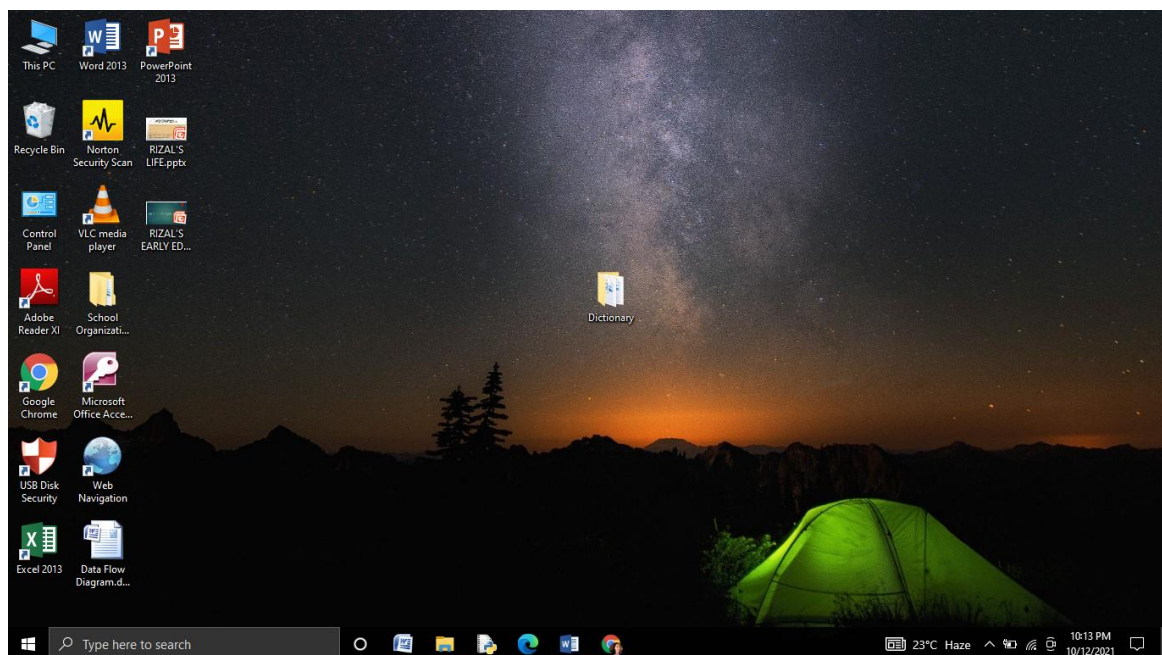
- **Jumper Wire**




A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

4.3.2 SOFTWARE

- **Operating System Windows 10**



- **Arduino IDE**



```
File Edit Sketch Tools Help

#include <SoftwareSerial.h>
SoftwareSerial sim(10, 11);    //RX, TX reverse pin

int _timeout;
String _buffer;
String number = "+639354507929";
int buzzerPin = 12;
int redled = 5;
int greenled = 6;
int sensor = 4;
int state = HIGH;
char Incoming_value = 0;

void setup() {
  pinMode(buzzerPin, OUTPUT);
  pinMode(redled, OUTPUT);
  pinMode(greenled, OUTPUT);
  pinMode(sensor, INPUT);
  sim.begin(9600);
  Serial.begin(9600);
  pinMode(13, OUTPUT);
}

void loop(){
  state = digitalRead(sensor);
  if (state == HIGH)
  {
    digitalWrite(buzzerPin, HIGH);
  }
}
```

4.4 Project Work Plan

[illegible]

Table 3 - Gant Chart

4.5 Environment

The proponents chose the Faj Dormitory as part of their capstone research project. The Arduino- Based Human Motion Sensor Alarm System used to help for monitor the dormitory and to enhance the security level from unauthorized person. The proponents conducted a survey to help the client to monitor their dormitory.

4.6 Research Local

The study was conducted at Avocado Drive, Baliwasan Chico, Zamboanga City. The place is held as a dormitory.

4.7 Population

The respondent was the owner of the dormitory were involved in the conducted survey. And the proponents were provided with a questionnaire that contains questions that related to the Arduino-Based Human Motion Sensor Alarm System.

4.8 Organizational Chart

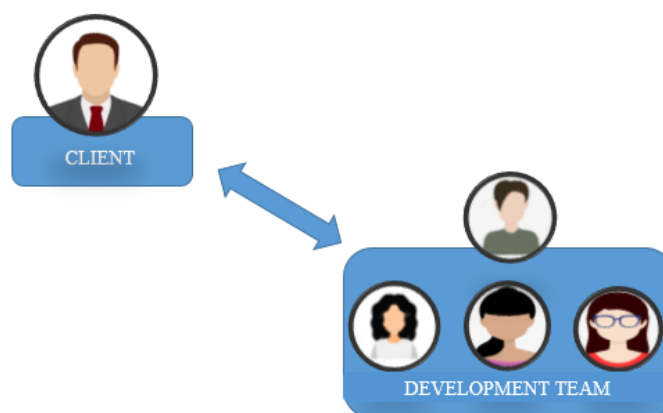


Figure 2. Organizational Chart

4.9 Architectural Diagram

Architectural Diagram displaying information it shows how the elements within the system interact with each other in a wider process.

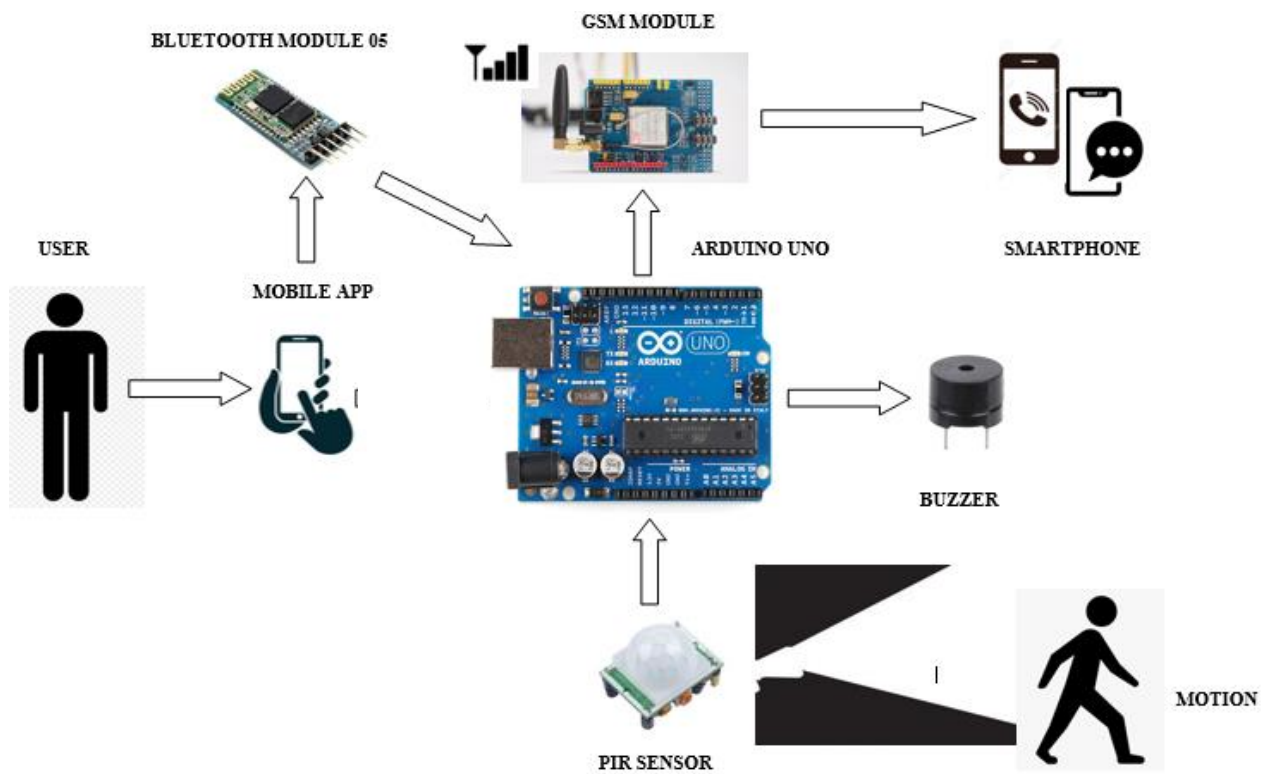


Figure 3 - Architectural Diagram

4.10 Block Diagram

Block Diagram also show the process that data change or transform data and how data come to be at specific locations. Block Diagram focuses on the movement of data process that shows the graphical flow data through information system.

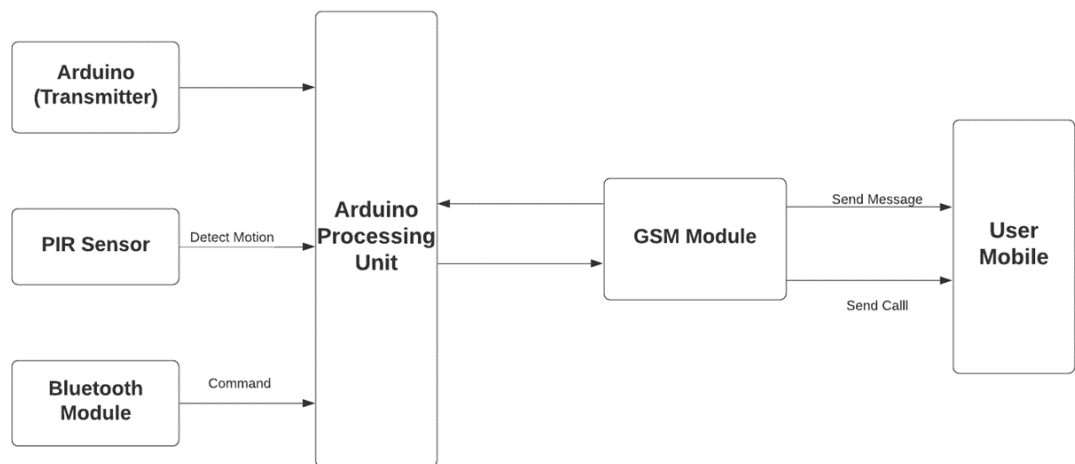


Figure 4 - Block Diagram

4.11 Circuit Diagram

The figure below shows the circuit diagram of PIR motion that consist of different features such as the Arduino, Buzzer, Led, GSM Module, Bluetooth Module, PIR Sensor and a Mini ups Back-up power supply. The detailed working of connecting a PIR sensor to an Arduino UNO board is explained. The very same article contains an advanced circuit where an SMS based system can be setup to message the user in case of an intruder alert. An intruder alarm circuit where the PIR sensor is interfaced with microcontroller is provided as well.

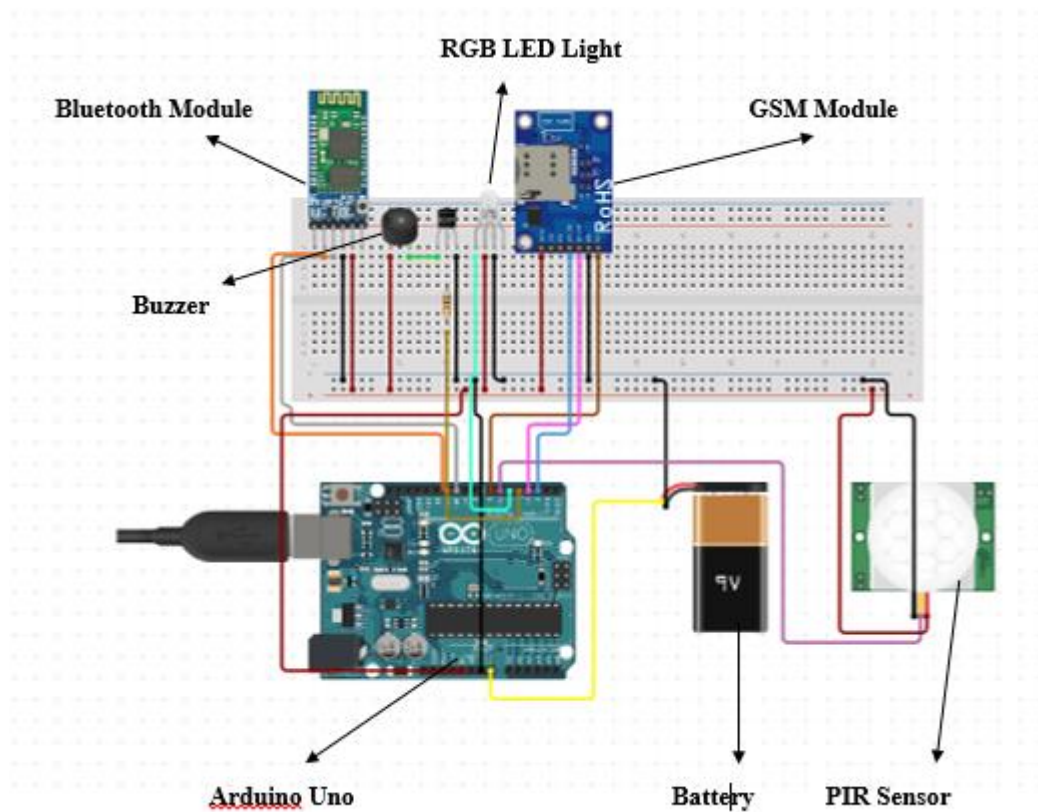


Figure 5 - Circuit Diagram

4.12 Development and Testing

4.12.1 Development Plan

In the table below represents by its developmental plan and covers the system duration of time within the corresponding targets of each development.

Task ID	Task Name	Assigned To	Estimated		
			Duration	Start	Finished
			Days	Date	Date
Chapter 1					
1.1	Introduction	Basir	4 Days	03/15/2021	03/19/2021
1.2	Project Context	All members	4 Days	03/15/2021	03/15/2021
1.3	Purpose and Description	All members	4 Days	03/15/2021	03/15/2021
1.4	Objectives	All members	4 Days	03/15/2021	03/15/2021
1.5	Scope and Limitation	All members	4 Days	03/15/2021	03/15/2021
Chapter II					
2.1	Introduction	Basir	8 Days	03/24/2021	04/02/2021
2.1	RRL	Salikala	8 Days	03/24/2021	04/02/2021
2.2	Synthesis	DaculaBagcat	8 Days	03/24/2021	04/02/2021
Chapter III					
3.1	Technical Background	Dacula	9 Days	03/29/2021	04/09/2021
Chapter IV					
4.1	Introductory	All members	10 Days	04/20/2021	04/30/2021

	Systems				
4.2	SDLC Model	All members	10 Days	04/20/2021	04/30/2021
4.3	Requirements Analysis	All members	10 Days	04/20/2021	04/30/2021
4.4	Requirements, Documentation	All members	10 Days	04/20/2021	04/30/2021
4.5	DFD,Circuit Diagram	Bagcat Basir	16 Days	05/04/2021	05/19/2021
4.6	Project Work Plan	Bagcat	16 Days	05/04/2021	05/19/2021
4.7	Gantt Chart	Dacula	16 Days	05/04/2021	05/19/2021
4.8	Prototype, User Interface	Dacula	16 Days	05/04/2021	05/19/2021
4.9	Implementation	Basir	16 Days	05/04/2021	05/19/2021
Chapter V					
5.1	Conclusion				
5.2	Recommendation				

Table 4 - Development Plan

Analysis Phase (Preparation, Draft Documentation and Coding/Implementation)

In this phase Arduino-Based Human Motion Alarm System the proponents will focus on developing the system process through brainstorming and survey the gathered information and this will help to analyse the information that was gathered during the planning session. In addition, the developer facing of difficulties which is face to face meet ups due to pandemic , they use different meeting via phone calls, messenger voice calls and chat box, therefore to solve these hindrances the developer aims to gain knowledge and sharing ideas in different ways of communication, to perform the system proposes.

Programming Phase (Design, Coding and Development)

In this phase the developer will be focused on the development of the system. Ms. Siti Sharmiza Basir is the project manager and the other members would be helping in debugging and research on how the device will look like and also on what being inputted. In this phase, the developer utilize different meeting through the use of internet resources like messenger voice call, Google meet and phone calls they can share different logical ideas to analyse the propose system. In addition, the design and coding will be developed by the developers by gathering data on what is being inputted. The coding phase are done within 75 days.

Testing Phase

In this phase, Mr. Datu Alrasdi Salikala who is the responsible to handle the testing phase will be conducting through meet up the client with the help of the adviser, Mr. Ian Kenneth Pilien. The other members are responsible on answering the Integration test plan while Mr. Salikala will mainly focus on Unit testing of the device at the same time the developer aims to test the functionality of the system to detect the error and bugs. Mr. Imdani as our client who responsible in answering the system test plan. The developers conducted the testing phase from October 3 to November 25, 2021 and this was done successfully.

Implementation Phase

In this phase, the developers is successfully develop the device and ready for marketing process. In addition, each developers have the copy of MIT application for the connections of the device. With this Implementation plan, the device develop and deploy successfully.

4.13 Testing Plan

The different testing phase are done to make sure the system is functioning well and meet the client desire.

4.13.1 Unit Test Plan

In this unit testing it deals of each command. The aim of the developers is to ensure that all the functionality and commands are working well and provide the satisfaction of the client. Based on the result of the unit test plan which is answered by Mr. Salikala, the actual result is accurate.

4.13.2 Integration Test Plan- User Interface Testing

In this Integration testing it deals of interface. The aim of the developers is to ensure all the functionality are working well. Based on the results of Ms. Basir and Ms. Bagcat, all functions are working correctly.

4.13.4 System Test Plan

In this System test plan it deals with the client. The aim of the developers is to meet the client expectations regarding the device functionality. According to Mr. Imdani, the device is very helpful and easy to use for the dormitory.

4.14 Prototype

In this figure below shown the prototype of this project in which the different component of each pages has its function. It is included the processing of the system on how the devices responded and perform the task guided by the inputted instruction inside Microcontroller.

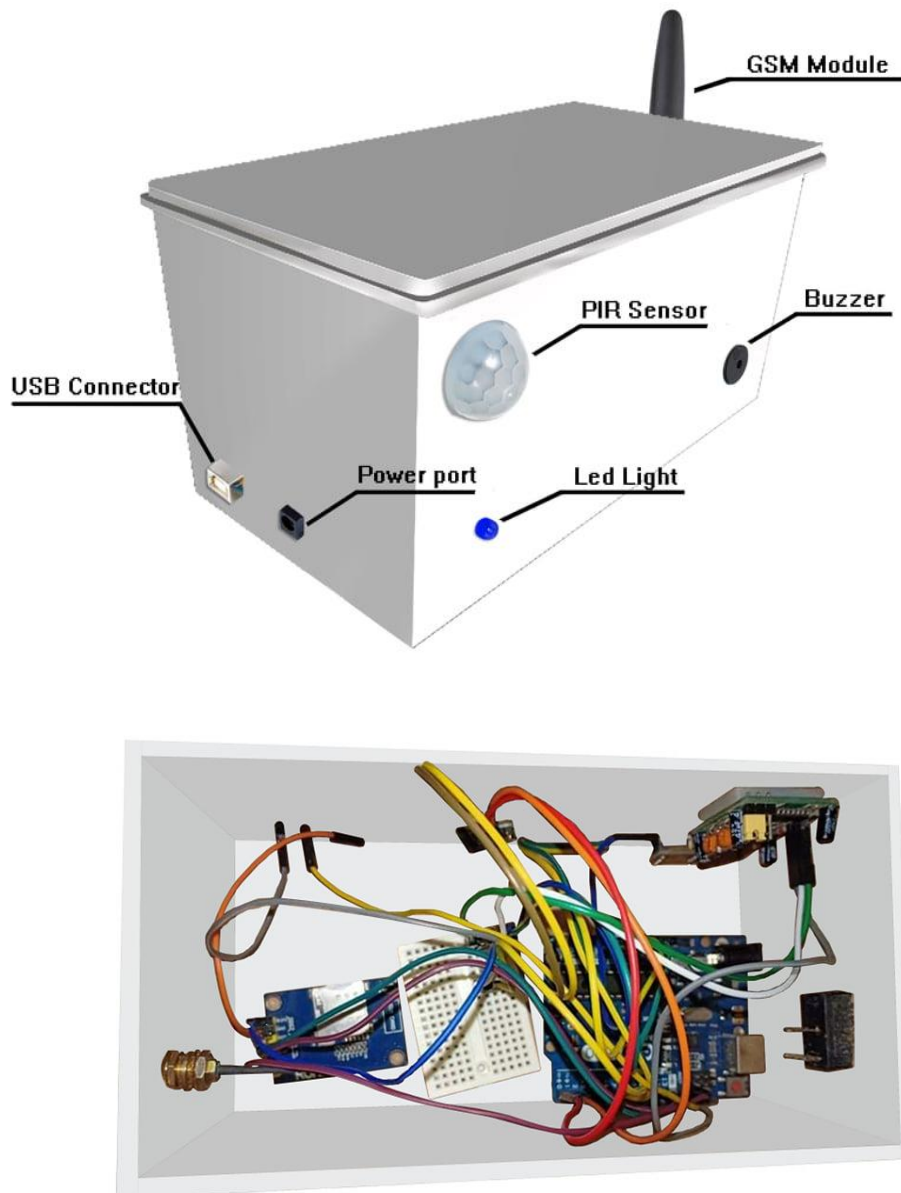


Figure 6 – Prototype

4.15 Implementation Plan

The proposed system entitled Arduino-Based Human Motion Alarm System utilized in this work as Windows 10 Operating System, Arduino IDLE and Kodular Mobile Application for the said dormitory. In addition, the programming language used is C-sharp and for the mobile applications the developer will use blocks to serve as the controller of the PIR Sensor.

Implementation Result

The prototype was developed to help the Faj Dormitory to enhance the security of the said dormitory by detecting unauthorized movement and notify through send SMS and call. This prototype consisted of PIR Sensor, Buzzer, LED Light, GSM Module, Bluetooth Module and Kodular Mobile Application. The PIR Sensor is used to detect unauthorized movements. The GSM Module is used for send SMS, and the call for dial tone or alarming to the owner. Bluetooth Module and Kodular Mobile Applications are connected that enable to control the PIR Sensor. The client must have the copy of the mobile application to command the PIR Sensor. In this device, the client will be the one to benefit the device. In this work the developers successfully developed a device which can be processed by controlled the PIR Sensor using mobile application.

As the result of the client where Mr. Imdani answered the system test plan using the device and mobile application. The client asked to the developers if the device is available for sale and he also said that is very useful and very portable.

Chapter V

Summary of Result and Discussion, Conclusion and Recommendation

This chapter provides the conclusion of the overview of the project and implementation results and discussion, conclusion, recommendation of the device.

Result and Discussion

This device entitled “Arduino Based Human Motion Sensor Alarm System” can be implemented for security concerns. It detects motion if someone entered the restricted area and it will give alarm and notify to the owner through call and send SMS.

After conducting usability testing of the device given to the right user and other users, the researchers were able to get the results, errors of the evaluation and some suggestions from the users.

Conclusion

This device entitled “Arduino-Based Human Motion Sensor Alarm System will give much attention in the future. The client gets more concerned to protect the tenants from unauthorized movement. This device can monitor for the safeness of the dormitory by the use of the PIR sensor that are integrated with a controller and send notification to the owner through call and send SMS. The device is designed using modularity to become a flexible system that can be uses for high security for the dormitory and also to the tenants. The GSM Module is used for dial tone through call and send SMS notification to the owner.

Recommendations

Based on the findings and conclusion of the project entitled “Arduino-Based Human Motion Sensor Alarm System” the following recommendations are suggested:

1. The device must be connected via Bluetooth Module that the owner can command the device using controller application.
2. The device and CCTV must put in one place. So, that if the owner is not around, they can also review the CCTV footage when they comeback.
3. The device must put in a higher place and not in a crowded area.

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Users Guide

Arduino-Based Human Motion Sensor Alarm Sysytem

Controls:

1. PIR Sensor
2. RGB LED Light
3. Buzzer
4. Bluetooth Module

Parts Identification

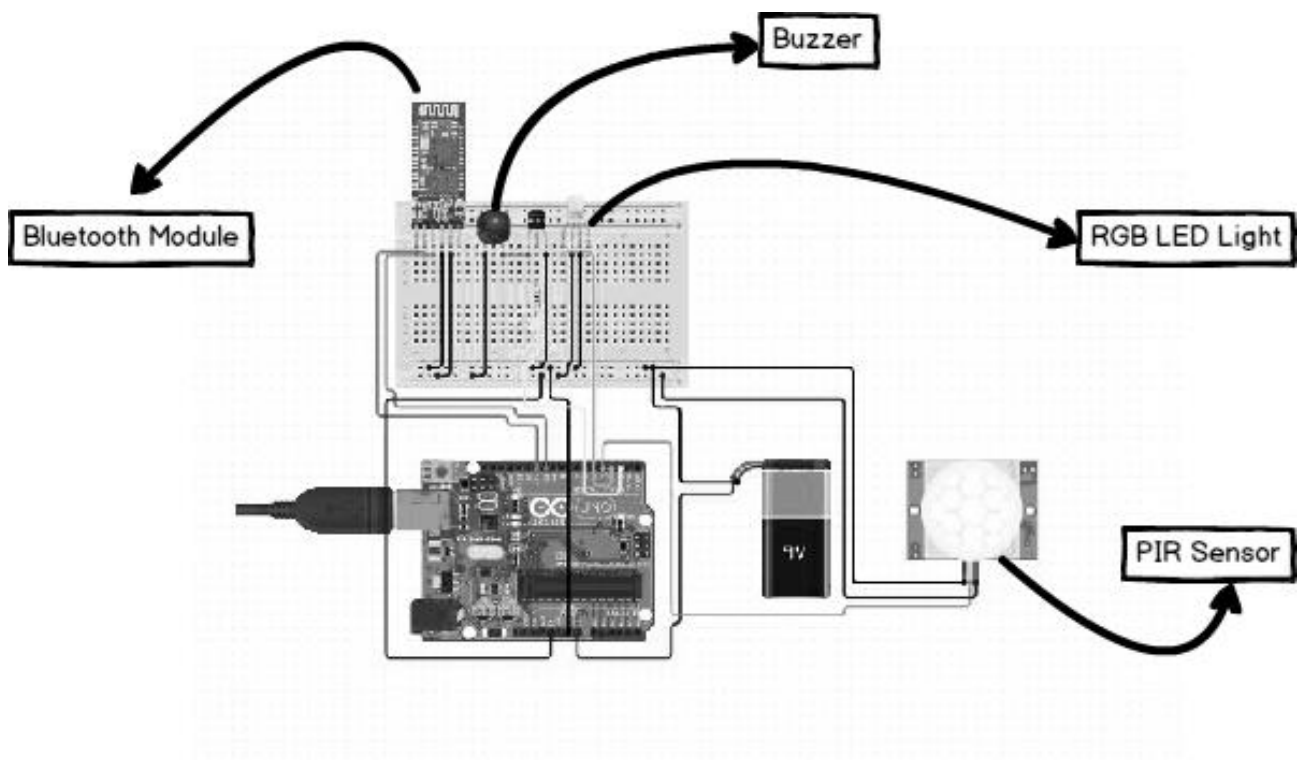


Figure 6. User Guide

Device Installation

1. Place the device in desire location (avoid from other motion of e.g Trees).
2. Set-up the device for the power supply
3. Install the device along with mobile application.
4. Using the MIT application to activate the device.

Connectivity of Device to the Mobile Application

1. Turn on your mobile Bluetooth and connect to the Bluetooth device.
2. Used the mobile app (MIT Application) for the power controls (ON/OFF).

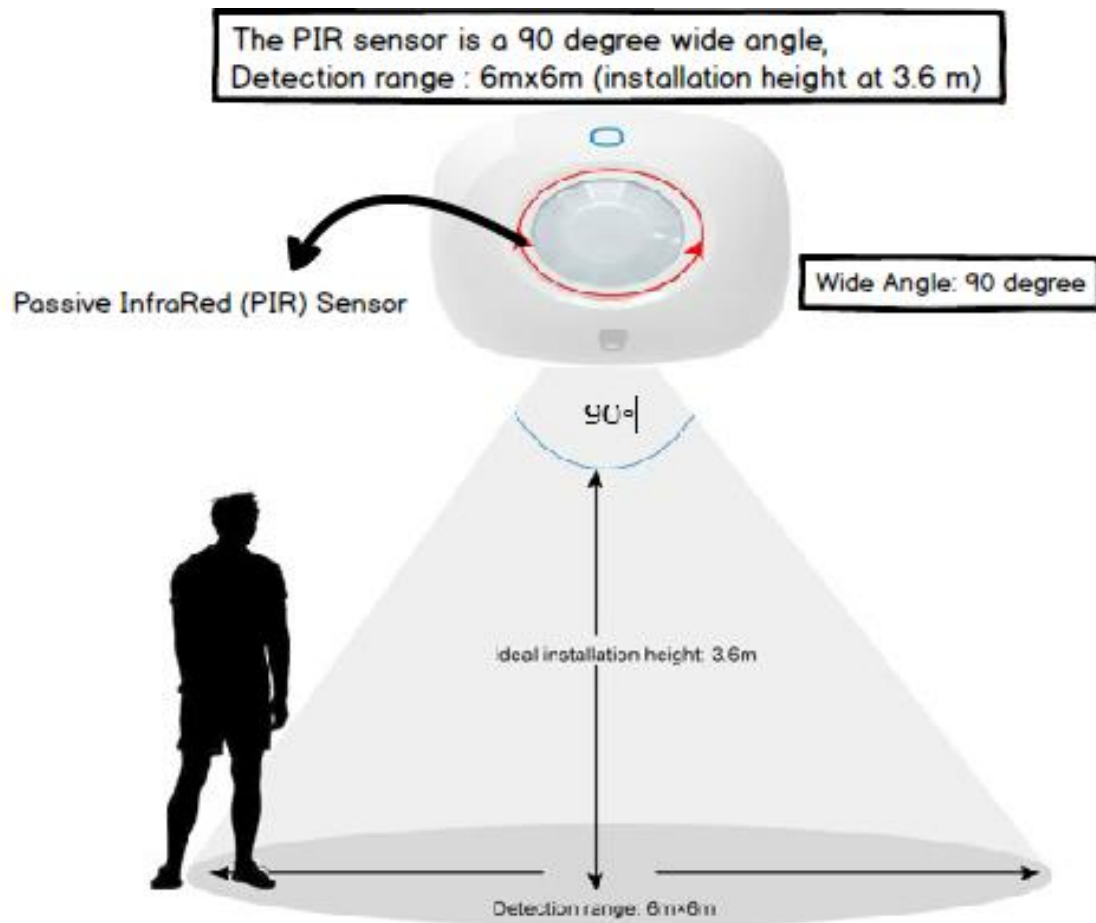
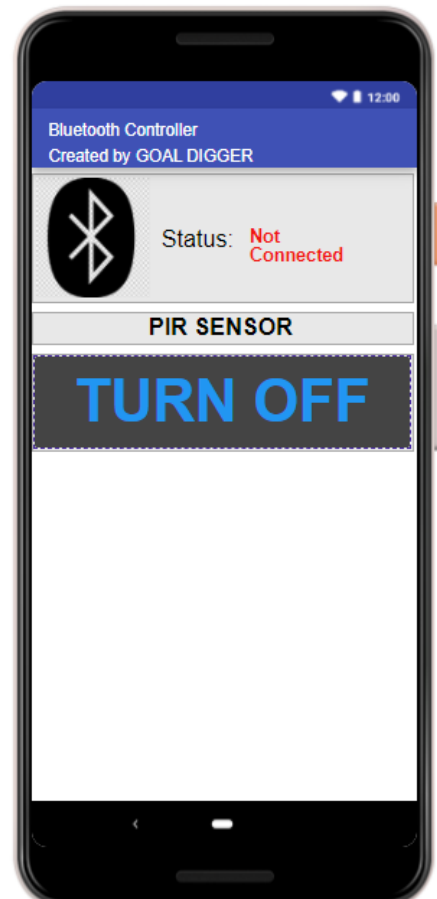
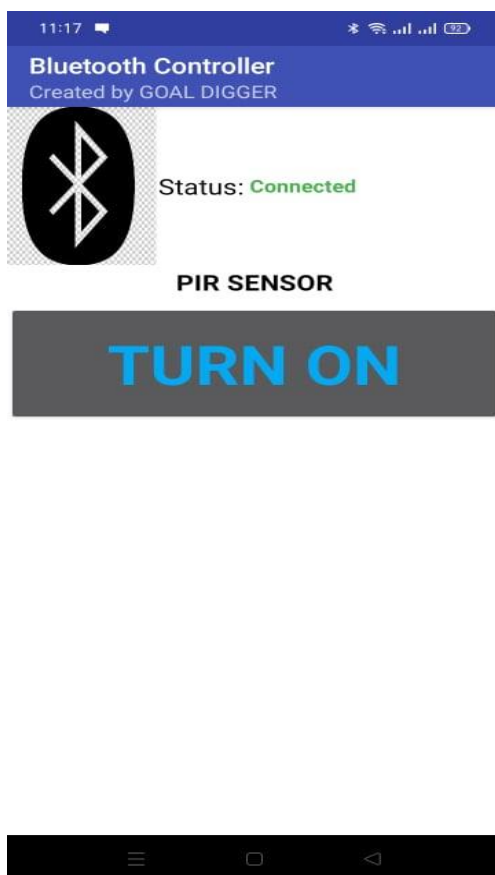
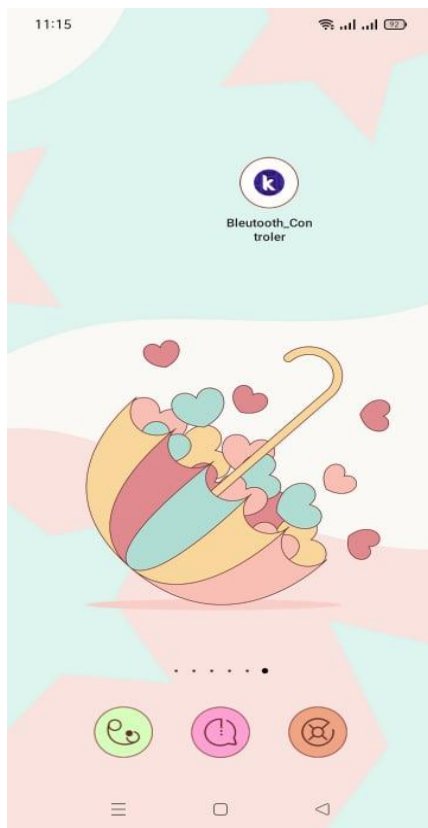
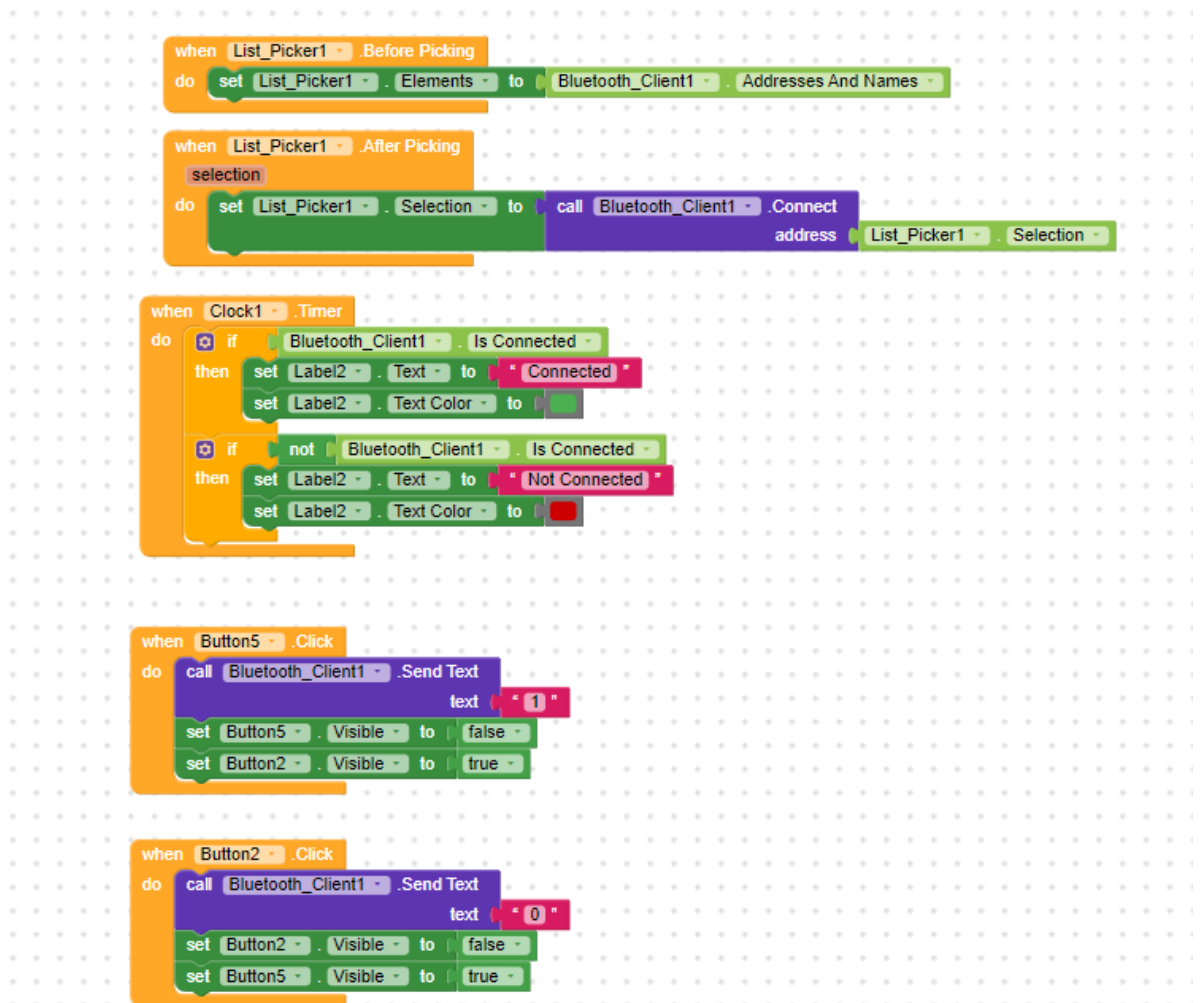


Figure 7. Description

User Application



Blocks



Questionnaire

Questionnaires	Extremely Satisfied	Satisfied	Neutral	Unsatisfied	Extremely Unsatisfied
1. Does your dormitory is accurately secured by letting using CCTV cameras as one of the useful device to maintain the safeness of your tenants?			✓		
2. What would you keep from using the device?		✓			
3. Was the interface easy to understand? (the analogue transmission)	✓				
4. What problems are you facing when you are using CCTV cameras or other padlocks to obtain the safeness of your				✓	

tenants as well as the dormitory?					
5. Why do you need this device as your surveillance tool? Does this tool effectively monitored the intruders?	✓				
6. How often do you use your CCTV at home?	✓				
7. What performance goals should be implement or any recommendation regarding of highly and upgraded device to keep your dormitory secured?			✓		

8. The PIR Sensor works well?		✓			
9. The GSM Module sends immediately?	✓				
11. The device is easy to use?					
12. The Buzzer communicates well with the PIR Sensor?	✓				
13. Would you like to recommend the device to other people?		✓			

Table 5 - Evaluation of the Participants

Appendix A-Curriculum Vitae

Personal Data

Name: Siti Sharmiza O. Basir

Address: Boalan, Zamboanga City

Age: 22

Gender: Female

Birth of Date: April 25, 1999

Birth of Place: Zamboanga City

Father's Name: Ghafar L. Basir

Mother's Name: Josephine O. Basir



Educational Attainment

Elementary: Divisoria Elementary School

Year: 2011-2012

High School: Maria Clara Lorenzo Lobregat National High School

Year: 2015-2016

Senior High School: AMA Computer College

Year: 2017-2018

College: Zamboanga Peninsula Polytechnic State University

Year: Ongoing

Personal Data

Name: Venus E. Bagcat

Address: Avocado Drive, Baliwasan Chico, Zamboanga City

Age: 21

Gender: Female

Birth of Date: May 04, 2000

Birth of Place: Picanan, Kumalarang Zamboanga Del Sur

Father's Name: Marcial S. Bagcat

Mother's Name: Angelina E. Bagcat



Educational Attainment

Elementary: Picanan Elementary School

Year: 2011-2012

High School: Basalem National High School

Year: 2015-2016

Senior High School: Diplahan National High School

Year: 2017-2018

College: Zamboanga Peninsula Polytechnic State University

Year: Ongoing

Personal Data



Name: Zyrene Anne Marie A. Dacula

Address: Avocado Drive, Baliwasan Chico, Zamboanga City

Age: 21

Gender: Female

Birth of Date: August 8, 2000

Birth of Place: Kauswagan Zamboanga Sibugay

Father's Name: Alberto A. Dacula Jr.

Mother's Name: Zita A. Dacula

Educational Attainment

Elementary: Diplahan Central Elementary School

Year: 2011-2012

High School: Diplahan National High School

Year: 2015-2016

Senior High School: Diplahan National High School

Year: 2017-2018

College: Zamboanga Peninsula Polytechnic State University

Year: Ongoing

Personal Data

Name: Datu Alrasdi D. Salikala

Address: Southcom Village, Zamboanga City

Age: 22

Gender: Male

Birth of Date: March 21, 1999

Birth of Place: Jolo, Sulu

Father's Name: Benrasdi Salikala

Mother's Name: Melanie Salikala



Educational Attainment

Elementary: Southcom Elementary School

Year: 2010-2011

High School: Southcom National High School

Year: 2014-2015

Senior High School: N/A

Year: N/A

College: Zamboanga Peninsula Polytechnic State University

Year: Ongoing

Appendix B- Survey Questionnaire

SURVEY QUESTIONNAIRE

Direction: Please fill up the spaces and answer it by checking on the choices provided.

Name: _____ Date: _____

Sex: _____ Address: _____

1. Type of Residence:

- ☐ Apartment
- ☐ Commercial
- ☐ Town House

2. Which of the following best describe where you live?

- ☐ City
- ☐ Rural Property
- ☐ Urban Property
- ☐ Other (Please specify): _____

3. How comfortable are you with technology?

- ☐ Comfortable
- ☐ Moderately comfortable
- ☐ Very comfortable
- ☐ Extremely comfortable

☐ Not all comfortable

4. Have you heard about Arduino-Based Human Motion Sensor Alarm System?

☐ Yes

☐ No

5. It is important to you to have a security device in your living property?

☐ Yes

☐ No

6. How important is it to be connected to your home while you are away?

☐ Important

☐ Moderately important

☐ Very important

☐ Extremely important

☐ Not very important

7. Which of the following would you want to be alert of?

☐ If someone enters your property

☐ If unexpected movement is detected in your property

☐ Other (Please specify):_____

8. Do you have any security devices at your home?

☐ Yes (Please specify):_____

☐ No

9. Do you checked all the doors and windows locked properly whenever you leave the house?

☐ Yes

☐ No

10. Are you willing to install a device Arduino-Based Human Motion Sensor Alarm System to your area?

☐ Yes

☐ No

Comment/Suggestions:

Signature: _____

Appendix C- Post Test Questionnaire

POST-TEST QUESTIONNAIRE

Name: _____ Date: _____

Rate the following base on your experience. Put a number that correspond to your satisfaction. There is no right and wrong answers.

5 4 3 2 1
Extremely Satisfied Satisfied Neutral Unsatisfied Extremely satisfied

Questions	Extremely Satisfied	Satisfied	Neutral	Unsatisfied	Extremely Satisfied
1. Overall impression on the device?					
2. The device is easy to use?					
3. Detect a motion accurately?					
4. It gave you enough information?(e.g Detect Motion, send SMS and call					
5. The device is reliable?					
6. The PIR Sensor works well?					
7. The buzzer communicates well the PIR Sensor?					
8. The PIR Sensor and buzzer are recognizable and functional?					

9. The GSM Module sends SMS and Call immediately?					
10. Would you recommend the Arduino-Based Human Motion Sensor Alarm System to other people?					

Suggest anything that will help to improve the device.

Appendix C- Source Code

```
#include <SoftwareSerial.h>

SoftwareSerial sim(10, 11); //RX, TX reverse pin

int _timeout;

String _buffer;

String number = "+639351186768";

int buzzerPin =12;

int redled = 5;

int greenled = 6;

int sensor = 4;

int state = HIGH;

char Incoming_value = 0;


void setup() {

    pinMode(buzzerPin, OUTPUT);

    pinMode(redled, OUTPUT);

    pinMode(greenled, OUTPUT);

    pinMode(sensor, INPUT);

    sim.begin(9600);

    Serial.begin(9600);

    pinMode(13, OUTPUT);
```

```
}
```

```
void loop(){
```

```
    state = digitalRead(sensor);
```

```
    if (state == HIGH)
```

```
    {
```

```
        digitalWrite(buzzerPin, HIGH);
```

```
        digitalWrite(redled, HIGH);
```

```
        digitalWrite(greenled, LOW);
```

```
        delay(1000);
```

```
        sim.println("AT+CMGF=1");
```

```
        delay(1000);
```

```
        sim.println("AT+CMGS=\"+639351186768\"\r");
```

```
        delay(1000);
```

```
        sim.println("HI! THERE IS SOMEONE DETECT TO YOU SENSOR");
```

```
        delay(1000);
```

```
        sim.println("ATD+639351186768 ;");
```

```
        delay(1000);
```

```
        sim.println((char)26);
```

```
delay(1000);
```

```
if (state == LOW) {
```

```
    Serial.println("Motion detected!");
```

```
    state = HIGH;
```

```
}
```

```
}
```

```
else {
```

```
    digitalWrite(buzzerPin, LOW);
```

```
    digitalWrite(redled, LOW);
```

```
    digitalWrite(greenled, HIGH);
```

```
    if (state == HIGH){
```

```
        state = LOW;
```

```
    }
```

```
}
```

```
if(Serial.available() > 0)
```

```
{
```

```
    Incoming_value = Serial.read();
```

```
    Serial.print(Incoming_value);
```

```
    Serial.print("\n");
```

```
    if(Incoming_value == '1')
```

```
digitalWrite(13, HIGH);
```

```
else if(Incoming_value == '0')
```

```
digitalWrite(13, LOW);
```

```
}
```

```
}
```

Appendix D- Sample input (Pictures/Print Output Reports)



