Arduino Base Fire, Gas, Smoke Alarm Detector
with GSM Module

Mark Cristian T. Bongat
College of Information and Computing Science
Zamboanga Peninsula Polytechnic State University, Zamboanga City, Philippines
Markbongat01@gmail.com

Jay-R Jhan G. Cuario
College of Information and Computing Science
Zamboanga Peninsula Polytechnic State University, Zamboanga City, Philippines
ararcuario11@gmail.com

Julius D. Dela Cruz
College of Information and Computing Science
Zamboanga Peninsula Polytechnic State University, Zamboanga City, Philippines
Juliusdcd800@gmail.com

Chirstina C. Satumbaga
College of Information and Computing Science
Zamboanga Peninsula Polytechnic State University, Zamboanga City, Philippines
Christinacoleta22@gmail.com

Ian Kenneth I. Pilien
College of Information and Computing Science
Zamboanga Peninsula Polytechnic State University, Zamboanga City, Philippines
pilien@zcspc.edu.ph

Abstract

Nowadays, establishment security becomes the best solution to overcome establishment intrusion problems when the user is not in the site of the establishment. As we know, there are many types of establishment security systems which are too expensive and difficult to use. For that reason, an effective establishment security system at low cost is built where users can also program the security system on their own. This project is focusing on developing a security system for house, apartment and other establishments with active modules are the Infrared flame, Methane, Butane, LPG and Smoke Gas Sensor - MQ-2 detector which is controlled by microcontroller.

The overall project is divided into two parts; the first part is concerned with hardware development where all electronics components are connected via the circuit design. An active infrared flame and Methane, Butane, LPG and Smoke Gas Sensor - MQ-2. While

buzzer, indicator are the output components where it's all controlled by the controller circuit. The second part is the software programming to create a mobile application that connected to device to operate the hardware structure. The process of downloading and executing the program is done using Arduino IDLE, C# software to the microcontroller serial port, also the software program used to develop the mobile application is the kodular site. The infrared flame detector can detect flame and Methane, Butane, LPG and Smoke Gas Sensor - MQ-2 is capable of detecting different kinds of smoke and gas, the microcontroller is capable of controlling the whole operation of the security system.

1 Introduction

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control both physically and digitally. The Arduino board uses many microprocessors and controllers.

The proponent conducted a survey at the barangay Putik and fire sub- station (BFP) beside the barangay hall, wherein there were 4 cases of fire incidence recorded in barangay Putik in the year 2020- 2021.

The first incident occurred near the area of our client establishment was on March 10, 2020, at Delos Santos drive Putik, Zamboanga city. A concerned citizen called the barangay fire sub-station at the time of 2000H(08:00pm), the fire force of the barangay immediately responded to the area as mentioned by the caller. They arrived at 2007H(8:07pm) the fire incident lasted for 3 hours and half (03:30 minutes). The fire sub- station personnel declared the fire out at 2330H(11:30pm). Under the investigation of the fire man on duty, the cause of the fire was the electrical

fire (the air-conditioner) located at the second floor of the house.

The second incident occurred on august 07, 2020 at Morning Glory Putik Z.C a concerned citizen approached the barangay fire sub- station at the time of 1947H(07:47pm), the fire force of the barangay immediately responded to the area as mentioned by the concerned citizen. They arrived at 1954H(07:54pm) the fire was already controlled by neighbors (concerned citizens) so the fire force team double checked the area where the fire started. Under the investigation of a fireman on duty, the cause of the fire was electrical fire (electrical wiring).

The third incident occur was on September 02, 2020, at Morning Glory Putik Z.C a concerned citizen approaches the barangay fire sub-station at the time of 0222H(02:22am), the fire force of the barangay immediately responded on the area was mentioned by the concerned citizen. They arrived at 0228H(02:28am) the fire incident lasted for 17 minutes, the fire sub-station declared fire out at the time of 0245H(02:45am) Under the investigation of fire man on duty the cause of fire was structural light material, (light material).

The fourth incident occur was on October 13, 2020 at Sto.Nino Putik Z.C a concerned citizen called the barangay fire sub-station at the time of 1347H(01:47pm), the fire force of the barangay immediately responded to the area of fire accident, they arrived at 1354H(01:54). The fire incident lasted for 3:38 minutes under the investigation of the fire officer on duty, the cause of fire was the light material structural in the area.

According to the BFP team, the fire incident reports they got mostly are from residents of the barangay who came to their office to report the incidence and some they received calls, which sometimes reported the incidence late that led them to respond late. In every delay of their response, it took the

chance to save lives of people who are in danger and their properties. And sometimes they responded to some calls they received that when they got to the location, it was just a false alarm.

In line with this the proponent will propose a device that can automatically give warning to the concerned authority like the BFP team, employers, and employees if there is an alert of occurrence of fire in the establishment of Printing shops and car tint shops.

This proposed project on the request of the client (employer of Car tint & Printing Shop). With this device, the employer can secure the safety of the establishments and of the customers and employees specifically in terms of preventing the occurrence of fire or if in case there is about to occur fire, just detecting the smoke, gas, fire, the concern authority will automatically be alarmed and informed to immediately act as to how the occurrence of fire be controlled.

Arduino-based fire, gas and smoke alarms are to detect and notify by sending SMS notification to the owner, employees, and have the capability to call the barangay fire forces sub- station (BFP) depending on the level of fire, smoke, and gas detected. The proponent decides to put in a 3-level alarm.

The proposed project will also consist of internal devices such as Quad band GSM Sim900A, Buzzer, Arduino UNO R3, Smoke Gas sensor, Infrared Flame detector sensor, Mini Ups Battery Backup that will add features to this proposed device.

2 Review of Related Literature
This chapter supports the conceptual framework of the study relating between the previous literature and past studies on the Arduino Base Fire, Gas, Smoke Alarm Detector with SMS Notification. The related literature on its existing applications will be used as a reliable source of the study. This serves as a 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 LPG Gas Leakage Detection and Alert System according to research by E. Jebamalar Leavline, D. Asir Antony Gnana Singh, B. AbinayaH. Deepika Gas leaks cause a variety of mishaps that result in both property damage and human injury. Physical characteristics like toxicity, flammability, and so on determine the danger of explosion, fire, and asphyxia. In recent years, the number of people who have died because of gas cylinder explosions has risen. Substandard cylinders, outdated valves, worn-out regulators, and a lack of understanding on how to handle gas cylinders are all factors that contributed to the explosion. LPG, or propane, is a combustible combination of hydrocarbon gases that is utilized as a fuel in a variety of applications such as houses, hostels, factories, autos, and vehicles due to its favorable features such as high calorific value, low smoke, low soot, and low environmental impact. Natural gas is another often utilized household fuel. Both gases burn to create clean energy, but they have a severe leakage problem. These gases do not spread easily because they are heavier than air. When inhaled, it can cause asphyxia and even explode. LPG explosions have resulted in an increase in the number of deaths in recent years. To avoid this problem, a system for detecting LPG leakage is required. The technique of detecting potentially harmful gas leaks using multiple sensors is known as gas leak detection. In the literature, several concepts for LPG detection and alarm systems have been presented. Kitchen gas leak detection and automated gas shut off systems were created by Apeh et al. The cylinder LPG gas leakage detecting system was introduced by T.Soundaryaet al. Gas detectors based on wireless and GSM technologies have also been proposed. This article describes a method for detecting and alerting LPG leaks in order to prevent fires and ensure the safety of the home. The remainder of the paper is laid out as follows. The LPG leakage detection and alarm system is shown in Section 2, and the article is concluded in Section 3. As illustrated in Figure 1, the LPG leakage detection and alarm system provided in this section is basic yet effective. It runs on batteries and is thus portable. It is built in such a way that it may be used with an AC power source as well. It has a bridge rectifier with a capacitor filter

to accommodate the latter situation. Then there's an IC7805-based regulator that offers a +5V controlled power supply. It is built in such a way that it may be used with an AC power source as well. It has a bridge rectifier with a capacitor filter to accommodate the latter situation. Then there's an IC7805-based regulator that offers a +5V controlled power supply. The MQ-6 gas sensor is used to detect LPG. This sensor may be used at a voltage of +5V. This sensor has a very high sensitivity and a fast reaction time. It can detect LPG concentrations ranging from 200 to 10,000 parts per million. Tin Dioxide (SnO2) and gold (Au) electrodes make up the sensor's gas detecting layer. The gas sensor's output is sent into the LM358 dual operational amplifier, where it is compared to the gas density threshold value, which is adjusted using preset potentiometers, and amplified. The operational amplifier output fires the LED and Buzzer driver circuits if the detected voltage is greater than the specified threshold voltage. As a consequence, the LED will begin to illuminate, and the buzzer will begin to sound an alert.

2.1.2 Low Power Wireless Smoke Alarm System in Home Fires,

according to Juan Aponte Luis, Juan Antonio Gómez Galánand, and Javier Alcina Espigado's study. Home fire detection is a major problem, and most industrialized nations dedicate significant resources to the development of automated detection systems. A fire alarm system should alert building occupants to the presence of fire indications such as smoke or high temperatures in a reliable and timely manner. Because of its early fire detection capability, quick reaction time, and inexpensive cost, a fire detector is commonly used as a smoke sensor. Other fire detection methods include gas sensors and temperature sensors. Temperature fluctuations cause significant false-alarm rates in fire detectors that employ a single sensor, usually a smoke sensor. The smoke sensor works by refracting infrared (IR) light into a tiny chamber owing to the presence of smoke. Because both the IR LED and the photodiode are temperature sensitive, the smoke sensor's sensitivity is likewise affected by the ambient temperature, but this impact is eliminated in high-performance systems. As a result, a fire detector with many types of sensors is more efficient than a fire alarm system with only one type of sensor. The proposed sensing device enables the deployment of a wireless network in which the collected data is transferred to a base station for processing. The base station acts as a link between the sensor nodes and the users. A smartphone application has also been created to alert users to a fire alarm in real time. The wireless sensor network captures and analyzes sensing data from a house fire, then properly activates a fire alarm. The design satisfies the requirements for a wireless node's compact

size and low power consumption. A low-cost solution is also required for the deployment of a large number of sensor nodes. For early detection of house fires, the system performs several parameter measurements. Analog sensors for measuring smoke, carbon monoxide (CO), and temperature are included in the node.

2.2 Related Studies
2.2.1 Interfacing Flame Sensor with Arduino to Build a Fire Alarm System

According to Shashi Kumar's paper, Interfacing Flame Sensor with Arduino to Build a Fire Alarm System, published on August 2, 2018. In this post, we'll learn how to connect a Flame Sensor to an Arduino and how to create a Fire Alarm System with an Arduino and a flame sensor. A photodiode detects light and an op-amp controls sensitivity in the flame sensor module. It detects fire and sends out a HIGH signal when it detects it. Arduino detects the signal and alerts the user by activating the buzzer and LED. The flame sensor in this case is an infrared (IR) flame sensor.

2.2.2 Fire Detector using Flame Sensor and Arduino Interface

According to Alex Newtom's May 13 2020 research titled Fire Detector Using Flame Sensor and Arduino Interface, this gadget will connect the flame sensor to Arduino. Simply said, we will create a Fire Detector utilizing a Flame Sensor and an Arduino to detect fire. The DIY fire alarm or fire detector utilizing a flame sensor and an Arduino board is fantastic. The sensor detects IR (Infra-Red) light wavelengths ranging from 760 nm to 1100 nm (nanometer) produced by the fire flame. The YG1006 sensor, which is a high speed and high sensitivity NPN silicon phototransistor, was used in the majority of the flame sensors.

2.2.3 Arduino Smoke Level Detector using MQ-135 Sensor with Alarm

Alex Newton's Arduino Smoke Level Detector Using MQ-135 Sensor with Alarm, published on May 13, 2020. In this project, we created an Arduino Smoke Level Detector using a MQ-135 Sensor to measure the amount of smoke in the surroundings. Simply put, we connected a MQ-135 Gas Sensor module to an Arduino and 16*2 LCD modules for display. The MQ-135 sensor was used to detect smoke. Smoke detectors, as well as critical safety criteria, are extremely valuable in detecting smoke or fire in buildings.

2.2.4 Arduino Base Smoke Detector

According to TechnicalEngineer claims, Arduino Base Smoke Detector was published on September 27, 2018. This project's smoke detector not only sounds an alert, but it also operates an exhaust fan, allowing smoke to be evacuated quickly. Instead of the real exhaust fan, a DC motor was used in the

project as a demonstration. The MQ-6 sensor detects smoke concentration and displays it on an LCD display. A LED indicator is activated when the concentration of smoke reaches a harmful level, which might indicate the start of a fire.

The project is constructed on an Arduino Pro Mini, and the MQ-06 gas sensor detects smoke. The MQ6 gas sensor detects gas concentrations in ppm and provides an analog value that may be transformed to a digital measurement using the Arduino's built-in Analog to Digital Converter. The digital measure's value will be 10-bit long and range from 0 to 1023. Based on the same digital measure, the project allows the user to select the unsafe threshold for leakage. When the user-specified value matches the value detected by the sensor, the alarm is triggered. The MQ6 sensor may be calibrated by connecting it to a fixed-value load resistance.

2.2.5 Smoke Detector using Gas Sensor

According to Aritro Mukherjee, May 6, 2016, paper titled Smoke Detector Using Gas Sensor. In this project, we will use Arduino to build a smoke detector. The detector detects smoke and alerts the user by buzzer and red LED if the smoke density exceeds the safety limit.

3 Technical Background

In this chapter, the proponents proposed this project to further help the concern of the employer. Fire, Gas, Smoke alarm Detector with Notification is a type of detector that, aside from its alarm, it also sends notification to the employer/employees as well as the barangay fire force (BFP) when it detects fire, gas, or smoke. Through this, the proponents believed that it could help prevent the occurrence of fire if there is a warning given in the establishment and so with the employer/employees and barangay fire force that they can automatically see where, what the fire level is and how to act over it. The first level of the alarm is when the device detects smoke, and gas; the buzzer will activate, and notify the owner and employees via SMS notification.

The second level of the alarm is only that the device can detect smoke or any gases or the smoke and gases sensor (MQ2). exclusive for the notification via text message, the device will activate the buzzer and notify the owner by sending an text notification to him/her and has a capability to command the device to call the Fire Sub-Station team.

And for the third level of the alarm, when the fire or flame reaches a certain height (by feet), the device will activate the

buzzer and notify the owner and the Fire Sub-Station by sending notification via dial tone to the Fire Sub-Station team. The content of the SMS for Fire Sub-Station team is the detailed location of the establishments, and the level of the fire.

For the implementation of this proposed system. The fire, gas, smoke alarm detector with SMS notification on the establishment needs to have an efficient and right monitoring device to detect fire, gas and smoke for the safety of establishment. This system requirement is divided into hardware and software parts. For hardware, researcher used Arduino R3, Smoke and Gas sensor, Flame detector sensor, Buzzer, GSM module, RGB led light and Laptop, for the software, researcher used Windows 10 Operating System, C# and Arduino IDLE is inputted and inserted for the data processing system. The Arduino Device is very useful, especially in today's generation because it can ensure the safety of the establishment from any incidents occurring.

4 Methodology, Result and Discussion
This chapter discusses the methodology in the development of a model for the Fire, Gas, Smoke Alarm Detector with SMS Notification using Arduino the following are the different phases of the methodology, Requirement Planning phase, User Design phase, Construction Phase and Cut Over phase.

SDLC Model
On application development, the researcher will use the System Development Life Cycle (SDLC) method for the development of the application. The researcher will use Agile Model to explain feasible large scale software development sequentially to complete the projects shown in Figure 4.1
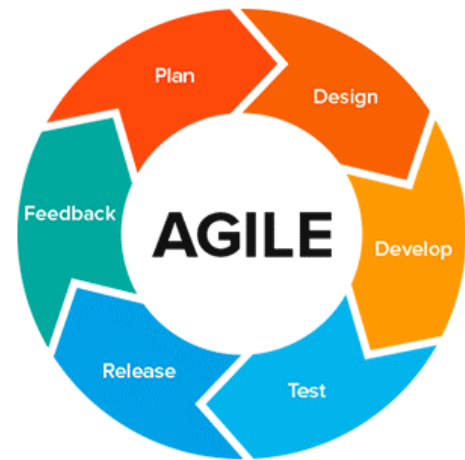

Figure 4.1 Agile Model

These are the following phase of Agile Model:

Plan
In this phase the proponents discussed the goals and objectives of this project. Planned on how to gather data and organize the time to conduct the study. Discuss the possible solution to the existing problem of the system. The proponent had a brainstorming within the group to come up with the idea of the members and suggestions to be able to propose a well-developed application that

provides a friendly customer service to the users. Observation has been done on analyzing the data on the related literature and on other research conducted, to better understand the existing system that would be a help on developing a better application.

Design

In this phase, the application will be designed, based on the requirements needed in the application. Here, the proponents will categorize the interface details and database using flowchart that represents a workflow and can easily determine the process of the application. The application offers a framework of the design carried out by using flowchart and data flow diagram in Fire, Gas, Smoke Alarm Detector with GSM Module. Also, with the source code using Arduino Device.

Develop

In this phase, the proponent will be conducting a run-up testing of their application and give a demonstration to the users on how to properly use the application. All the do's and don'ts will be explained to the user to prevent complications and problems on the machine.

Test

This phase includes the process of the application to check whether the system or requirements are met by the users to prevent system failure. The proponents need to ensure that the application should be functional to function well for the users, and to be able to detect errors. In addition, the application will be tested and made sure that it's functional and successfully developed without any bugs and errors.

Release

This phase, the proponent will monitor the performance of the application periodically to know whether there is a problem, or if it runs successfully.

Feedback

The increment developed in the application will be subjected to users review and any feedback may be appended to the product backlog, which can prioritize at the discretion of the product owner.

V Model

On device development, the researcher will use the System Development Life Cycle (SDLC) method for the development of the device. The researcher will use V Model to explain feasible large scale hardware development sequentially to complete the projects shown in Figure 4.2
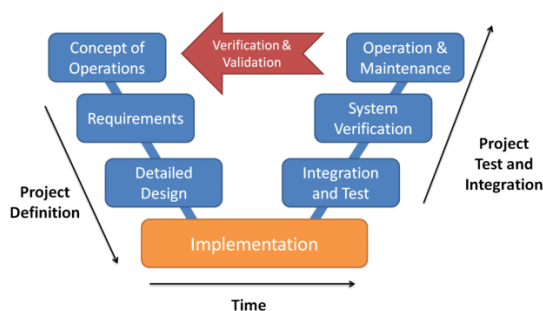

Figure 4.2 V Model

These are the following phase of V Model:

Concept of Operation

In this phase the proponents discussed and gather data to organize the time to conduct the study. Discuss the possible solution to the existing problem of the device. The proponent had a brainstorming within the group to come up with the idea of the concept of operation that the members be able to propose a well-developed device that provides a friendly customer service to the users. Proponents must all have the different module sensor to create the proposed device.

Requirements

This phase includes the requirements of creating the actual device and coding for the module sensor to work and adjust its sensitivity, also to check whether the device or requirements are met by the users to prevent system failure. The proponents need to ensure that the device should be functional to function well for the users, In addition, the device will be tested and made sure that it's functional and successfully developed without any bugs and errors.

Design

In this phase, the device will be designed, based on the requirements needed in the device. Here, the proponents will categorize the interface details and database using flowchart that represents a workflow and can easily determine the process of the device. The device offers a framework of the design carried out by using flowchart and data flow diagram in Fire, Gas, Smoke Alarm Detector with GSM Module. Also, with the source code using Arduino Device.

Implementation

In this phase, Implementation includes user notification, user training, installation of hardware, installation of software, and integration of the device into daily work processes. This phase continues until the device is operating in production in accordance with the defined user requirements.

Integration and Test

This phase includes the process of the device to check whether the device or requirements are met by the users to prevent system failure. The proponents need to ensure that the device should be functional to function well for the users, and to be able to detect errors. In addition, the device will be tested and made sure that it's functional and successfully developed without any bugs and errors.

System and Verification

In this phase, the device must be verified by the client and must assure that meets the expected outcome of the device after the run up testing to clearly see functional and developed without any errors.

Operation and Maintenance

In this phase the device operation is ongoing. The device is monitored for continued performance in accordance with user requirements and needed device modifications are incorporated. Operations continue as long as the device responds to the client needs. When modifications are identified, the system may reenter the planning phase.

Verification and Validation

In this phase, verification and Validation is the assurance that a product or device meets the needs of the client. It often involves acceptance and suitability with customers. Contrast with verification of the client that the device must meet the expected result and functionality of the device created.

Requirement Specification

The composition of the Arduino Base Fire, Gas, Smoke Alarm Detector with SMS Notification are a combination of both hardware and software working together. Hardware is the physical components and software is the programs that run on the device. The device requires both hardware and software to function.

A. HARDWARE
Arduino Uno (R3)

The Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has

14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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.

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 the perfect solution for any project that requires long range connectivity.

Methane, Butane, LPG and Smoke Gas Sensor - MQ-2

Gas Sensor (MQ2) module is useful for gas leakage detecting (in home and industry). It can detect LPG, i-butane, methane, alcohol, Hydrogen, smoke and so on. Based on its fast response time. measurements can be taken as soon as possible. Also, the sensitivity can be adjusted by the potentiometer.

Infrared Flame Detection Sensor

The IR flame sensor is used to detect the presence of fire or other infrared source (Flame or a light source of a wavelength in the range of 760 nm to 1100 nm can be detected). It can be used in firefighting robots or heat seeking robots.

RGB LED Light

RGB sensor It has RGB and Clear light sensing elements and an IR blocking filter. Moreover, it has a white LED to illuminate the sensed object.

Buzzer - That produces a loud 2KHz beep tone.

Mini Ups Battery Backup- A battery backup is a system in some power supplies that switches between a main power source and a battery.

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.

B. SOFTWARE

Arduino IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

KODULAR

Kodular is a free online suite for mobile apps development. It mainly provides an online drag-and-drop Android app creator, on which everyone can create any kind of app without programming a single line of code.

OS Windows 10

Windows 10 enables developers to make devices that combine the software capabilities of Arduino with the hardware capabilities of Windows. Developers can extend their Universal Windows Application with Arduino commands. It combines the power of Windows device features such as image processing, speech recognition and advanced audio pipelines through Arduino.
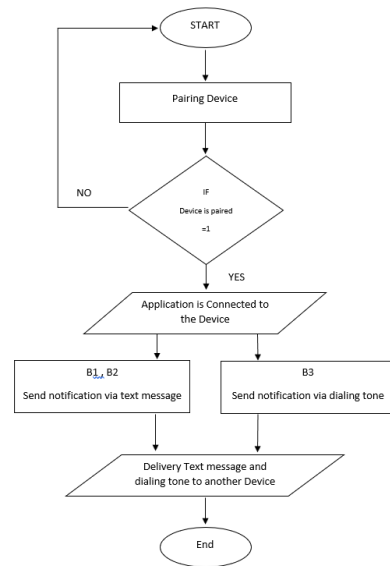
Flow Chart

Figure:4.3 *Flow Chart*

This Flow Chart shows the sequence of the user interface to be able to connect with the device wherein the mobile phone is required to Pair with the device through Bluetooth, when already paired the mobile Phone can already command the device with the use of the Buttons.
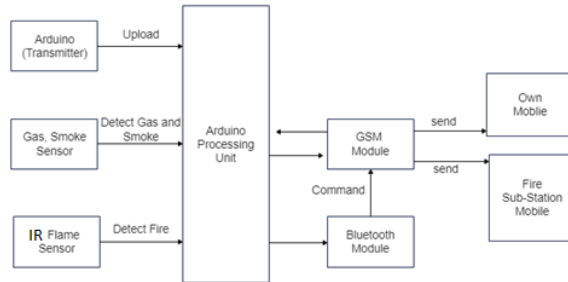
Architectural Design of the Proposed System

Figure:4.4 *Architectural Design*

The Figure above shows the Arduino transmitter upload the codes to the Arduino processing units connecting to the detect sensor of fire exposure, smoke and gas leakages returning back to the Arduino processing towards to the GSM Module and message the owners via SMS or Call. The purpose of the Bluetooth module is to command the GSM Module to send a message or calls.

Block Diagram

   Block flow diagrams also show the process that data change or transform data and how data come to be at specific locations. Block flow diagram focuses on
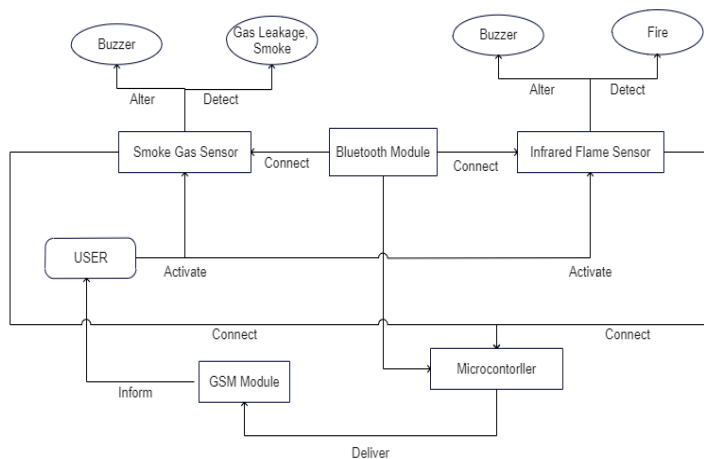
The Figure shows the devices are connected to micro controller for functioning. While Gas and smoke sensor detect exposure And comes a buzz alert directly send a data to micro-controller At that point in time, micro-controller will send a data to GSM module to automatically deliver a message to the user.

Project Design

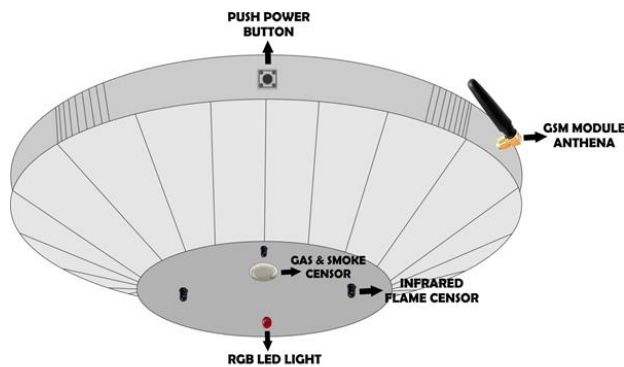
Figure 4.6 *Project Design*

1. Push Power Button used to turn on and off to the device
2. Mini Ups A battery backup for device.
a. MQ-2 Smoke Detector it used to detect gas leakage, LPG, i-butane, methane, alcohol, Hydrogen, smoke and so on.
3. IR Flame Detector is it used to detect the presence of fire or other infrared source.
4. GSM Module used for sending and receiving SMS and making and receiving dial calls.
5. Bluetooth Module used for wireless communication with Bluetooth enabled devices.
6. RGB LED Light can emit any color by mixing the 3 basic color red, green and blue
7. Jumper wires used for making connections between items on your breadboard and your Arduino's header pins.
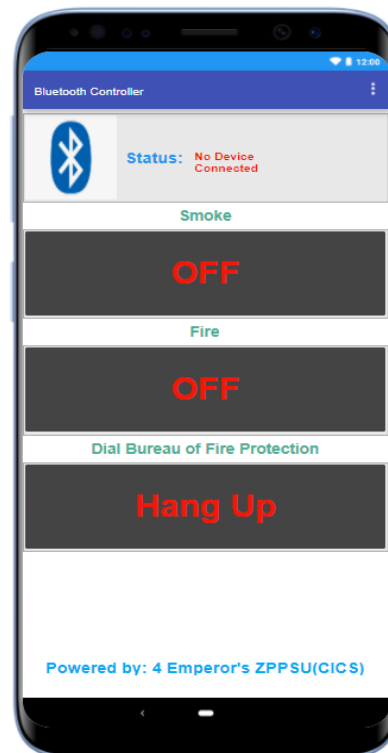
Development and Testing

TASK ID	Task Name	Assigned to	Estimated		
			Duration (Days)	Start Date	Finish Date
CHAPTER 1					
1	Introduction	Cuario	1	03/15/2021	03/16/2021
1.1	Project Context	Delacruz	1	03/15/2021	03/16/2021
1.2	Purpose & Description	Cuario	2	03/17/2021	03/19/2021
1.3	Main Objectives	Cuario	2	03/17/2021	03/19/2021
1.4	Scope & Limitation	Delacruz	3	03/20/2021	03/23/2021
CHAPTER 2					
2.1	Related Literature	Bongat	4	03/27/2021	03/30/2021
2.2	Related System	Cuario	4	03/27/2021	03/30/2021
2.3	Synthesis	Bongat	2	03/31/2021	04/01/2021
CHAPTER 3					

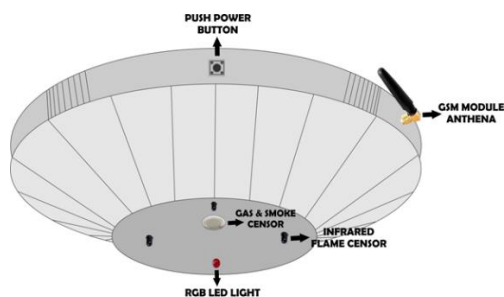| TASK ID	Task Name	Assigned to	Duration	Start	Finish
3.1	Technical Background	Satumbaga	2	04/02/2021	04/03/2021
CHAPTER 4					
4.1	Requirement Analysis	Delacruz	4	04/06/2021	04/09/2021
4.2	Requirement Analysis and Documentation	Bongat	2	04/11/2021	04/13/2021
4.3	Design of Software, Systems, Product, and/or Processes		2	04/15/2021	04/17/2021
4.3.1	SDLC Model	Bongat	2	04/18/2021	04/20/2021
4.3.2	Requirement Specification	Cuario	1	04/23/2021	04/24/2021
4.3.3	Architectural Design	Bongat	1	04/23/2021	04/24/2021
4.3.4	Block Diagrams	Bongat	1	04/23/2021	04/24/2021
4.3.5	Circuit Diagram	Bongat	1	04/23/2021	04/24/2021
4.4	Development and testing	All Members	4	06/26/2021	06/30/2021
4.4.1	Development Plan	All Members	4	07/02/2021	07/06/2021
4.4.2	Gantt Chart	All Members	4	07/02/2021	07/06/2021
4.5	Description Prototype	Delacruz	3	07/15/2021	07/17/2021

Description Prototype

Figure: 4.8 *Description Prototype*
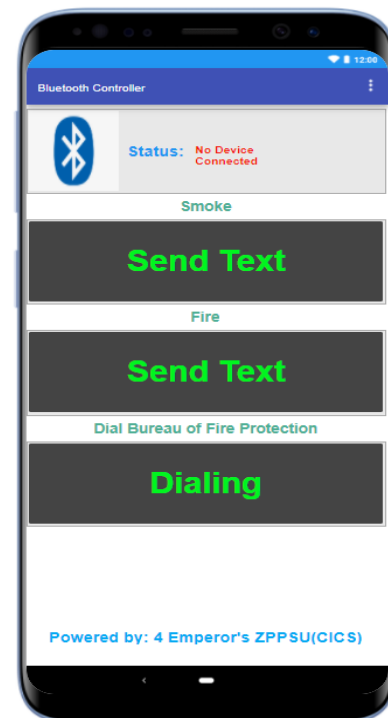
This Prototype design shows the output design of Arduino Base Fire, Gas, Smoke Detector with GSM Module that consists of series of modules which works as the major function of the device

Description User Application

Figure: 4.9 *Description User Application*

The figure shows the User Interface of the

Application which functions to command the device when already connected.

Implementation Plan

The proposed system of Arduino Base Fire Gas Smoke Alarm Detector with SMS Notification device utilized in this Windows 10 Operating System, Arduino IDLE, E&E Application. The proposed device helps the security of the printing shop and tinting shops against occurrence of fire. The researchers intended to place the device at a certain height to test its functionality. Data will be taken and discussed in the results. In addition, the durability of the device is guaranteed to last.

Implementation Results

After the implementation or testing phase, the researchers have gathered the following data:

The device was installed and attached in a ceiling approximately 8 ft above the ground. The researchers test its main feature by producing fire beneath it (8 ft below). As expected, the device automatically rings its buzzer and sends an SMS notification after detection.

For smoke detection, the device automatically rings its buzzer and sends an SMS notification after the rise of the smoke approximately 5 ft from the source.

Chapter 5

CONCLUSION

The Arduino Base Fire, Gas, Smoke Alarm Detector with SMS Notification using Arduino will give much attention in the future. People will get more concerned to protect their house and establishment from fire occurrence. This system device can monitor houses as well as the establishment using the sensors that are integrated with a controller and a GSM unit. This system is designed using modularity to become a flexible system that can add more sensors without changing the whole system, only adding some sensors to increase systems functionality. So, this system is a modular home as well as establishing a security system by using the different sensors as well as the GSM module to call functions to communicate between the system device and a user.

RECOMMENDATION

The proponent's recommendation to every Employer or Home owner who wanted to secure their Houses and establishments from fire occurrence is to install this device in their respective areas. This does not only give security but also bring them peace of mind considering that they will be well informed and alarmed if in case there is occurrence of fire. Hence, they can

immediately take actions and contact the authorities concern.

In addition, this device is also highly recommended to the Personnel of Fire Department. The Device is very useful to lessen the cases of false alarm.

Direction: Check the best response to each statement.

        4- Very Satisfied
        2- Dissatisfied
        3- Satisfied
        1- Very Dissatisfied

1.The whole functionality of the device and mobile application.

Statement	4	3	2	1	Mean
Arduino based Fire, gas, smoke sensor works well	8	0	0	0	4
GSM module notify the owner as well as BFP immediately	7	1	0	0	4.5
User application works properly and command different modules	8	0	0	0	4
The buzzer communicates well with fire, gas, smoke sensor	8	0	0	0	4
The security device has a clear purpose	8	0	0	0	4
The user application has a clear purposed and its usability and effectiveness	8	0	0	0	4

2. The overall design of the device as well as the user application.

Statement	4	3	2	1	Mean
The design device fits on the celling	3	5	0	0	3.37
The modules placement fits on the device	5	3	0	0	3.62
The design size of the device is enough to fit all of the modules	8	0	0	0	4
The design of the device is durable and long lasting	4	4	0	0	3.5
The design of the device can be replicable	8	0	0	0	4
The use application UI interface is clear and show how easy to use the application	8	0	0	0	4

3. The different functions of the device and the user application.

Statement	4	3	2	1	M
I find the Arduino Base Fire, Gas and Smoke Alarm Detector with SMS Notification reliable	8	0	0	0	
The Fire, Gas, Smoke Sensor working well	8	0	0	0	
The buzzer communicates well with fire, gas, smoke sensor	8	0	0	0	
The fire, gas, smoke sensor and buzzer recognizable and functional	8	0	0	0	
Easy and automatically detect flame, gas and smoke	8	0	0	0	
The user application for the device is user friendly and easy to use	8	0	0	0	

4. The features of the whole device as well as the user application.

Statement	4	3	2	1	Mean
The fire, gas, smoke sensor automatically detects immediately	8	0	0	0	4
The GSM module send SMS & Call to the owner & BFP immediately	4	4	0	0	4
The user application function properly to command the different modules	7	1	0	0	4.5
The buzzer function well whenever detects fire, smoke, gas	8	0	0	0	4
The buzzer communicates well with fire, gas, smoke sensor	8	0	0	0	4
The user application for the device has a clear purpose on how easily application works on device	6	2	0	0	3.75
User application features is to command different sensors.	7	1	0	0	4.5
User application features also to automatically call to the BFP to notify.	6	2	0	0	3.75

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