1.0 INTRODUCTION

1.1 Background Information

Fire is often described as the greatest servant but the worst master- difficult to control when it turns into inferno- as it wrath on, burning and scorching everything on its path. Fire, as we all know, has no respect for man; rich and poor alike. Fire outbreak in the country has indeed assumed an alarming proportion. In Nigeria today, there is barely a day without one accident or the other and most has to do with fire outbreak.

The following fire outbreaks were so far reported in the nations daily in the year 2016; Yola market fire inferno (Iro, 2016), behind Mandilas, Marina, Lagos, fire inferno (Sotubo, 2016), Kano Singa market fire (Nkem, 2016), Vice-chancellor lodge's fire, Unilag (Wale, 2016) and Kano's Sabon-gari fire inferno (NAN, 2016).

Although most of these fire outbreaks can be attributed to many factors which includes but not limited to the following; storing of adulterated fuel, Power surge, electric sparks, illegal connection of electricity, lighted match, stoves, cookers and gas cylinders, it's a fact that whether from electrical faults in homes and offices, to firecrackers in marketplace or petrol tanker explosion on busy streets. This reported fire infernos has resulted in destruction of properties worth billions naira, several deaths, burning to ashes of cars worth millions of naira and consumption of numerous buildings, including worship centres.

1.2 Problem Statement

The rate at which fire outbreaks occur is becoming worrisome calling to question the effectiveness of the Federal Fire Service (FFS) tasked with the mandate of urgently addressing the trend by way of implementing fire code among other expectations. In most cases, it has always been tales of inefficiency on the part of the fire service that always arrives late to the venue of the incidence and complains of lack of equipment to do their job

1.3 Objectives of the Research

To design a wireless fire reporting system that will supply the following information to the firefighting centre;

- Address of venue of incidence
- Time of occurrence
- Distance of firefighting office to the vicinity of the inferno

The system will also furnish the occupants of the building that are away with the information on the inferno.

1.4 Scope of Research

The design is a prototype, global design will require the integration of google map.

1.5 Literature review

A fire alarm system is intended to enable a fire to be detected at a sufficiently early stage so that people who are at risk can be made safe either by escaping from the fire or by the fire being extinguished (also to prevent extensive property damage). Neither of these measures can be used until people are made to be aware of the fire (Safety, 1926), (Goh & Kwek, 2005). A fire alarm is to provide the followings;

a. detect a fire at an early stage

b. alert and evacuate occupants

c. notify the relevant personnel

d. activate auxiliary functions e.g. smoke controls, lift homing etc

e. identify and guide fire fighters

A basic Fire detection and response system is as shown in Fig. 1 (Goh & Kwek, 2005).
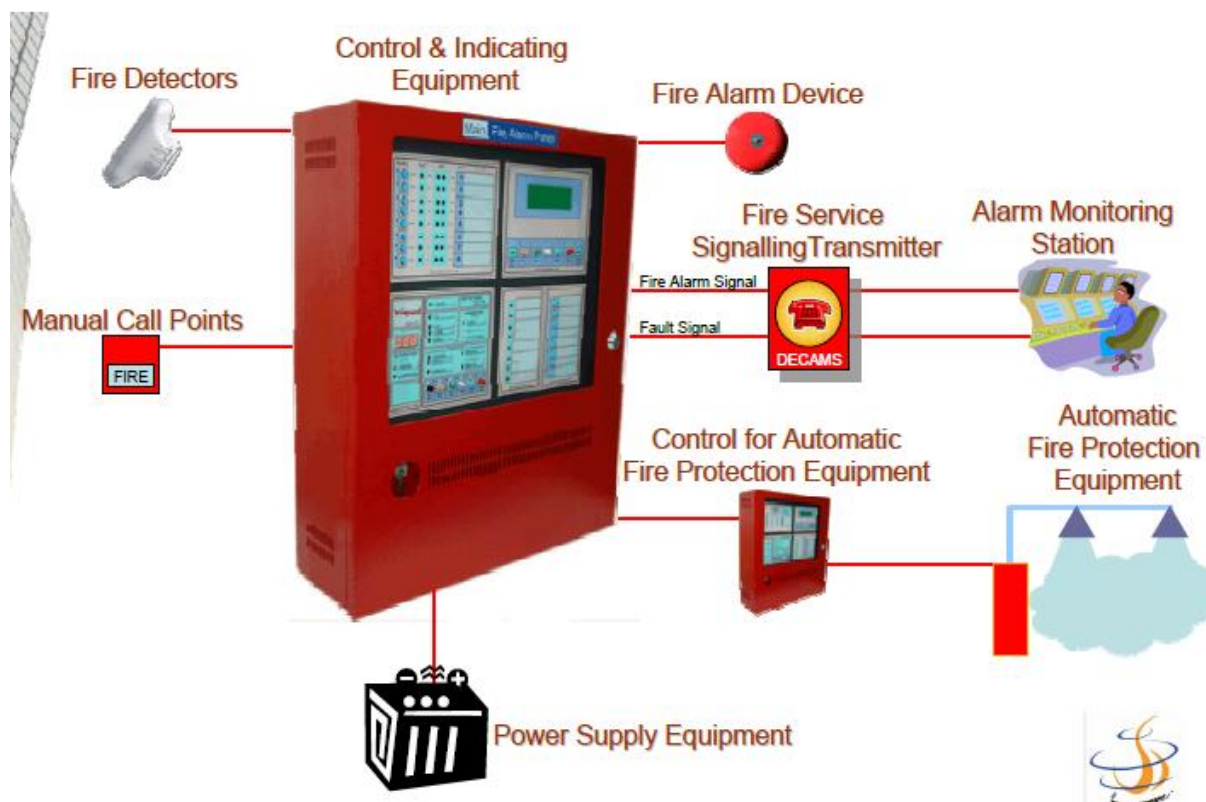
2.0 METHODOLOGY

2.1 Materials/Equipment

1. ATmega328P microcontroller
2. 433Mhz RF Transmitter & Receiver Communication Module
3. MQ2 Smoke Sensor
4. MQ7 CO Carbon monoxide Sensor

5. DS1820 Temperature Sensor
6. 900Mhz – 1800Mhz GSM Modem
7. Passive Buzzer
8. 12V 50Ah battery
9. Voltage Regulators
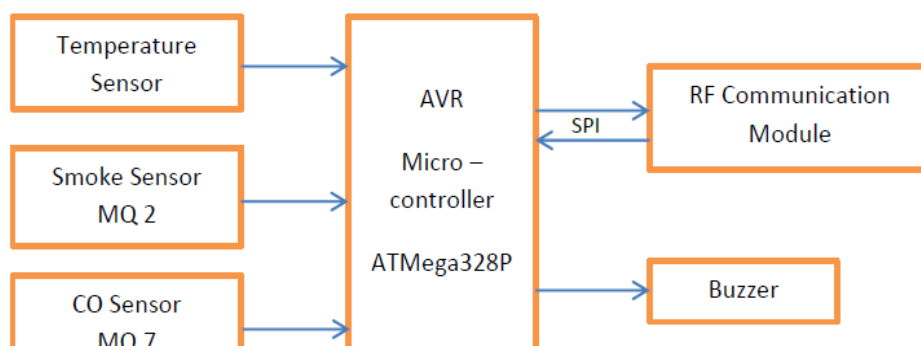10. Subscriber Inline Module (SIM) Card

2.2 Procedure

Wireless Fire Alarm System is a device that senses smoke, typically as an indicator of fire. It should be reliable and in a timely way notify building occupants and also the nearest fire station about the presence of fire indicators, such as smoke or high temperatures. A fire detector is usually implemented as a smoke sensor due to its early fire detection capability, fast response time and relatively low cost. Wireless sensor network has become the most important technology in environmental monitoring and home or factory automation in recent years.

Automatic wireless fire alarm system provides real-time surveillance, monitoring and automatic alarm. It sends early alarm when the fire occurs and helps to reduce the fire damage. In order to provide early extinguishing of a fire disaster, large numbers of detectors which periodically measure smoke concentration or temperature are deployed in buildings. Those scattered detectors report their monitoring information to the surveillance centre via GSM network.

Wireless Fire Alarm Systems are ideal for fire alarm systems requiring a quick installation. It requires no cable installing between the master station/panel and devices. This also means that the decoration within the building does not need to be affected during the installation process. The block diagrams of the proposed system are as shown in Figs. 2 and 3.

The proposed system comprise of two basic units; the Fire sensing node and the Fire signal receiving node. This basic nodes are made up smaller subunits namely, Temperature sensor, Smoke sensor, CO sensor, RF communication module, GSM module and the Buzzer. These units are for basic activities; sensing the environmental conditions, communicates it to occupants and fire service centers, raise an alarm and give information about the inferno.

Figure 3: Fire signal receiving block

2.3 Result and Discussion

The proposed system will report the occurrence of fire inferno and provides the firefighting personnel with the distance to the site of the inferno to achieve prompt response time, thus putting out the fire and rescuing the victims.

3.0 Schedule of Activities

Tasks	WK 1	Wk 2	WK 3	WK 4	WK 5	WK 6	WK 7	WK 8	WK 9	WK 10	WK 11
Circuit diagram design, components identification and sourcing.											
Procurement of materials											
Programming of 2 units of **ATmega328P** Micro-controllers.											
Construction of smoke, CO_2 and temperature sensor unit.											
Construction of RF and GSM modules											
Construction of Fire sensing and Fire signal receiving nodes.											
Enclosure fabrication, assemblage, packaging and testing.											
Reporting and documentation of											

Research											

4.0 Budget

Materials and Equipment

S/N	Item	Quantity	Unit Price (₦)	Cost	Stage when needed in Research
1.	ATmega328P	2	250,000	500,000.00	Implementation Stage
2.	433Mhz RF Tx & Rx Communication Module	2	150,000	300,000.00	Implementation Stage
3.	MQ2 Smoke Sensor	1	120,000	120,000.00	Implementation Stage
4.	MQ7 CO Carbon monoxide Sensor	1	120,000	120,000.00	Implementation Stage
5.	DS1820 Temperature Sensor		120,000	120,000.00	Implementation Stage
	900Mhz – 1800Mhz GSM Modem	1	120,000	120,000.00	Implementation Stage
6.	Passive Buzzer	1	150,000	150,000.00	Implementation Stage
7.	12 V, 50 AH battery (Litium)	1	300,000	300,000.00	Implementation Stage
8.	Mapping out of the Polytechnic community	Lot	400,000:00	400,000:00	Implementation Stage
Total				**2,010,000:00**	

Personnel

S/N	Name	Designation and Qualification	Role in the Research Process	Duration of involvement	Rate (₦)	Total Honorarium (₦)
1.	Aiyelabowo, O. P.	Lecturer I, Ph. D M. Eng.	Head Researcher	Throughout	200,000	200,000.00
3.	Timothy, M.	Lecturer I B. Sc., M.Tech.	Co-researcher	Throughout	150,000	150,000.00
4.	Adaramola, O. J.	Senior Lecturer, B. Sc., M.Sc	Co-researcher	Throughout	150,000	150,000.00
Total						**500,000:00**

Others (Transport and Publication of Research)

S/N	Item	Description	Rate (₦)	Total Cost (₦)
1.	Alaba International Market, Lagos	Transportation	100,000	100,000:00
2.	Report Preparation and Binding	Typesetting, Printing and Binding	100,000	100,000:00
3.	Journal Publication	Publication	200,000	200,000:00
4	Consultation	Training	100,000	100,000:00
Total				**400,000:00**

A grand total of **₦2, 910,000:00**, Two million, nine hundred and ten thousand naira only.

References

Goh, D., & Kwek, M. (2005). Overview of Fire Alarm Systems and Maintenance. Retrieved from http://www.scdf.gov.sg.

Iro, D. F. (2016, January 4). Fire guts Yola market, Retrieved form www.premiumtimesng.com

News Agency of Nigeria (2016, March 26). Midnight fire destroys Sabon-Gari market in

Kano. The Guardian, Retrieved from guardian.ng.

Nkem, I. (2016, February 28). Early morning fire guts popular Singa market in Kano
(Photos). Naij.com, Retrieved form www.naij.com.

Wale, O. (2016, March 3). Ex-Borno Auditor General dies as fire guts UNILAG VC's lodge
(Photos). Daily Post, Retrieved form dailypost.ng.