REAL TIME HYBRID DETECTIVE SECURITY SYSTEM USING GSM TECHNOLOGY

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ABSTRACT

Security has become an important issue everywhere and it is becoming necessary nowadays as the possibilities of intrusion are increasing day by day. Safety from theft, ritual killing like badoo in Lagos state Nigeria, as well as October 20th demonstration that was hijack by hoodlum in Nigeria, leaking of raw gas, Human intrusion and fire disaster are the most important requirements of home security system for people. A traditional security system gives the signals in terms of alarm for notification. However, the GSM (Global System for Mobile communications) based security systems provides enhanced security as whenever a signal from sensor occurs from integrated fire alarm system, gas leakage system and human intrusion system, a text message is sent to a desired number(s) to take necessary actions. This research employs a method for Real time intrusion detective security system for fire, gas, and human intrusion, where signal is send through SMS with the application of GSM Technology (sim548c) in line with Atmega644p microcontroller, sensors, relays and buzzers.

Keywords: Fire alarm**,** Gas leakage, Human Intrusion, Microcontroller, SMS (Short Message Service)

INTRODUCTION

General security has changed a lot from the last century and will be varying in other to meet with the current trend of technology. Security is an important feature in our environment, particularly in our homes. The new and emerging concept of securities at homes should offers a comfortable, convenient, and safe environment for occupants. Security systems keep

homeowners, and their property safe from intruders by giving the indication in terms of alarm. This paper focuses on the security of a home when the user is away from the place and employed GSM technology to detect the signal/intruder by sending a message in form of alert to the owner. The system is aim at the security of Home against Fire outbreak, Gas Leakage, and human intrusion, if any of the above cases happens while the owners are out of their home then the device sends SMS to the emergency number which is provided by the use and installed in the GSM system. The system is made up of components, such as sensors, GSM, PIC16FH16A Microcontroller, relays to control the device and buzzers to give security alert signal in terms of sound. The three cardinal research domain can be explaining briefly as:

Fire Outbreak

Fire alarm system provides a prompt cautionary of fire so that people can be emptied in other to take abrupt action to stop or eradicate the fire effect as soon as possible. As human technology advances, the concerns of fire safety have rapidly increased as well. Fire vulnerabilities have claimed a lots of lives, as well as destroying immeasurable properties and equipment in the household setting and the industrial environment that needs the prime magnitudes of advanced technology. It is rich to know that current system makes use of Fire Alarm Control Panel (FACP) fitted with a Digital Alarm Communicator Transmitter (DACT), which transmitter signal to the central station. The current fire alarm systems do not have a measure of communicating to the external world. The sensors and detectors are designed to report only to the FACP. When there is Fire outbreak at home or organization, individuals outside cannot know the gravity of the disaster, Fire fighter cannot determine the extent to which the fire has vigorously spread within the building, house owner who travelled, cannot know the status of the damage from his locality. All this anomalist brought to the development of an SMS based fire alarm and detection system that utilizes an SMS that is configured in GSM to give information to a specified number of occupants and a nearest Fire Services Department.

Gas Leakage

In modern homes, gas cookers are fast supplanting power-driven cookers and paraffin stoves for domestic cooking. It comprises of hydrocarbons which are made up of inorganic elements. Base on the high demand and increasing rate of patronage of LPG for cooking and heating applications, there are needs for us to come up with safety measure and technique of averting the impact of fire outbreak that may result from its leakage. Since the introduction of electronic gas detectors, a number of devices have been developed to monitor and alert the people in the event of wide array of gases leakage. It was discovered that all these devices did not provide solution because damage might have been made before salvage can be objectify. Moreover, for the actualization of quick response, GSM module will be built in the system to monitor any leakage of gas and interpreted though SMS for quick responses.

Human Intrusion

Safekeeping procedures are very important factor regarding its protection. So the security level has moved on to the next level where all the control lies on the Holders hand. Academics have been accompanied regarding the computerized and safety of the household items and other properties. One of the main developed systems is Home Security System which is a most higher defensive means in the recent world. In this modern developed network society, each and every individual can access their information easily anytime from anywhere. Due to the difficulty faced by the current home-based security and surveillance systems in providing information on the situation while the users being away from home to give notification in case of any intrusion. This paper we also incorporate, discussed and tried to overcome this project which provides implementation of different features in the home security along with control of home automation using SMS alert to direct calls to corresponding phone number(s) following secure safety towards environment.

RELATED WORKS

Elbehiery, H., 2012 developed intelligent fire alarm system designed for the improvement of technology submissions to commercialize fire alarm market demand growth. The system comprises of control panel, alarm initiating devices, notification appliances, and the accessory equipment necessary for a complete Fire Alarm System. Simmi, S., Diwankar, S., Sanjay, S.

R., Paras, 2017 designed Fire Detection System using GSM Technology to detect the presence of a hazardous LPG leak in any environment of applications. The systems employed turning ON an exhaust fan for removing gas out from the area and sends a message as "FIRE ALERT" to the registered mobile number. Asif, O., Hossain, Md.B. Hasan, M., Rahman, M.T. and Chowdhury, M.E.H., 2014 introduced a system to alert the distant property-owner efficiently and quickly by sending short message (SMS) via GSM. Bahrudin, S.B., Kassim, R.A., Buniyamin, N. (2013) developed fire alarm system using raspberry pi and Arduino Uno that operate in real-time monitoring system and able to detects the presence of smoke in the air due to fire and capture images via a camera installed inside a room when there is any occurrence of fire. The system also has the ability to remotely send an alert when a fire is detected and will also need the user confirmation to report the event to the Firefighter using Short Messaging Service (SMS) .

Wireless sensors network was used for detection of leakage in gas tanker by Nuga, O.O., Amusa, K. A., Olanipekun, A. J., Odedina, O.T. (2016). GSM Based Gas Leakage Security Alert System. Proceedings of the 2016 International Conference on SET. A multiple gas sensing was worked upon using Taguchi sensor by Ramya, V. and Palaniappan, B.,2012. Uses Embedded system for hazardous gas detection and Alerting," in Proc. Of International Journal of Distributed and parallel system(IJDPS). The MQ2 gas sensor which is a semiconductor type material was used as a domestic gas leakage detector and sensible to LPG, isobutene and propane gases by Hanwei Eletronics (2016). The developed device has six major functional units: the power supply, the sensor, the microcontroller, the transmitter, alarm and the mechanical units and gas sensor as a detector and GSM module as agent for alert via short message is used.

The idea of domestic automation has been around since the late 1970s, but with the advancement of Internet of Things (IOT). Sadeque Reza Khan Et al (2015) proposed a home secure system which monitors the obstacle its touch, heat smoke, and sound. It collects information from the sensors and sends SMS to the corresponding number by using GSM module. It uses PIC microcontroller 16F76 that control the whole system. Viraj Mali Et al (2013), proposed a home automation and security which is of low cost by using motion sensors and GSM that employed the use of Arduino in the triggering of alarm and alert messages and send to the corresponding user through mobile phone. Sriskanthan.N and TanKarande F.

(2013), developed a home automation system using Bluetooth as a wireless technology that allows control of different appliances connected over a receiver Bluetooth in a home environment, this Technology do not provide full home security system. Bhavani Annapurna et.al developed a system using a password on digital lock, as a control system that allows authorized persons to access restricted area and RF wireless communication that transmits theft indication signals to the neighboring houses. Huang et al. designed a Home security alarm system based on Wireless sensor network and GSM technology that comprises of full duplex in terms of communication mode, this system overcomes Wide Area Network but increases operational cost. Xiang Yang et al presented the security system based on the internet which acts a real-time monitoring and controlling and used AT9ISAM9260 Microprocessor as a host controller.

RESEARCH METHODOLOGY

Hardware of the system contains sensors, Atmega644p microcontroller, sim548c (GSM module), Buzzer, in system programmer and relays to control the appliances. The system block and circuit diagram are shown below.

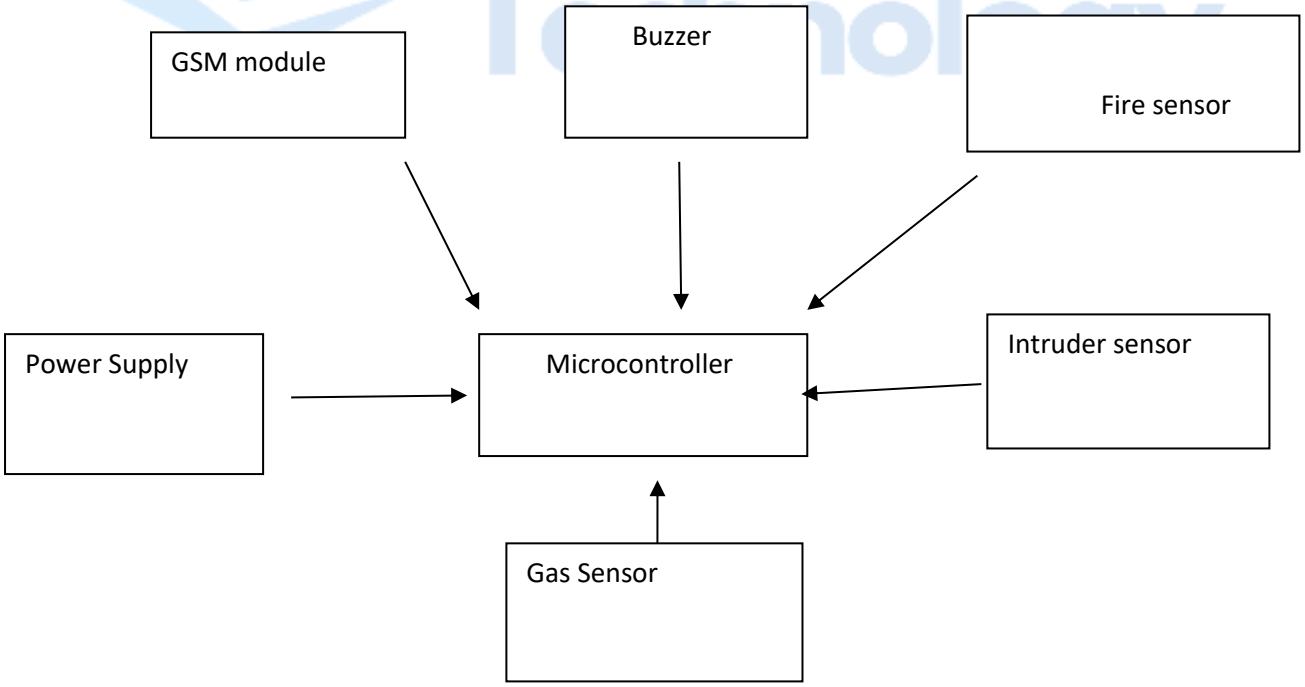


Figure 3.1: Block Diagram of Real Time Hybrid Detective Security System Using GSM Technology

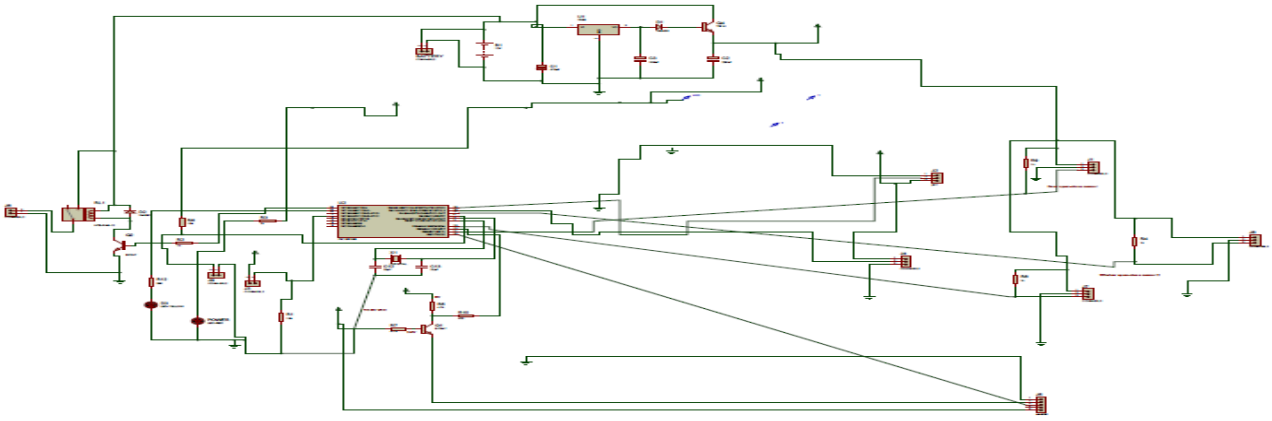


Figure3.2: Circuit diagram of Real Time Hybrid Detective Security System Using GSM Technology

The outputs of all the three sensors are connected to Analogue to Digital Converter (ADC). But for Human Intrusion, the entry from the window or door is treated as authorized / unauthorized base on the hour specified by the owner. Then, it required the use of GSM to control the system in terms of powering ON and OFF but if the system is not powered ON for twelve (12) hours an alarm will be turned ON as a reminded and immediately SMS will be send to the owner GSM specifying the non-functionality of the system. But when powered on, any human intrusion close to certain radius as specifiers by PIR motion sensors which is placed anywhere of the building where it is suitable to detect the range of 5m. This signal which detects intruder presence triggers the input of the microcontroller, an SMS message will be sent to the specified GSM Number.

For fire alarm system, it begins reading the sensors and averaging their readings to eliminate errors and also to prevent false alarms. The sensor is build and culture to maintain a specific temperature, but when temperature reading goes out of the range considered normal, transfer of control is initiated to the GSM module, and a message is sent also to the GSM specified and this gives the user a greater awareness of the environmental parameters in his residence or

office. If a combination of readings meets the preset criteria for a fire, an alert message is sent to the server because temperature is continuously monitored by the sensor, if it is high to a certain degree in case of fire, a SMS is sent ("Fire emergency") to the home owner.

For Gas Leakage, it performs a dual function by visually constructing a Light Emitting Diode (LED) to alert nearby people about the event LPG leakage and simultaneously sending a short message to a pre-defined telephone number to alert the concern people of the occurrence of the LPG leakage. It is necessary to use an MQ2 gas sensor because the sensor is capable of detecting wide varieties of domestic cooking gases like butane, propane and methane. The gas sensor is interfaced with the microcontroller so that if any gas leakage is detected at its input, it gives an output that is fed into the unit of the microcontroller. The microcontroller then generates short message as a response to the GSM module if gas sensor is ON indicating the gas leakage then SMS will be send to the owner ('Gas emergency'). Due to high spend of Gas, it is necessary to Provide automatic control unit as a third level of control such that after visual indication of gas leakage through lighting of LED and sending of short message to a pre-defined telephone number, a DC stepper motor switches off the gas supply to prevent its for further spread before arrival of fire service. There are needs to have a central sensor which generates the electrical signals and convert to GSM module using Arduino microcontroller. The functionality of the GSM depends on the network module as the transmission of the sensor rays is send using the connectivity of the internet.

MICROCONTROLLER UNIT

The control module is built with the microcontroller IC. The central controller is PIC16FH16A which is 8-bit Microcontroller with 64K Bytes and in-System Programmable Flash. It is having advanced RISC architecture. It consists of Two 8-bit Timer/Counters, one 16-bit Timer/Counter, Real time counter with separate oscillator, six PWM channels, 8-channel 10-bit ADC and 32 Programmable I/O Lines.

GSM MODULE UNIT

GSM Modem SIM900 modem, is a Quad-band GSM that can be embedded in the consumer application. The modem requires voltage in the range of 3.3V-3.9V to function. The GSM modem is interfaced with AT cellular command as well as an external subscriber identity

module (SIM) card at a voltage 3V/1.8V. Each of the microcontroller pin is at voltage of 5V. Since the modem operates at 3.9V (maximum). To interface the PIC transmitter and GSM receiver, a limiting resistor is used in series with a Zener diode. This is employed to step down 5V from the microcontroller to 3.9V (maximum) requires by the GSM modem AT Command is a communication command to talk with a GSM modem/mobile phone. AT commands are used to automatically receive the call on system from the preconfigured number and system also sends the message to preconfigured number about the type of operation as indication through AT commands.

SENSORS USED IN THE SYSTEM

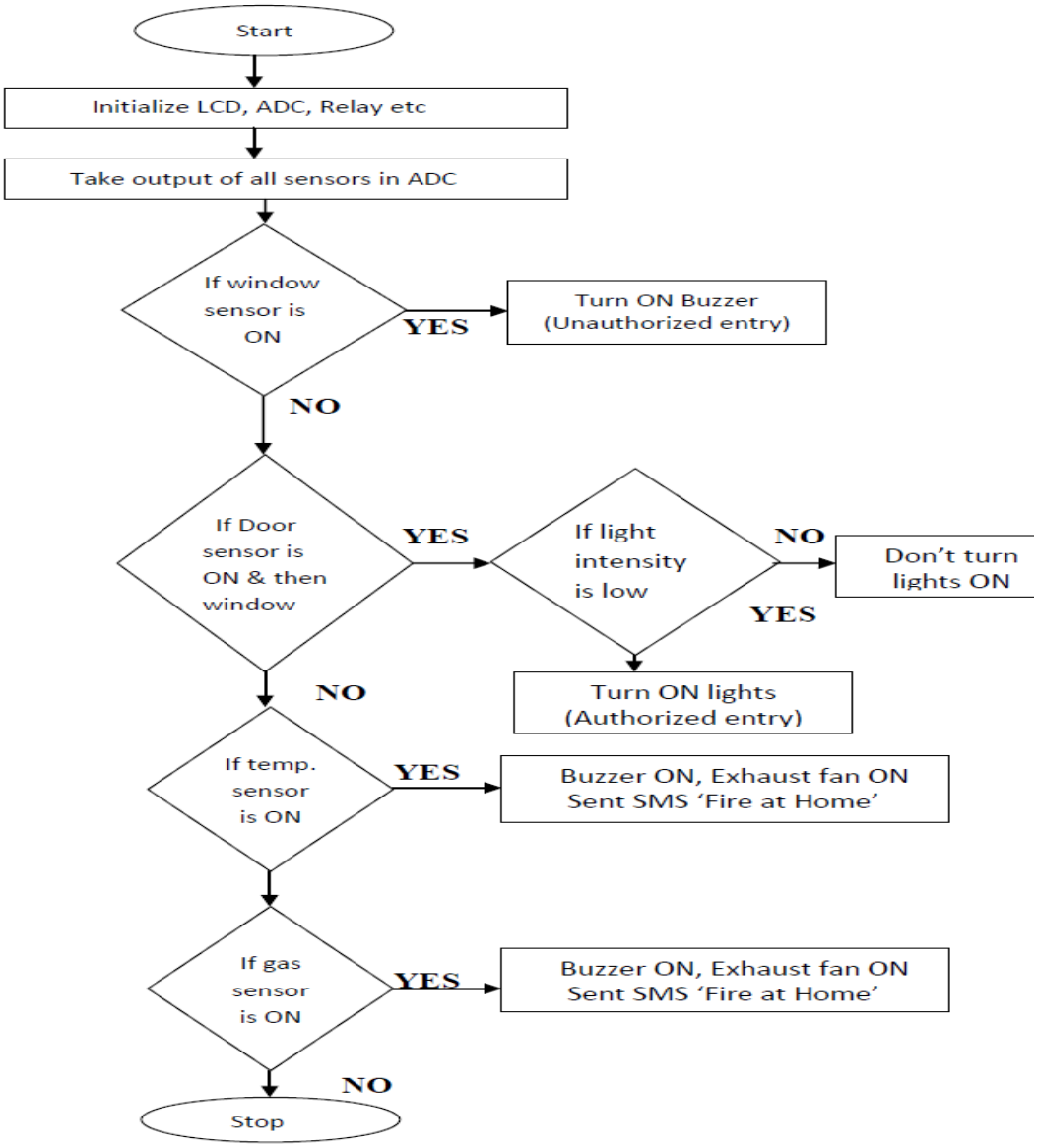
Infrared (IR) sensors are used to detect the intruder. The IR pair that is IR transmitter and IR receiver detects the obstacle within the range of 5-6 feet. The LM35 is used as temperature sensor whose output voltage is expressed in Celsius (Centigrade) temperature. It gives linear output 10.0 mV/0 C as scale factor. Light Dependent Resistor (LDR) is used as a light sensor to sense the light intensity in the room. LDR gives the output voltage corresponding to the light intensity.

SOFTWARE DESIGN

The proposed system uses AVR microcontroller, programming is done in 'embedded C' language and to download the program into AVR chip, eXtreme burner is used.

MIKROC PRO AND EXTREME BURNER FOR AVR

In this system MikroC PRO is used to develop the program for AVR microcontroller. To get the HEX file from developed C program, eXtreme Burner software is used. The flow chart of whole system is shown below.



RESULTS AND DISCUSSIONS

The proposed systems are tested on the model of home environment. The developed GSM based security system gives good response to the sensors and sends SMS when it detects the fire, Gas or temperature is increased above desired level or detection of human intrusion with in the environment. The time taken by the system to deliver the SMS depend on the strength of the Network and the coverage area of the mobile network in use.

CONCLUSIONS

Real Time hybrid detective security system using GSM Technology has been designed and tested with the mobile network. The user can get alerts anywhere through the GSM technology thus making the system location independent as far there is Network. A flexible way to control and explore the services of the mobile is the use of AT commands., and the only means of communication is full duplex through the SMS.

CONTRIBUTION TO KNOWLEDGE

This paper focuses on the security of a home in terms of Fire alarm, Gas leakage and Human intrusion where the user is away from the place and employed GSM technology to detect the intruder. The GSM technology is used to send the SMS to the owner in case of irregularities

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