Ea-Eagle's Eye on Abode

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Abstract: *In the present scenario, a building without electricity is unbearable but the worst case is that, this essential element of day-to-day life may blast the happiness of ours due to gas leakage. As all of us know that electrical switches or any electrical component on movement produce sparks and that spark is enough for the leaked gas to blast the system. Hence here we propose a system to cut off the electricity in the case of gas leakage at any cause. The so called SMART HOME does it. SMART HOME is not only with the measure of avoiding fire but also the theft. For this purpose, we sense the motion and panic the thief. In both condition an SMS intimation is sent at the absence of people in home. Mitsubishi FX series Programmable Logic Controller is being used to cut the electricity after conforming the detection of gas in the gas sensor by voting process and the motion detector sensor is used to sense the motion and that signal is given to PLC to panic the thief by sudden switch on of fans, lights and sound buzzers.*

Keywords: *Component; formatting; style; styling; insert (key words)*

I. Introduction

Home automation is the use and control of home appliances remotely or automatically. Early home automation began with labour-saving machines like washing machines. Some home automation appliances are stand alone and do not communicate, such as a programmable light switch, while others are part of the internet of things and are networked for remote control and data transfer. Hardware devices can include sensors (like cameras and thermometers), controllers, actuators (to do things), and communication systems. Remote control can range from a simple remote control to a smart phone with Bluetooth, to a computer on the other side of the world connected by internet. Home automation systems are available which consist of a suite of products designed to work together. These typically connected through Wi-Fi or power line communication to a hub which is then accessed with a software application. Popular applications include thermostats, security systems, blinds, lighting, and door locks. All these together are the automated system and is the domestic application of building automation.

A gas leak refers to a leak of natural gas or other gaseous product from a pipeline or other containment into a living area or any other area where the gas should not be present. Because flammable gases may explode when exposed to flame or sparks, this situation is very dangerous to the general public. In addition to causing fire and explosion hazards, leaks can kill vegetation, including large trees, and may release powerful greenhouse gases to the atmosphere. Hence proper measure has to be taken to avoid gas leakage are to take necessary action to withstand the cause such as giving alerts, monitoring gas etc,.Pure natural gas is colorless and odorless, and is composed primarily of methane. Unpleasant scents in the form of traces of mercaptans are usually added, to assist in identifying leaks. This odor may be perceived as rotting eggs, or a faintly unpleasant skunk smell. Persons detecting the odor must evacuate the area and abstain from using open flames or operating electrical equipment, to reduce the risk of fire and explosion. As a result of the Pipeline Safety Improvement Act of 2002 passed in the United States, federal safety standards require companies providing natural gas to conduct safety inspections for gas leaks in homes and other buildings receiving natural gas. The gas company is required to inspect gas meters and inside gas piping from the point of entry into the building to the outlet side of the gas meter for gas leaks. This may require entry into private homes by the natural gas companies to check for hazardous conditions.

An anti-theft system is any device or method used to prevent or deter the unauthorized appropriation of items considered valuable. Theft is one of the most common and oldest criminal behaviors. From the invention of the first lock and key to the introduction of RFID tags and biometric identification, anti-theft systems have evolved to match the introduction of new inventions to society and the resulting theft of them by others.

A first approach gas detection instruments are products of safety technology and are used preferably to protect workers and to ensure plant safety [1]. Gas detection systems are dedicated to detect dangerous gas concentrations, to trigger alarms and – as far as possible –before it can come to a hazardous situation for employees, assets and environment. Gas detection instruments may be portable (or semi-portable) gas measuring instruments or fixed installed gas detection systems. The safety of an area potentially being affected

by dangerous gases and vapours to a high degree depends on the reliability of the gas detection system, and especially on the quality of the sensors being used. In opposite to sensors of portable devices fixed installed sensors including their electronics are continuously in operation year for year for 24 hours a day – just to be available for the instance of a random gas release. And this even under extreme environmental conditions, at e.g. - 50 °C or + 65 °C, at high relative humidity or even very dry atmospheres, in outdoor applications with rain, storm and snow or hot desert conditions, electromagnetic disturbances or strong vibration ... And – selfevident – explosion protection must not be an issue and measuring performance shall only be affected insignificantly. As shown in the graphics, there is a fluent crossover between gas detection technology on the one side and process instrumentation on the other side. Although developed as a product of safety technology, there are certain gas detection transmitters having so excellent measuring performance characteristics that today they even show up more and more as analyzing instruments in the field of process instrumentation.

The leakage of dangerous and flammable gas like LPG in cars, service stations, households and in storage tanks can be detected using the gas sensor unit[3]. This is detected by the microcontroller and buzzer is turned on. After a delay of few milliseconds, the exhaust fan is also turned on for throwing the gas out and the main power supply is turned off. A message ‗LEAKAGE' is sent to a mobile number that is predefined.In order to tackle the increase in robbery cases in houses and offices, this system with the help of two microcontrollers ATMEGA 8515, sensors, magnetic switch (reed switch) transmitter and receiver can form elements to protect our houses from the astute minds of thieves. The user will be carrying the receiving module, whenever he/she steps out of the house. This module will encompass receiver, microcontroller, LCD and a buzzer. The transmitting module will be equipped with sensors, reed switch, microcontroller and transmitter. There is constant monitoring between the transmitter and receiver and as soon as some moment is detected by the sensors or reed switch, immediately the buzzer will go ON and the user will come to know about the activity through LCD. The user needs to cut off the battery whenever he/she accesses the doors and windows as it can trigger the buzzer, which is not necessary at that moment. This system can also be successfully brought into implementation at places like offices, shopping malls (for protection of products kept on display), ATM's etc. But the drawbacks are it catches fire when sparks comes, only alarm indication is given and theft indication is given only after lost of items.

II. Proposed System

To remotion the drawback of the existing paper we include a voting process for Gas detection(MQ2 Sensor) and cut off the electricity and for a low value of gas leak exhaust fan is ON to draw down the gas out. This will trim down the chance of getting fire. The presence of human race by a break up of security set up will be detected by using a motion detector (PIR Sensor) and intimation is given to the particular person along with sudden turning ON of light, fan, sound buzzer to make the theft panic and get run off.
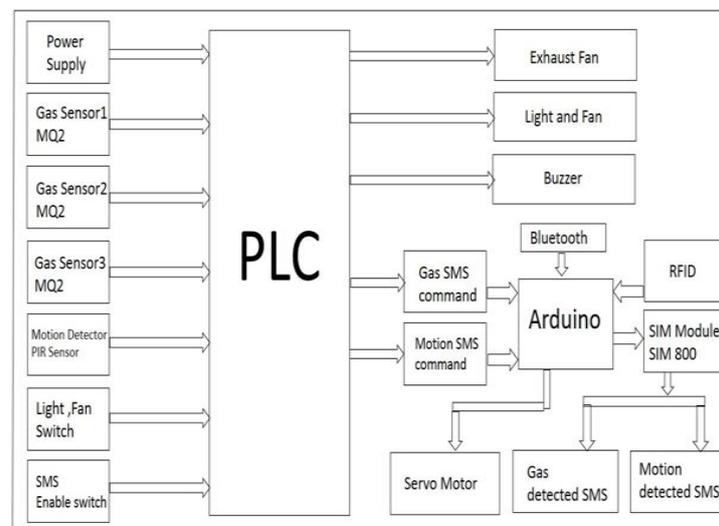

Fig. 1: Block diagram

Input Devices: The input devices connected to PLC are as follows: Gas Sensors (MQ2),Motion Detector (PIR Sensor),Light and Fan Switches and SMS Enable Switch.Output Devices: The outputs connected to PLC are as follows: Exhaust fan, Light and Fan, Buzzer and SMS command enable signal. The Logic for electricity shut down is as follows:
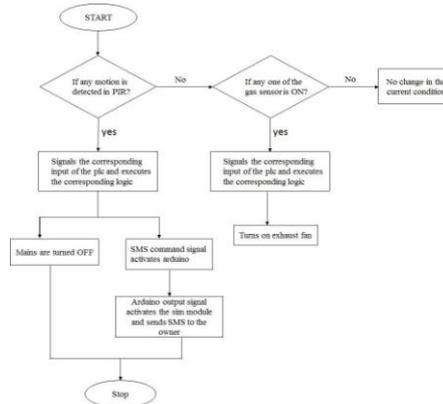
Fig. 2: Flow chart for Gas detection by voting process

In the absence of gas detection: Light and Fan will switch ON only when their respective switches are ON.
When a little amount of gas is detected (i.e. when only anyone Gas Sensor is ON): The Exhaust fan will switch ON. *When a more amount of gas is detected* (i.e. when two out of three Gas Sensors are ON): The SMS Command is obtained from the PLC and it is given to the Arduino board that is connected with the SIM Module, to send SMS to the particular person about the situation.

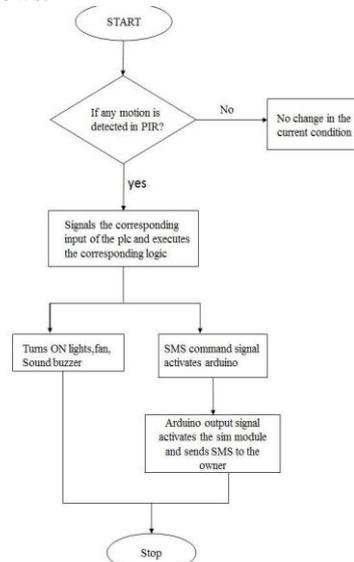The Logic for theft detection is as follows:

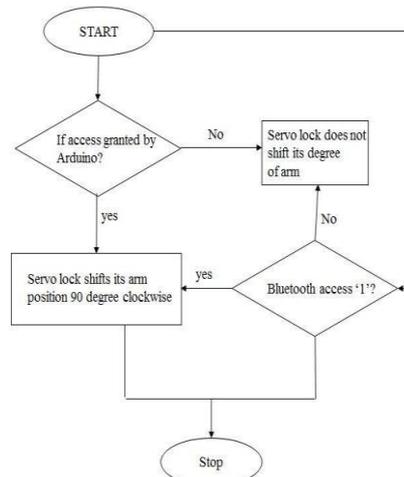**Fig. 3:** Flow chart for theft detection

Fig. 4: Flow chart for door access

The RFID is connected to the Arduino to access the door. The ID card is used to open and close the door using servo motor. This door access can also be done using Bluetooth module and an inner switch for accessing the door manually. When motion is detected, the SMS Command is obtained from the PLC and it is given to the Arduino board that is connected with the SIM Module, to send SMS to the particular person about the situation.

III. Hardware Specification

Gas sensor MQ2 works based on the conductivity change when the gas exist in it. The conductivity of the gas sensor will be low for clean air. Its conductivity will be more on combustible gas.

Case 1: Any One Gas: In the presence of low leak grade LPG gas, any one of the Gas sensor will be activated and hence the exhaust fan will be turned ON.

Case 2: Two Out Of Three:In the presence of high amount of gas present in a particular place, any two out of three or all the three Gas sensor will be activated and hence the total power will be shut down so as to prevent fire due to spark in the electrical contacts.

Motion detector (pir sensor): It is basically made up of a pyroelectric sensor which can detect levels of infrared radiation. The sensor in a motion detector is actually split in two halves. This is because we look to detect motion(change) not average IR levels. The motion detected is enabled only when the SIM enable switch is ON. The detected signal is sent to PLC via 6V Relay contact because of different operating voltage. Relay module: A relay is usually an electromechanical device that is actuated by an electrical current. The current flowing in one circuit causes the opening or closing of another circuit. Highly sophisticated relays are utilized to protect electric power systems against trouble and power blackouts as well as to regulate and control the generation and distribution of power.

Lights and fan switch: For the purpose of turning ON the lights and fan a separate switch is provided which will remain OFF during the two out of three logic even when the switch is ON.SMS enable switch: In order to block the SMS when the individual is at home a switch is installed this should be turned ON when there is no one in the home. So that on the emergency situation the set up can send SMS to the owner.Programmable Logic Controller: Programmable Logic Controller is a controlling device used in the field of Automation[4][5]. These plc's are easily programmed using ladder logic. Any changes in the logic after execution can be easily done by changing the ladder logic instead of rewiring as of other system. Mitsubishi FX-1S series uses GX Developer (MELSEC) software to develop the ladder logic.

Arduino: The Arduino Mega 2560 is a microcontroller board based on the ATmega2560(datasheet). It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

RFID: A Radio-Frequency IDentification system has three parts: scanning antenna, transceiver with a decoder to interpret the data, transponder - the RFID tag - that has been programmed with information. On sensing the access card the no. in the chip the access card is verified with the no. in Arduino program and door access is enabled.

SIM module: Once the SIM is enabled by sensing the nearby signal the command from the Arduino will send the SMS.

Bluetooth module: Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices and building Personal Area Networks (PANs). The Bluetooth connected door accessed as follows: by giving 0 it locks and on giving 1 it opens.

Servo motor: A servo system mainly consists of three basic components - a controlled device, a output sensor, a feedback system. This is an automatic closed loop control system. Here instead of controlling a device by applying variable input signal, the device is controlled by a feedback signal generated by comparing output signal and reference input signal. The servo motor is used to lock the door. It gets signal from the Arduino board to lock and unlock using the RFID process.

IV. Result

The access card is showed to the RFID attached. This will check for the card number in the chip located in it. Then by matching the numbers the access is granted. That indication is given by glowing the white LED. The access is not granted , if both the number is un matched. That indication is given by glowing the red LED. The servo motor gets input signal as the access card is showed and the 90 degree rotation of arm will help to open the door. If the card is un-accessed card the door will remain closed. Any one gas detection: The output condition is being showed with the Mitsubishi FX 1s series. The any one gas activation is showed by red LED in the one of the input and the corresponding output is ON. The Exhaust fan is ON by the action of any one gas. This will help to get the low leak grade gas out by the air movement action.

Two out of three gas detection: The output condition is being showed with the Mitsubishi FX 1s series. The two out of three gas activation is showed by red LED in the two of the input and its corresponding output is ON.
On detecting the gas the Mitsubishi FX 1s series will control the power drop in order to prevent the sparks through the switches.

The SMS enable switch should be ON for the process of SIM module. The two out three logic will end up with the sms command from the Mitsubishi FX 1s series Programmable Logic Controller, that in turn is sent to the SIM module via Arduino to send the SMS to the owners number about the situation. Motion detected: The output condition is being showed with the Mitsubishi FX 1s series Programmable Logic Controller. The PIR sensor activation is showed by red LED in the input and its corresponding output is ON.In order to panic the thief the sudden glowing of Lights and turning on Fan alarming the sound buzzer is done by output from Mitsubishi FX 1s series Programmable Logic Controller. The sms enable switch should be ON for the process of SIM module. The motion detected logic will end up with the sms command from the Mitsubishi FX 1s series Programmable Logic Controller that in turn sent to the SIM module via Arduino to send the SMS to the owners number about the situation.

V. Conclusion and Future Enhancement

The ultimate aim of reducing the cause for fire is reduced by this project proposal of EA-EAGLE'S EYE ON ABODE. Thus when the gas is leaked the electricity is shut down hence spark from switches is eliminated. The entire process is controlled with the help of Programmable Logic Controller. The motion detected is sent to PLC to PANIC the thief. SIM Module is used to give the intimation via SMS to the default number saved in the module. This process of detecting gas can be expanded to the Industry purpose as well as Shopping complex, Mall, Cinema theatres. The Anti-theft can be used in the Bank as well financial lockers.

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