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IOT Based Industrial Plant Safety Gas Leakage Detection

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Abstract: ***Most of the fire-breakouts in industries are due to Gas leaks. These cause dreadful damage to the equipment, human life leading to injuries, deaths, and environment. Currently Available leakage detectors warn the people around using on-site alarms. So, this project proposes a leakage detector which sends the warning to the concerned people through SMS. This detector senses the presence of harmful gases particularly, LPG, Methane and Benzene. LPG and Methane gases catch fire easily resulting in blasts. Benzene is carcinogen effecting the health of workers, if inhaled in higher concentrations. Hence, detection of these gases is essential. This low-cost project includes MQ6, MQ4 and MQ135 gas sensors which detect LPG, Methane and Benzene gas leaks respectively and uses ESP-32 as a Wi-Fi module. The Concentration levels of the above-mentioned gases are uploaded in the firebase cloud and the login details are included in the alert message so that the user can check, if needed.***
Keywords: Sensors, ESP-32, IOT cloud(firebase).

I. INTRODUCTION

In this project, it is necessary to continuously store the data with real time. Monitoring system is used in such places. This device measures the data and displays it with real time and keeps storing it in on cloud . The data are various parameters of Sensors If consider this varying input has to be studied, we can do it by knowing the different readings at different time period with the help of the data sent to the cloud. This data gets stored, plotted, imported, exported with the help online API named Thingspeak.com or if you are using google firebase then depends on project requirement, we can change the GUI of Android application. This system even monitors whether the input is within specific limits or else there is an alarm warning for it at the Transmitter.[3] The microcontroller will display on the display which is 16x2 LCD (liquid crystal display). This information will be sent to cloud with help of Wi-Fi module i.e esp8266. There will be specific limits set inside the microcontroller for the data. Consider if the data goes above this limit, the buzzer will make noise and the range of the data will be shown as out on the display. When no input is outside the limit, the LCD will have the range shown as in. When any input goes beyond limits, the corresponding input range will be shown as out. The buzzer will have beeps if one input is out of limits and will produce noise continuously if all the inputs are outside limits.[3] The data is sent to the esp8266 continuously. For safety purpose fan will on and door will be close thorough application.

II. METHODOLOGY STEPS

In the proposed framework. The gas sensors MQ4 are connected to the Arduino microcontroller. These sensors work in the favor of the framework. The gas levels of each and every sensor is displayed on the LCD device connected to the proposed system[2]. The Relay module to send the alert messages to the concerned authority. This system is extraordinary as it accumulates two-layer security which comprises auto-air ventilation and automatic door locking mechanism is also present for added security. The framework includes the system's hardware and software activities. To encompass the working in detail, all the points are elucidated in brief in the section below

A. System software

1) Arduino Programming Software

Arduino IDE is a special software running on your system that allows you to write sketches (synonym for program in Arduino language) for different Arduino boards. The Arduino programming language is based on a very simple hardware programming language called processing, which is similar to the C language

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

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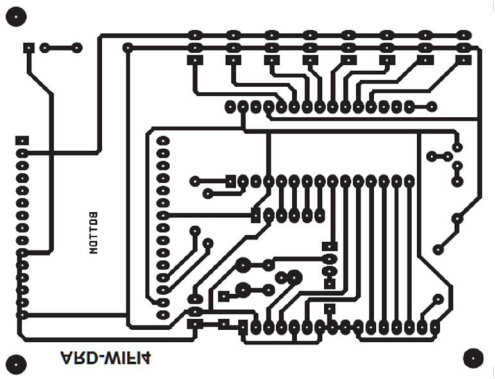
The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

2) Arduino Wi-Fi Pcb



B. System Hardware

1) MQ4

This semiconductor gas sensor detects the presence of methane (CNG) gas at concentrations from 300 ppm to 10,000 ppm, a range suitable for detecting gas leaks. The sensor's simple analog voltage interface requires only one analog input pin from your microcontroller. This methane gas sensor detects the concentration of methane gas in the
air and outputs its reading as an analog voltage. The concentration sensing range of 300 ppm to 10,000 ppm is suitable for leak detection. For example, the sensor could detect if someone left a gas stove on but not lit. The sensor can operate at temperatures from -10 to 50°C and consumes less than 150 mA at 5 V.

2) ESP8266 wifi Model

ESP8266 is a wifi SOC (system on a chip) produced by Espressif Systems . It is an highly integrated chip designed to provide full internet connectivity in a small package. ESP8266 can be used as an external Wifi module, using the standard AT Command set Firmware by connecting it to any microcontroller using the serial UART, or directly serve as a Wifi-enabled micro controller, by programming a new firmware using the provided SDK. The GPIO pins allow Analog and Digital IO, plus PWM, SPI, I2C, etc. This board has been around for almost a year now, and has been used mostly in IoT contexts, where we want to add connectivity for example to an Arduino project. A wide adoption has been facilitated by the very modest price, ranging from 2.50 to 10 USD depending on the features offered by the manufacturers.

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3) Buzzer

Buzzer having a piezo buzzer. It is basically a small speaker when electricity passes certain crystals will change shape, if we applied certain frequency to the electric signal then that crystals make sound in our project we are using a buzzer as a notification alarm.

4) Relay Model

For the relay model we need to have a 12V power supply.it separate the hardware devices from remote device switching.By using relay model we can control devices over a network.It connected to the arduino.by using Relay model we can connect the ventilation fan and the door

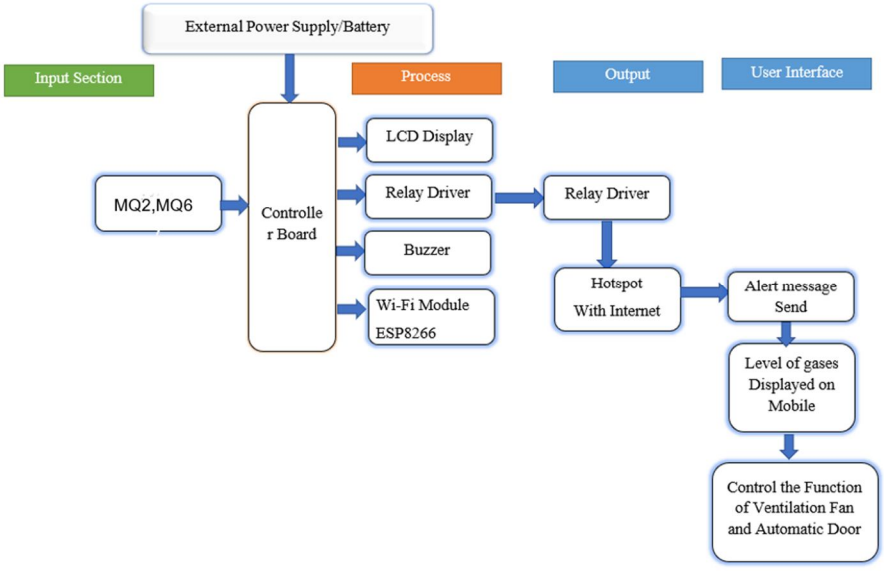
a) Ventilation Fan: For Fan we required a 5v power supply. We are using fan for to reduce the exceed limit of gases.

b) Door: Functioning of door we required a 5v. for evacuating the peoples.

5) LCD Display

It shows output of the project (for example gas is leaked,gas limit is exceeded)

C. Implementation Diagram



III. ADVANTAGES AND DISADVANTAGES

A. *Advantages*

1) It is easy to design and manufacture as all the components are easily available.
2) It is highly accurate and precise and also very reliable.
3) It is portable and hence can be placed anywhere.
4) The use of a micro-controller increases its scope of applications and modifications.
5) It has low cost of manufacturing
6) The Microcontroller can be reprogrammed if any modification is required.
7) power consumption is less

B. *Disadvantages*

1) If the power supply fails, the system won't work .
2) Failure of device/components may have dire consequences, fatal accidents can occur.

IV. RESULT AND DISCUSSION

The end-result of the sensors are displayed on the LCD screen. If the gas leakage is detected, the buzzer will be switched on and will start beeping, meanwhile the associated software will send the alert message to the concerned authority via SMS (Blynk Software). As soon as the SMS is received by the particular, the ventilation fan will be switched on and after evacuating the people from that area the automatic door will be shut close to avoid dreadful situations.

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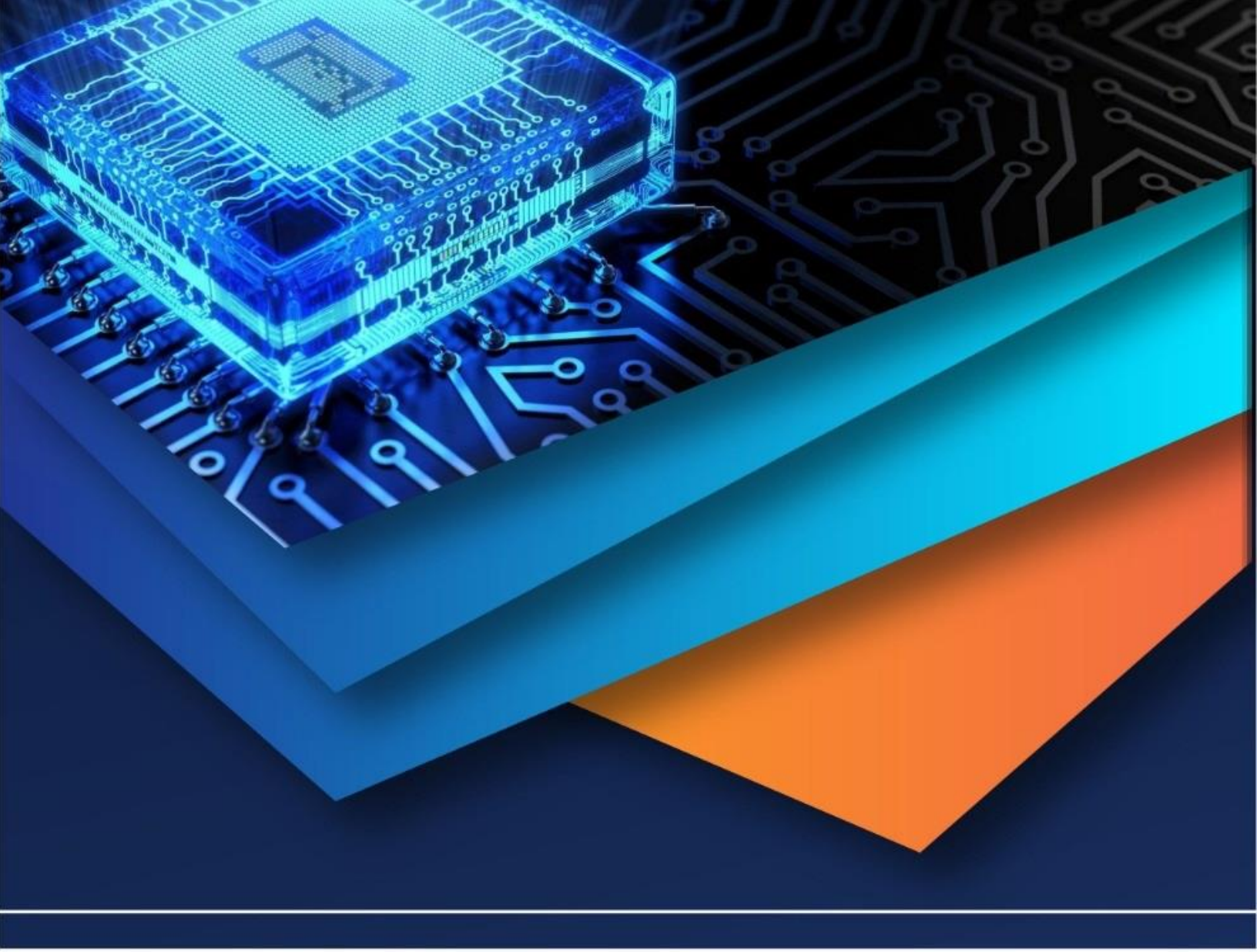

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