IOT Based Industrial Parameters Monitoring and Controlling Systems

Hritik Biswas	Department of Electrical Engineering, Marathwada Mitra Mandal's College of Engineering, Pune, Maharashtra, India
Atharva Ghodvaidya	Department of Electrical Engineering, Marathwada Mitra Mandal's College of Engineering, Pune, Maharashtra, India
Madan Gughe	Department of Electrical Engineering, Marathwada Mitra Mandal's College of Engineering, Pune, Maharashtra, India
Utkarsh Kadu	Department of Electrical Engineering, Marathwada Mitra Mandal's College of Engineering, Pune, Maharashtra, India
Prof. A.M.Suryawanshi	Assistant Professor, Department of Electrical Engineering, Marathwada Mitra Mandal's College of Engineering, Pune, Maharashtra, India

ABSTRACT

Safety is very paramount in any industry, especially with manufacturing, forging industries and many others .Therefore we intend to aid these problems in industries by developing a safety parameters monitoring and controlling system, and making it more capable and user friendly by inclusion of IoT. We believe that a system should be well automated so that a new user or a new employee who has no prior experience in controlling a unit should be able to get acquainted very easily.

With the help of IoT, administrators will come to know the live status of a unit on which a parameters monitoring and controlling system is installed, it can be done via mails, or if a person is present there they can observe themselves. For example we can set temperature to a certain limit and if temperature exceeds beyond the set limit, the fans or other cooling system will start automatically. This system will also have gas sensors, flame sensors as well as radiation sensors. We are using Arduino UNO ATmega 328 as a controller for this system.

Lastly the administrator will have records or logs of the parameters fluctuation and other activities at a particular time so it will be ready for reference in future and this will help the administrator to take security measures.

Keywords: IoT, Arduino, Automation, Remote Access, Controller, Safety, Energy, Sensor, Flexibility, Temperature, Light, Resistance, Data Logging, Light Intensity.

Introduction

Technology development is an unending process and hence it is necessary for us to be well equipped and aware of the new upgrades in technology. These technological changes have thus brought ease in daily human life. Automation has become the need of the day. Today all the data is available on the internet and web technology is growing very fast. Embedded systems with web technology provide remote management and controlling of embedded devices via network interface, Internet of Things (IoT) etc. Devices are controlled by a web controller or E- controller, which is the most renowned method for web development over the world. Remote login and monitoring by building a distributed web control system with the help of web pages built in web applications is now used instead of using big server systems for monitoring, managing and handling data.

These kinds of web control systems with IoT are characterized by: Energy Saving, Comfort, and Efficiency. Our basic objective is to apply the Internet control system to the Internet of things, such that the customers can use the application from any place around the world with the help of Internet facilities.

Components

COMPONENTS	TYPES	SPECIFICATIONS
Gas Sensor	MQ135	5V,20°C 10-300ppm for NH3 and Alcohol. 10-1000ppm Benzene
Flame Sensor	LM393	5V, 15mA, 760-1100nm wavelength
Radiation Sensor	LDR	100mW,540 nm, 10 Lux
Temperature Sensor	LM35	5V, 10mA (-60° to 150° C)
Controller	Arduino UNO AT mega 328	5V,50mA, 16MHz,6 pins
Buzzer		3V,25mA
Fan		12V DC
LED		3V, 25 mA

Software:

NI-LabVIEW:

LabVIEW is a graphical programming environment engineers use to develop automated research, validation, and production test systems.

Working & Operation

The system works in 4 phases of operation. The 1st phase is *DATA ACQUISITION*. The sensors used for this purpose are *GAS SENSOR, TEMPERATURE SENSOR, FLAME SENSOR, and LIGHT SENSOR*. These sensors are used to collect real time data on the respective parameters which are then feeded to the controller. The 2nd phase is *DATA PROCESSING*. The data acquired by the sensors are compared to the set safety limits by the users depending on the area of application. The 3rd phase is *DATA LOGGING.*

The data collected in real time is then sent to the user via email. The user has also got the facility to monitor the sensor acquired data in real time via IOT. The 4th phase is *SAFETY ALERT.* In this phase the user or the individuals working in the area of deployment is made aware of the crisis via different arrangements and basic preventive measures are triggered as well. \

The real time monitoring can be also done via a *DIGITAL MONITORING PANEL* made using *NI-LabVIEW.* The panel has also got a secondary panel called *SETTING*. This panel has got a feature which gives the immediate user flexibility to set the safety limit as per the conditions in area of deployment.

The *DIGITAL MONITORING PANEL* and *SETTING* panel are explained in detail in the following paragraphs.

Simulation

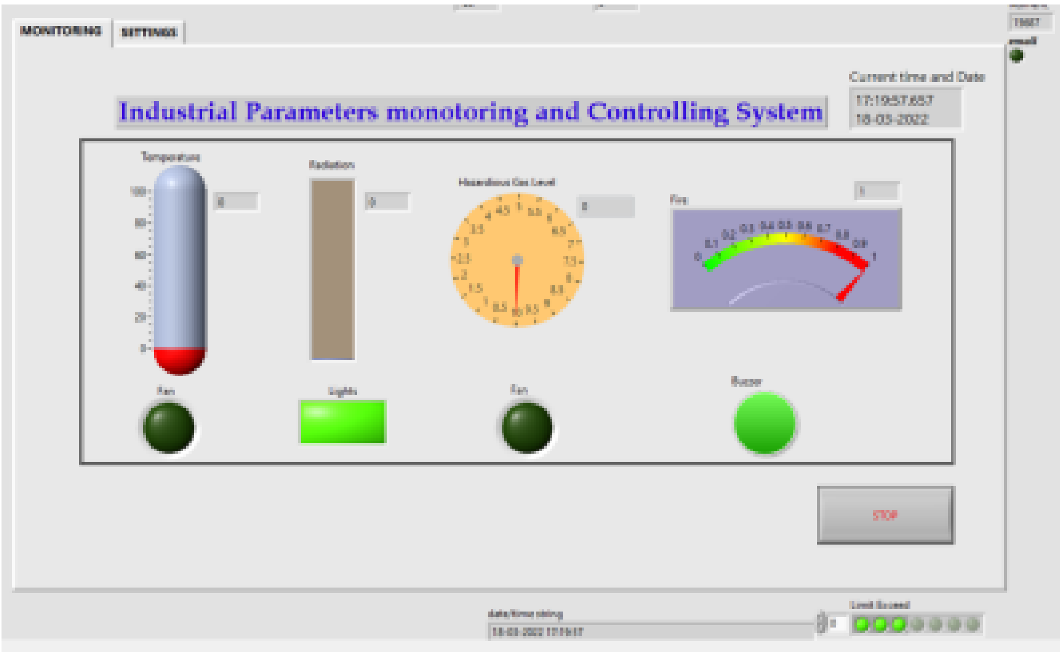

Fig.1 Front end of the display panel.

The panel has parameters displays such as *TEMPERATURE, LIGHT INTENSITY, HAZARDOUS GAS LEVEL* and *FIRE DETECTOR.*

The panel has also got a start/stop button to run the systems at required time to monitor the given attributes. It has also got a *TIME* and *DATE* for *SYSTEMATIC DATA LOGGING*. The system is also capable of sending the user with notification via email. The panel has got another window called *SETTING*. The setting window gives the flexibility to the user to *SET THE LIMIT* to activate the safety/alarming systems. The *SETTING* window is explained in detail in the following paragraphs.

The first display (from left to right):

- **Temperature:**

The temperature display shows the real time temperature in the deployed area. *LM35* is used to monitor the temperature. The limit for safe temperature is set on the setting page. Once the temperature exceeds the given temperature limit, the safety fan is activated automatically to cool down the affected area. Once the temperature goes below the safety limit the safety fan is turned off.

- **Radiation/Light Intensity:**

The light intensity sensor is used as a power saving smart sub-system. This sub-system is designed in such a way that the light would be turned on only when the ambient light would be less than the specified limit. Thus resulting in power saving. *LDR* is used for this application.

- **Hazardous Gas Sensor:**

Hazardous gas leaks are one of the common occurrences in manufacturing, metallurgy, and chemical industries etc. We have used an *MQ-135 sensor* to detect the hazardous gas level in the working area and as soon as the safety limit is crossed, the safety fan is turned on to provide adequate ventilation.

- **Flame/fire Sensor:**

LM 393 is the flame sensor used in our system. The working of this part is quite simple as soon as the *sensor detects fire*, a *buzzer* which acts as a safety alarm to alert the individuals in the vicinity.

Fig.2 Back panel where safety limits can be set

This is the settings panel of the system. The parameters like *TEMPERATURE, HAZARDOUS GAS,* and *LIGHT INTENSITY* can be set using this panel. This feature gives the user the *flexibility* to set the parameters as they desire in accordance with the equipment that this device is being implemented to. The path to save the *data logging* file can also be set using this panel.

Conclusion

The prototype systems worked as expected throughout the parameters. The feature to allow the limits to be set by the user seems to be providing significant operational flexibility for the system. This flexibility makes the system deployable in a number of scenarios as per requirement. The project has also proven that it has got potential to be scaled up to cater the demand and more and more sensors and sub-systems can be integrated as well.

References

1. Connecting Arduino Uno to PC to Use with Lab VIEW :
2. https://knowledge.ni.com/KnowledgeArticleDetails?id=kA03q000000YHeQCA W&l=en-IN
3. Introduction to the LabVIEW Programming Environment: https://www.ni.com/en-in/innovations/videos/10/introduction-to-the-la bview-programming-environment.html
4. For programming Arduino:
5. https://knowledge.ni.com/KnowledgeArticleDetails?id=kA03q000000YHeQCAW&l=en-IN
   Arduino cloud IoT:
6. https://docs.arduino.cc/cloud/iot-cloud
7. Using sensors with Arduino:
8. https://create.arduino.cc/projecthub/JANAK13/using-sensors-with-ar duino-eab1ec
   Monitor and Log Data with LabVIEW Real-Time:
   https://knowledge.ni.com/KnowledgeArticleDetails?id=kA03q000000x2DACAY&l=en-IN
9. ThingsSpeak for IoT Projects: https://thingspeak.com
   LabVIEW with Arduino: https://thingspeak.com/channels/158804