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IOT BASED INDUSTRIAL AUTOMATION SYSTEM USING ARDUINO UNO

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Abstract— Monitoring and Control is the main entity of the any field which can ensure for effective performance, hence its importance is rising exponentially in this modern era. There are millions of industries in all over the world, where different parameters and measures are to be placed within the limit. Variations on these values may lead to ceasing of performance or even the destruction of the equipments. Hence, those are to be monitor in real time and control whenever it is needed. In some industries proper maintenance of the controlling system or industrial devices is crucial to deliver an uninterrupted output. So to reduce the maintenance costs and to optimize critical monitoring system GSM Based Industrial Automation Technology is used.

Process Control and Monitoring system is developed to monitor the process value and control the values on needed without human interface. Thus, it can be defined as a mechanism removing as much human interaction as technically possible and desirable in various domestic processes and replacing them with programmed electronic systems. This Embedded systems are electronic devices that incorporate microcontroller with in their implementations .

***Keywords*— Critical Monitoring System (CMS)**

I. Introduction

The main purposes of the microcontroller are to simplify the system design and provide flexibility. Having a microcontroller in the device means that removing the bugs, making modifications, or adding new features are only matters of rewriting the software that controls the device. Or in other words embedded computer systems are electronic systems that include a microcomputer to perform specific dedicated applications. An emerging technology brought about rapid advances in modern wireless telecommunication, Internet of Things (IoT) has attracted a lot of attention and it is expected to bring benefits to numerous application areas including industrial WSN systems, and healthcare systems manufacturing. Wireless sensor networks (WSN) have been employed to collect data about physical phenomena in various applications such as habitat monitoring, and ocean monitoring, and surveillance. WSN systems are well-suited for longterm industrial environmental data acquisition for IoT representation. Sensor interface device is essential for detecting various kinds of sensor data of industrial WSN in IoT environments. It enables us to acquire sensor data. Thus, we can better understand the outside environment information.

II. METHODOLOGY

The system consists of Arduino board UNO R3 which is a microcontroller. To access the internet network we require the internet connectivity which is provided by WiFi module ESP8266.To sense gas leakage with in industries we used the MQ-6 gas sensor. For alerting we used the Buzzer, to monitor the temperature the LM35 temperature sensor also used along with it. In order to measure the pressure around the area, we used Pressure sensor interfaced with the arduino. To monitor the live data we used the application called arduino and thing speak server. To monitor the data the values of sensor are uploaded over the thing speak server through which the controlling of various devices is also possible. The common Access point like router is used to provide the internet connectivity for system as well for user is used like router.

A. *Block diagram*

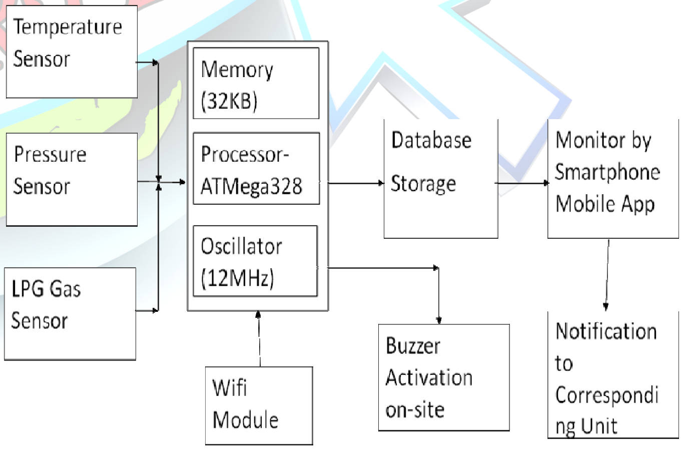

Fig 1: Block diagram Industrial Automation

B. *Hardware*

1. THERMOCOUPLE SENSOR

The thermocouple sensor measures the popular thermals, which are composed of the two different metal alloy wires. By combining the two different metals will generates the strong voltage which is the same capacity as

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a temperature. In general, the thermocouple gives the vast measurement ranges and they are worked by using the Seebeck effect. The Seebeck effect invested for changing the temperature in the electrical circuit. The sensor reads the temperature by taking the measurement of voltage output.

Fig 3: Thermocouple Sensor

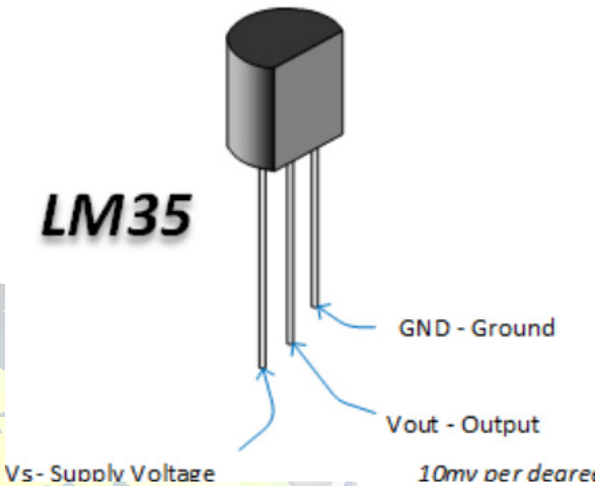

Fig 2: Temperature Module LM35

2. TEMPERATURE MODULE LM35:

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature Sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full – 55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µ A from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a – 55°C to 150°C temperature range, while the LM35C device is rated for a – 40°C to 110°C range (– 10° with improved accuracy). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package. The LM35D device is available in an 8-lead surface-mount small-outline package and a plastic TO-220 package

3. ARDUINO BOARD:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. 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. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter. With the help of this we can directly communicate with the PC or computer. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. in our paper we use Arduino board since it has inbuilt ADC so we no need to interface external ADC to connect with sensor, since most of the sensor gives their output in analog form. This board is also simple for programming it does not need any external programmer or burner to burn the program in microcontroller. Since it has 32kb flash memory so we can save our program as well as we can change the program according to our requirement.

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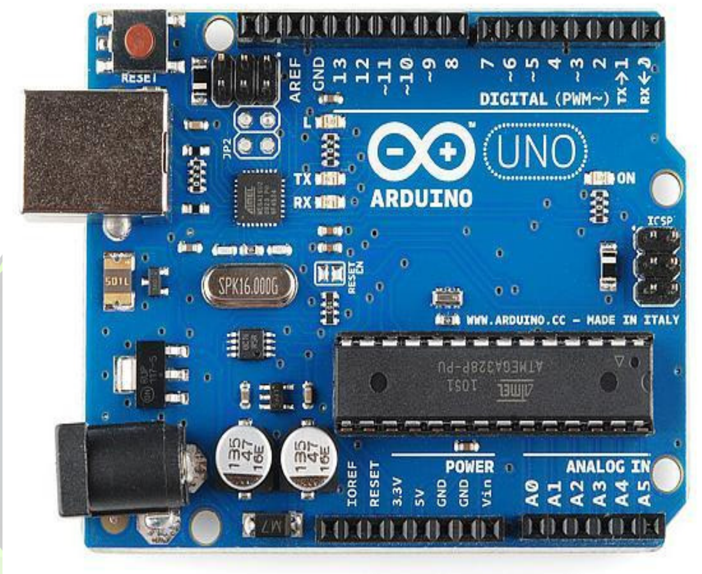
Feature of Arduino Uno board

- Microcontroller ATmega168 or 328
- Operating Voltage 5V
- Input Voltage (recommended) 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin 40 mA
- DC Current for 3.3V Pin 50 mA
- Flash Memory 16 KB (ATmega168) or 32 KB (ATmega328) of which 2 KB used by bootloader

Fig 4:- Arduino Uno Board



4. PRESSURE SENSOR:

A pressure sensor is a device which senses pressure and converts it into an analog electric signal whose magnitude depends upon the pressure applied. Since they convert pressure into an electrical signal, they are also termed as pressure transducers Since a long time, pressure sensors have been widely used in fields like automobile, manufacturing, aviation, bio medical measurements, air conditioning, hydraulic measurements etc. A few prominent areas where the use of pressure sensors is inevitable are The computer devices and smart phones that have touch screen displays come with pressure sensors. Whenever slight pressure is applied on the touch screen through a finger or the stylus, the sensor determines where it has been applied and accordingly generates an electric signal that informs the processor. Usually, these sensors are located at the corners of the screen. So when the pressure is applied, usually two or more such sensors act to give precise location information of the location In automotive industry, pressure sensors form an integral part of the engine and its safety. In the engine, these sensors monitor the oil and coolant pressure and regulate the power that the engine should deliver to achieve suitable speeds whenever accelerator is pressed or the brakes are applied to the car.

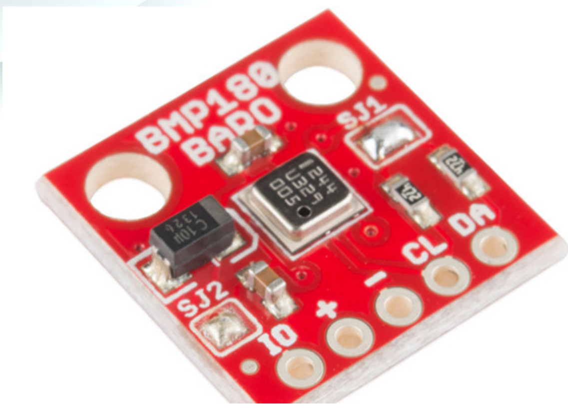


Fig 5 : Pressure Sensor

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5 GAS SENSOR:

The Gas sensor composed by micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-2 have 6 pin, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

The MQ6 gas sensor detects concentration of gas in ppm and outputs analog value which can be converted to digital measure using in-built Analog to Digital Convertor of Arduino. The value of the digital measure will be 10-bit long and varies from 0 to 1023. The project allows user to set the dangerous level for leakage based on the same digital measure. When the value set by the user matches with that of the value detected by the sensor, it invokes the alarm. The MQ6 sensor can be calibrated by interfacing a load resistance of fixed value with the sensor.

The entire project is built on Arduino UNO. The program code running the project is developed on Arduino IDE and burnt to the board using AVR Dude.

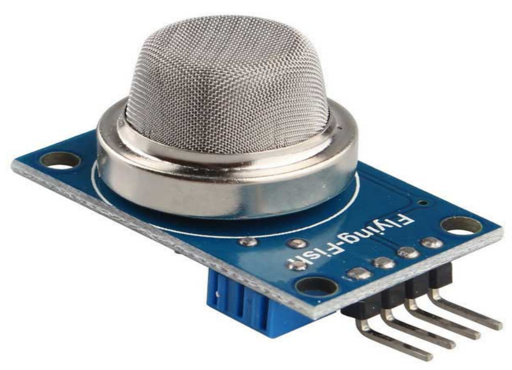

Fig 6 : Gas Sensor

6 WIFI MODULE

Low-power, low-cost Wi-Fi modules have changed the landscape of wireless sensor networks. Autonomous, Wi-Fi sensors connect to common, widely available wireless network infrastructure. They send sensor data over standard TCP/IP making their information anywhere in the world from any computer or smart phone.Previously, wireless sensors networks have been built on top of proprietary protocols running on sub-gigahertz radios. These systems have the benefit of covering long distances however they are closed systems. Likewise sensors networks based Zigbee radios are also closed system. Both of these wireless sensor networks require additional gateway hardware devices to get sensor data onto the internet or users LAN. Gateways introduce a single point of failure and additional cost.

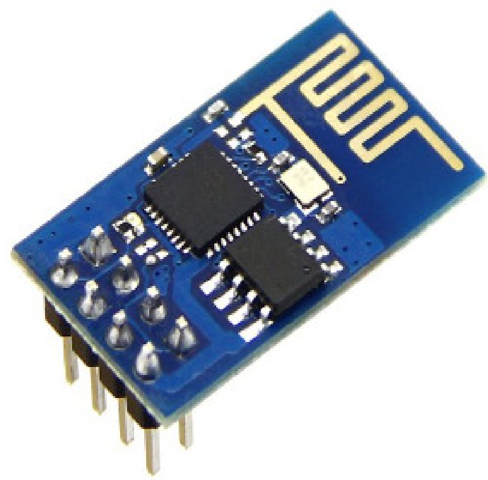

Fig 7 : WiFi Module

C. Software

1. Arduino IDE:

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. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other

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information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow to verify and upload programs, create, open, and save sketches, and open the serial monitor.

III. RESULTS AND DISCUSSION

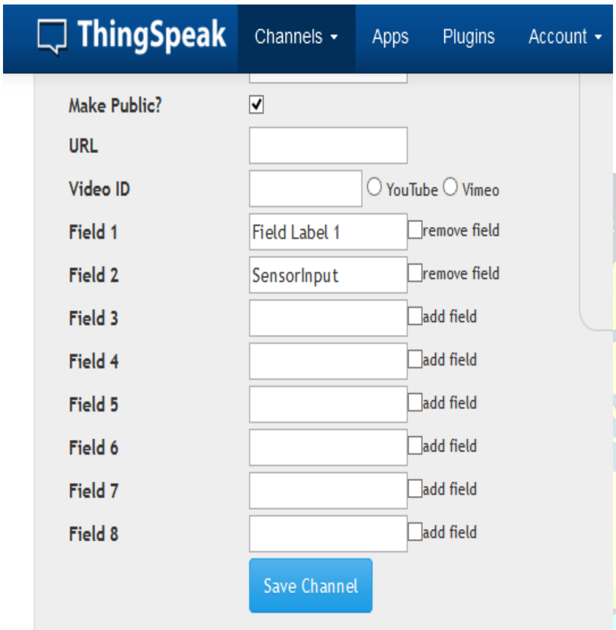

Fig 8 : Implementation of Industrial Automation System

IV. CONCLUSION

We conclude that by implementing these system we can acess the live data and also control the device interfaced with our system. This is one of the invocative projects based on smart phone to control our home or office smartly. Smart phone is nowadays an unavoidable device. So smart phone integrated project will reduce the cost of additional hardware units and get more convenient handling. This project will enhance our industrial security with simple cost.

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