IoT BASED INDUSTRY AUTOMATION USING RASPBERRY PI

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Abstract-*Industries have been automated with fully automated or with some little manual power. There are many challenges to IoT and Industrial Automation for example Data and service security, data integrity, information privacy, scalability and interoperability Automation Domain Constraints. It combines the concept of Raspberry Pi Industrial workstation and Industrial Automation using IoT. Here we propose sensor based industrial automation that is Temperature sensor, gas sensor and light sensor are used. The system consists of light, gas and temperature sensors interfaced with Raspberry pi. The sensor data is constantly scanned to record values and check for fire, gas leakage or low light and then this data is transmitted online. SMS data is analysis continuously and a level sensor is used to detect the level in the boiler. If any abnormality is detected, a message and email will be sent and a buzzer will make a sound.*

Keywords - IoT, Industry automation, Raspberry pi, sensors, wireless sensor network.

I. INTRODUCTION

Now-a-days, the field of industrial monitoring systems requires most of the human power which is used to control the parameters of the industry such as temperature, gas, Fire, IR sensors. This is mainly an important issue in the industrial sectors. The various Parameters are not correctly monitored and controlled, it may lead the harmful and dangerous Situations. Many kinds of industries are experiencing this type of problem due to manual Mistakes while taking a recording of the parameters. But this kind of situation may lead to a major type of accident in industries. So to monitor every parameter in the industry the human power is required. The coming technologies are very easy and overcome this type of problem in the industrial sector.

In industrial fields, there are different types of sensors used in the industries which are used for recording the values and which are going to send that values to the microcontroller and automate which is used in the system. This project involves the design of IoT based industry automation using raspberry pi 3 model B board and consists of various system blocks with various parameters that is temperature sensor light sensor, gas sensor and level sensor.

The raspberry pi power supply block converts the AC to DC power, which gives power to the raspberry pi board. The two relays are associated with the two industrial gadgets that are light sensor(LDR), when the room gets dark then automatically light gets turned on and the temperature sensor (LM35 series), when the room crosses its temperature then the fan will automatically turn on. Another two are the gas sensor(MQ2 sensor) and level sensor are connected to a raspberry pi board. When any harmful gas is detected in the industry then the buzzer will on and also SMS and an email will receive to phone and when the level of the boiler gets overflow then the buzzer will on and also SMS and email will receive to phone. We implemented how to remotely detect and monitoring the system that can enable the person away from the industrial surroundings to detect and monitoring the system by accessing raspberry pi, and get the related data by SMS and email on phone.

II. LITERATURE SURVEY

There are many ways to develop the system. The system is based on raspberry pi which enables cost-effective environment monitoring. Here we use the python programming language to control the industrial parameters and access them through IoT.

[1] Prof. Natrajan M, 2017 - In this paper, he planned a framework which will consequently control and screen the mechanical applications and furthermore enable the client to control the application

from anyplace on the planet. Having control over the applications over the internet is one of the best ways to deal with industrial applications.

[2] Gopinath Shanmuga Sundaram, 2013 - By using Radio Frequency Communication protocol we were able to establish Bluetooth transmission in Raspberry Pi controller board with utmost accuracy also when there is a mismatch between the sent and received data.

[3] Konrad Iwanicki, 2018 - Industrial IoT systems indeed pose a number of challenges, they have to interoperate with existing infrastructures and integrate highly heterogeneous hardware-software platforms. They also have to be prepared to scale a few orders of magnitude in size and diameter.

III. PROPOSED METHOD

In this system , we automatically detect the lights and fans by IoT based Industrial Automation system using Raspberry pi and the system uses temperature sensor,gas sensing to detect fire, gas leakage as well as low lighting to avoid any industrial accidents and prevent losses. If any abnormality is detected, a message and email will be sent and a buzzer will make a sound.

Since there are various sorts of ICS with shifting the degrees of potential hazard and effect, the report gives a rundown of a wide range of strategies and methods for verifying ICS. The piece of the framework fundamentally arranged with giving yield is alluded to as the procedure in industry.

BLOCK DIAGRAM:

In this, the related work of IoT is explained. Raspberry Pi the system is connected with the Internet to get messages and mails from the appliances used in the system and which we have to detect and monitoring should be connected to the GPIO pins of Raspberry Pi through relay circuit.

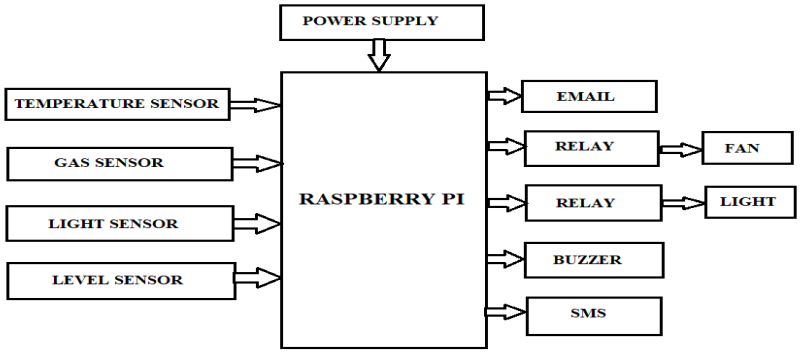


Fig.1 Block Diagram of Proposed method

HARDWARE REQUIREMENTS:

1. Raspberry pi 3b
2. Power Supply
3. Temperature Sensor
4. Gas sensor
5. Light sensor
6. Relay
7. Buzzer

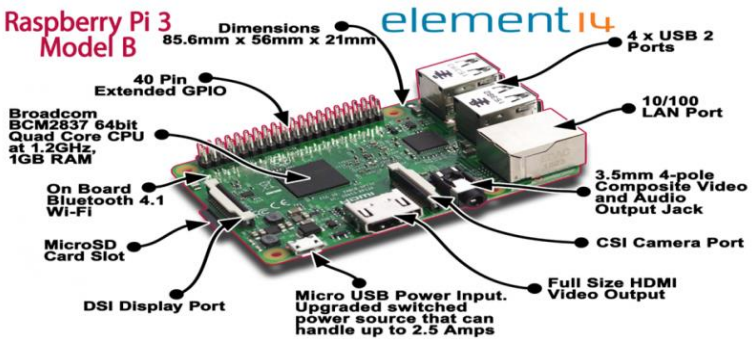
SOFTWARE REQUIREMENTS:

1. Python Language
2. Raspbian OS

The following is about the hardware components.

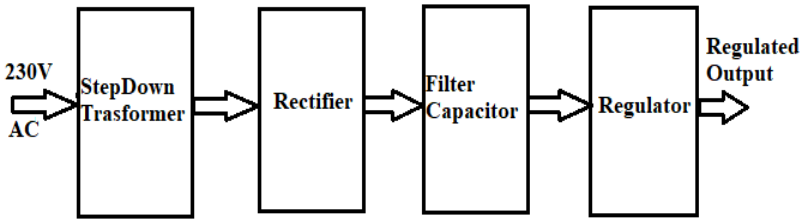
1. RASPBERRY PI 3 MODEL B:

The Raspberry Pi 3b delivers 10 times the processing capacity of Raspberry Pi 1 model.This second generation Raspberry Pi has an upgraded Broadcom BCM2837 processor, which is a powerful ARM Cortex-A53 based 64 bit quad-core processor that runs at 1.2GHz. The board also features an increase in memory capacity to 1 Gbyte**.** The Raspberry Pi has a Broadcom BCM2836 system on a chip which includes an 900 MHz 32- bit quad-core ARM Cortex-A7, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded .



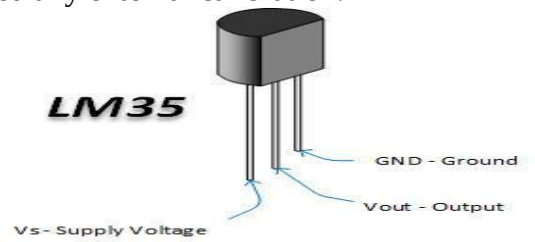
2. POWER SUPPLY:

All digital circuits require regulated power supply. In this article we are going to learn how to get a regulated positive supply from
the mains supply.



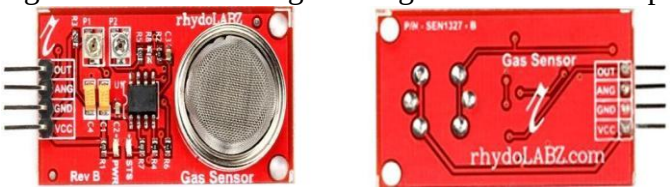
3. TEMPERATURE SENSOR (LM35):

In this we are using the LM35 series temperature sensor, the LM35 series are precision integrated circuit temperature sensor, whose output voltage is linearly proportional to the celcius temperature. The LM35 thus has an advantage over linear temperature sensor calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. The LM35 does not required any external calibration.



4. MQ2 GAS SENSOR:

In this we use the MQ2 sensor as the gas sensor. The MQ2 gas sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke etc. MQ2 gas sensor is also known as Chemiresistor. It containes a sensing material whose resistance changes when it comes contact with gas. It is a metal oxide semiconductor type of gas sensor. Concentrations of gas is measured using a voltage divider network present in the sensor.



5. LIGHT SENSOR:

We use the light-dependent resistor circuit for controlling the loads based on the intensity of light. An LDR or a photoresistor is a device that is made up of high resistance semiconductor material.

6. RELAY:

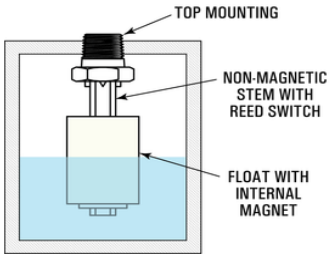
A relay is an electromagnetic switch used to turn on and off a circuit by a low power signal, or where several circuits must be controlled by one signal.

7. BUZZER:

A buzzer is an audio signaling device, which may be mechanical or electromechanical. It is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers, and other electronic products for sound devices.

8. FLOAT LEVEL SWITCH:

The Float level switches uses a float containing an internal magnet and a stem with an encapsulated, hermetically-sealed reed switch. As the float rises and falls within the liquid level, its internal magnet causes the switch circuit to open and close.



IV. REQUIREMENTS OF SOFTWARE INSTALLATION

A. PYTHON:

Python language is an open source programming language that was made to be easy-to-read and powerful. A Dutch programmer named Guido Van Rossum made Python in 1991.

The following steps is the requirements for software installation:

A Raspberry Pi model B.

An HDMI or composite video-capable television or monitor--An HDMI-capable monitor because it offers better resolution and built-in sound. You can use analog if you want, however.

An HDMI or composite video cable -- You'll need this cable to connect Raspberry Pi to television or monitor.

A 4GB Class 4 SD card (or better) and a card reader -- Most SD cards will work, but some aren't compatible and will therefore cause issues.

USB keyboard and mouse -- Any standard USB keyboard or mouse will do.

An Ethernet cable -- Any standard Ethernet cable will do.

V. TESTING RESULTS

The following parameters have been tested:

1. Light Sensor
2. Gas Sensor
3. Level Sensor
4. Temperature Sensor

Fig.6 Output of the light sensor when the room gets dark then automatically light gets on

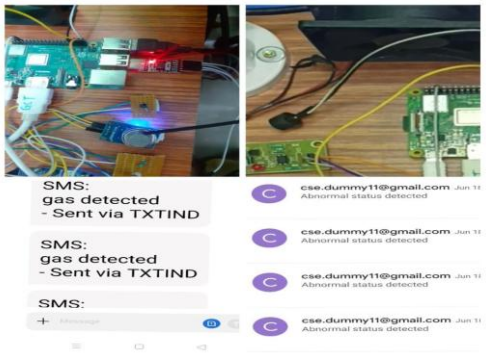


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Fig.7 Output of the gas sensor when the harmful gas is detected then the buzzer will on also SMS the and email will receive to phone.

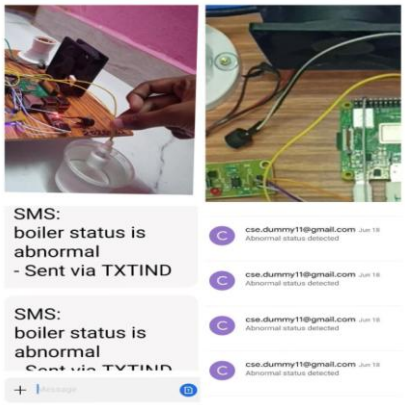

Fig.8 Output of the level sensor when the boiler gets over flow then the buzzer will on also the SMS and email will receive to phone.

Fig.9 Output of temperature sensor when the room crosses its temperature then fan will automatically gets on

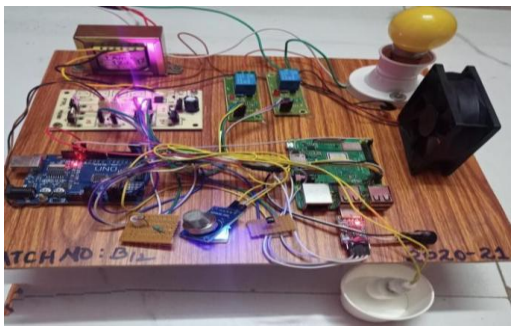

Fig.10 Connecting IoT based industry automation using raspberry pi system

Fig.10 shows connecting IoT based industry automation using raspberry pi system and there are one bulb holder, power supply, gas sensor, light sensor, level sensor, temperature sensor, exhaust fan etc, for our connecting those devices in which we can apply real time that we can connect number of devices.

FUTURE SCOPE

With reference to this system we add various parameters and make the industry fully automated. We use weighty sensor, PH sensor, color sensor, length and domination sensor. Using this sensor to reduce the time, effort of an employee and authorized person take quick decisions and improve the production. Overall this thing can be done by the Internet of Things.

CONCLUSION

The idea of implementing this system to interact with industry machines through the internet of things. This system is proposed to prove the various methods. Without using any manual power we can turn on and off the lights in the industry and if any suddenly any problem occurs in industry we get immediately an email and also the msg. The system try to minimize the energy waste by providing sufficient information to the owner or top level hierarchy persons via remotely and can make appropriate decisions.

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