Secure Monitoring of Industrial Control Systems using IoT Platform

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Abstract- Raspberry pi based multi parameter monitoring using MCP3008 that measures and controls various global parameters. The system comprises of a single master and multiple slaves communication with Raspberry pi. The parameters that can be tracked are temperature, light intensity and gas level. Master node collects the parameter data from the slave node. Here raspberry pi act as a master node and slave node is MCP IC. The Raspberry Pi is a credit card sized single computer or SoC uses ARM1176JZF-S core. System on a Chip is a method of placing all necessary electronics for running a computer on a single chip. Raspberry Pi needs an Operating system to start up. In the aim of cost reduction, the Raspberry Pi omits any on-board non-volatile memory used to store the boot loaders, Linux Kernels and file systems as seen in more traditional embedded systems. Rather, a SD/MMC card slot is provided for this purpose. After boot load, as per the application program Raspberry Pi will get execute.

Key words- Raspberry pi, sensor, Soc.

I. INTRODUCTION

Industrial control system (ICS) is an important term, which has been dedicating for monitoring and controlling of industrial infrastructures such as Oil, Gas, Manufacturing, Electricity and Transportation, and others, mainly combined with the most prominent control systems, such as the "supervisory control and data acquisition (SCADA) systems and distributed control systems (DCS), often employed in several industrial sectors of current era. ICS mainly deployed in the industries to control the overall structure of production plant, or other employed equipment's, to produce the desired production goals as according to specifications and requirements, through employing of several control components, varies according to industries specifications and performance paradigms, that consolidated together for producing of output. The ICS, however, have been designed and networked to provision the controlling functions that are may fully automated in controlling of the overall structure of sectors, such a transportation controlling and other areas like oil industry, or these controlling systems are self-control by individual or human in case of manual operational mode. Eventually, Industrial control system uses several control components and required network (or system) configurations and setting of sensors, actuators and programmable logic controllers (PLCs), also including system controlling loops, diagnostics and maintenance equipment, graphical interfaces or human machine interface (HMI) and proprietary and non-proprietary protocols such as DNP3, Modbus, TCP/IP , UDP and others. ICS deployed system is usually controlled by one or more controllers (or control loops), however, overall system information is manipulated bases on the system specified set points between various networked equipment or sensors, with the usage of proprietary or/and non-proprietary protocols and functional control algorithm that controls these set points.

II. EXISTING SYSTEM

➢ In the existing system the Process is Monitor by ARM controllers. To monitor through ARM controller we need some extra software and PC.
➢ Wired communication
➢ Can control only from fixed place

III. PROPOSED WORK

➢ In our Raspberry pi based multi parameter monitoring using mcp3008 that measures and controls various global parameters.
➢ Wireless communication
➢ In real time Can monitor the data from any place any time
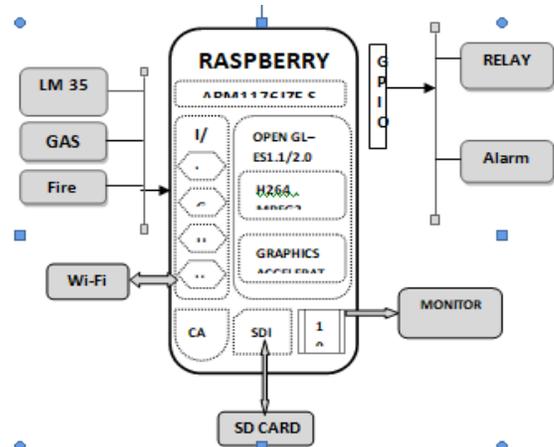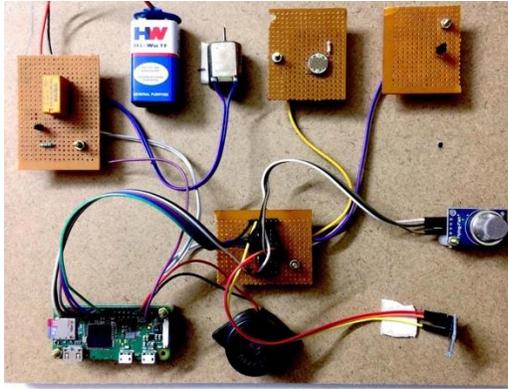
IV. ARCHITECTURE AND WORKING

Fig.1:Block diagram

THEORY:
The block diagram for Industrial monitoring is shown in the Fig1 TheRaspberry Pi 3 board is interfaced with the temperaturesensor, fire sensor and gas sensors. A buzzer is connected forgiving alert to the labors and a cooling fan is interfaced inorder to reduce the ambient temperature in case if thetemperature exceeds a threshold. The created web browser is opened in it and used.

V.   HARDWARE MODULES USED

Raspberry Pi Core Module
The core module of the system is realized using a Raspberry Pi 3 board; it's a $ 35 bare-bones computer designed and developed by the Raspberry Pi Foundation, the Pi 3 features a BCM 2837 System-on-Chip which includes a Quad-Core 64-Bit ARM Cortex A7 CPU clocked at 1.2GHz paired with 1 GB of RAM. It also has Video Core IV GPU for graphical processing applications, it also includes four USB ports for peripherals and 40 Pin General Purpose Input Output (GPIO) pins for interfacing the Pi with external electronic circuits, these GPIO pins are used to interface the Pi to the module. The Raspberry Pi is designed to run various Linux based operating systems and has Raspbian as its official operating system and Python as its official programming language.

Fig.4: Raspberry Pi 2 Module

Temperature sensor:
TheLM35 pin diagram is shown in the figure 2. As a temperature sensor, the circuit will read the temperature of the surrounding environment and relay temperature to us back in degrees Celsius. The LM35 is a low voltage IC which uses approximately +5VDC of power. This is ideal because the Arduino's power pin gives out 5V of power. The IC has just 3 pins, 2 for the power supply and one for the analog output. The output pin provides an analog voltage output that is linearly proportional to the Celsius (centigrade) temperature. Pin 2 gives an output of 1 millivolt per 0.1°C (10mV per degree). So, to get the degree value in Celsius, all that must be

done is to take the voltage output and divide it by 10- this give out the value degrees in Celsius.

Fig.2: Temperatur e sensor LM35

Fire sensor:
In the fire sensor, an efficient, inexpensive, easily-obtainable temperature sensing material is used. When the external heat is applied to the thermistor, it will generate voltage in the circuit. The output voltage from the thermistor is given to the comparator for voltage amplification. This in turn helps in detecting a very small voltage changes which in turn detects all range heat variation.

Smoke sensor:
Ideal sensor for use to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LNG and cigarette smoke.

Fig.3: Smoke sensor

DC motor:
DC motors are configured in many types and sizes, including brush less, servo, and gear motor types. A motor consists of a rotor and a permanent magnetic field stator. The magnetic field is maintained using either permanent magnets or electromagnetic windings. Motors are the devices that provide the actual speed and torque in a drive system. This family includes AC motor types (single and multiphase motors, universal, servo motors, induction, synchronous, and gear motor) and DC motors (brush less, servo motor, and gear motor) as well as linear, stepper and air motors, and motor contactors and starters.

VI.   RESULTS

VII.   CONCLUSION AND FUTURE WORK

The gas detector will notice alternative outflow like H, smoke etc. This model can alsobe used for other purpose also. The work surroundings are often seen from the controller space itself. Since Wi-Fi is employed, the info is often transmitted from anyplace. The suffocation of the labors operating within the Industries is avoided. The accidents are prevented that are caused by close conditions. This application is often used for all industrial space wherever human intervention for security are often avoided. In hospitals, searching malls conjointly this application are often used. This project is often increased by inserting a Video recorder and water sprinkler. just in case of any fireplace accidents water must be sprayed at the proper place. Also, another detector like dirt sensor, wetness detector is often interfaced for more convenience of the employees.

VIII.   REFERENCES

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