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IOT Based Safety Surveillance System For Refinery Inspection

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1. ABSTRACT

Nowadays we constantly come across the need to transfer remote data to monitor center which will be far away from the place of data acquisition. Traditional data acquisition system using wires cannot satisfy these requirements due to its heavy cost and impracticability. Embedded devices with network communication which makes it more powerful and easier to monitor and control remote data, is one of the major outcomes of the developments in the field of communication and networking technology. The fundamental aim of this paper is to develop an embedded system to design a real time remote industrial controlling and monitoring system which enables the monitoring of important industrial parameters. Such a system makes use of sensors like temperature, pressure, smoke, ldr. The data from the sensors are collected by the Raspberry pi, processed and also sent to intended location through wifi. Oil and gas refineries can be a dangerous environment for numerous reasons, including heat, toxic gasses, and unexpected catastrophic failures. In order to augment how human operators interact with this environment, a mobile robotic platform is developed.

This paper focuses on the use of Wi-Fi for communicating with and localizing the robot. This project presents the monitoring and controlling of robotic movements through wireless network by using a web browser and accessing a webpage. The robot is designed with high end controller Raspberry Pi3 and featured with gas sensor and smoke sensor. This obstacle sensor detects any object present in front of the robot and smoke sensor senses if any smoke presence in the environment and gives alarm sound and will be updated in the web page.

KEYWORDS: CAMERA, OBSTACLE, L292D IC, RASPBERRY PI, GEAR MOTORS.

2. INTRODUCTION

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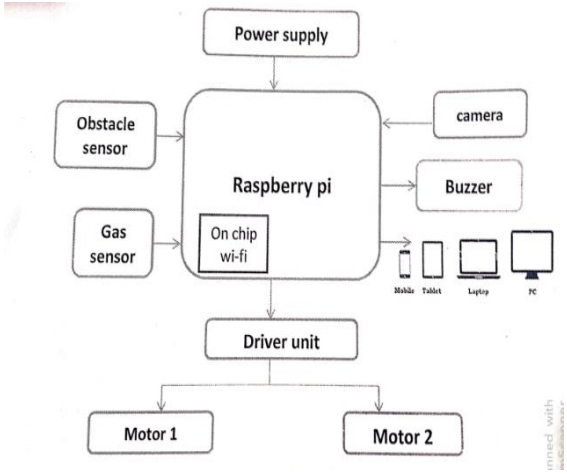
3. BLOCK DIAGRAM



3.1proposedblockdiagram

4.HARDWARE REQUIREMENTS

- Raspberry PI 3
- Gas Sensor
- Obstacle sensor
- Smoke Sensor
- Buzzer
- UVC Camera
- Wi-Fi
- Power Supply Unit
- L293D
- Gear Motors
- Miscellaneous Components

5. SOFTWARE REQUIREMENT

- A Wheezy Raspbian, Linux based operating system is loaded in SD card.

- All editions provide a complete Python development environment includes extensive middleware libraries.
- For developing a webpage, we use HTML and PHP.
- For hosting web pages we use Apache Web server.

Some packages installed through Command Line interface like python GPIO library and SPI library packages.

6.HARDWARE REQUIRMENT

6.1 RASPBERRY PI

The Raspberry Pi 3 Model B is out and it's amazing! With an upgraded ARMv7 multi core processor, and a full Gigabyte of RAM, this pocket computer has moved from being a 'toy computer' to a real desktop PC

The big upgrade is a move from the BCM2836 (single core ARMv6) to BCM2837 (quad core ARMv7). The upgrade in processor types means you will see ~2x performance increase just on processor-upgrade only. For software that can take advantage of multiple-core processors, you can expect 4x performance on average and for really multi-thread-friendly code, up to 7.5x increase in speed!

Best of all, the Pi 3 keeps the same shape, connectors and mounting holes as the Raspberry Pi B. That means that all of your HATs and other plug-in daughter boards will work just fine. 99% of cases and accessories will be fully compatible with both versions.

Also, any precompiled software will not work at full speed (although supposedly the processor will be able to run it). Still, you'll likely want to have it recompiled for the new processor! For many people, this isn't a big deal, but if you have a pre-created Pi 1 Model A+B+ card image, just be aware it won't work without performing an 'sudo apt-get upgrade' on the older Pi 1 before installing on the Pi 3.

Fig: 6.1 raspberry pi

6.2 OBSTACLE SENSOR

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

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- Using IO trigger for at least 10us high level signal.
- The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time ×velocity of sound (340M/S) / 2,

Fig: 6.2Ultrasonic sensor

6.3 GAS SENSOR

A **gas sensor** is a device which detects the presence of gas in an area. This sensor interacts with a gas to measure its concentration. Each gas has a unique breakdown voltage i.e. the electric field at which it is ionized. Sensor identifies gases by measuring these voltages. The concentration of the gas can be determined by measuring the current discharge in the device. The **MQ5 gas sensor** detects the presence of various gases such as **hydrogen, carbon monoxide, methane and LPG** ranging from **100ppm** to **3,000ppm.**

6.4 GEAR MOTOR

What Is a Gear Motor?

Gear motors are complete motive force systems consisting of an electric motor and a reduction gear train integrated into one easy-to-mount and -configure package. This greatly reduces the complexity and cost of designing and constructing power tools, machines and appliances calling for high torque at relatively low shaft speed or RPM. Gear motors allow the use of economical low-horsepower motors to provide great motive force at low speed such as in lifts, winches, medical tables, jacks and robotics. They can be large enough to lift a building or small enough to drive a tiny clock

Fig6.4 dc motor

6.5 L293D

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide

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a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respective Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

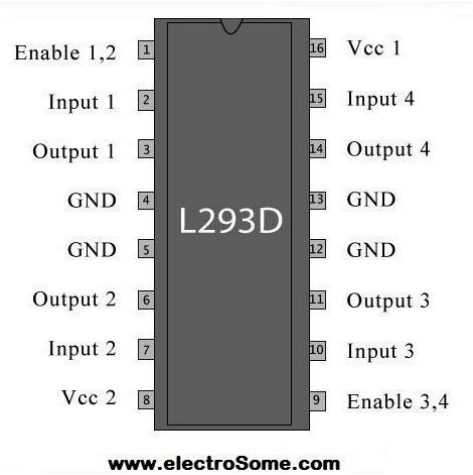

Fig 6.5Pin Diagram

6.6 LM35 SENSOR

Most commonly-used electrical temperature sensors are difficult to apply. For example, thermocouples have low output levels and require cold junction compensation. Thermistors are nonlinear. In addition, the outputs of these sensors are not linearly proportional to any temperature scale. Early monolithic sensors, such as the LM3911, LM134 and LM135, overcame many of these difficulties, but their outputs are

An inherent strength of the LM34 sensor over other currently available temperature sensors is that it is not as susceptible to large errors in its output from low level leakage currents. For instance, many monolithic temperature sensors have an output of only 1 µA/°K. This leads to a 1°K error for only 1 µ-Ampere of leakage current. On the other hand, the LM34 sensor may be operated as a current mode device providing 20 µA/°F of output current. The same 1 µA of leakage current will cause an error in the LM34's output of only 0.05°F (or 0.03°K after scaling).

6.7 PRESSURE SENSOR

The MPX10 series silicon piezoresistive pressure sensors provide a very accurate and linear voltage output, directly proportional to the applied pressure. These standard, low cost, uncompensated sensors permit manufacturers to design and add their own external temperature compensation and signal conditioning networks. Compensation techniques are

simplified because of the predictability of Freescale's single element strain gauge design.Air Movement Control Environmental Control Systems Level Indicators Leak Detection Medical Instrumentation Industrial Controls Pneumatic Control Systems Robotics

6.8 USB CAMERA

A camera is an optical instrument that records images that can be stored directly, transmitted to another location, or both. These images may be still photographs or moving images such as videos or movies. The term camera comes from the word camera obscura(Latin for "dark chamber"), an early mechanism for projecting images.

The modern camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the human eye.

fig 6.8 usb camera buzzer

6.9 BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or electronic. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke.

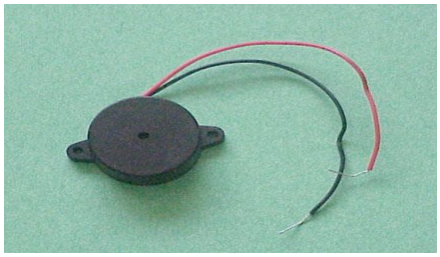

Fig 6.9 buzzer

6.10 LDR

A photo resistor or Light Dependent Resistor or CdS Cell is a resistor whose resistance decreases with increasing incident light intensity. It can also be referred to as a photoconductor. A photo resistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band.

The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

7.REQUIREMENTSFOR SOFTWARE

7.1Set Up Raspberry Pi SD Card With Operating System

The Raspberry Pi requires the operating system to be loaded onto an SD card before it will start up. The easiest way to set up the

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SD card is to use NOOBS; you may find that you can buy an SD card with NOOBS already loaded on it.

NOOBS provides an initial start menu providing options to install several of the available operating systems onto your SD card.

If you are using an SD card that you have used previously, you may need to reformat it to remove any previous partitions and data. NOOBS expects the SD card to consist of a single FAT32 partition.

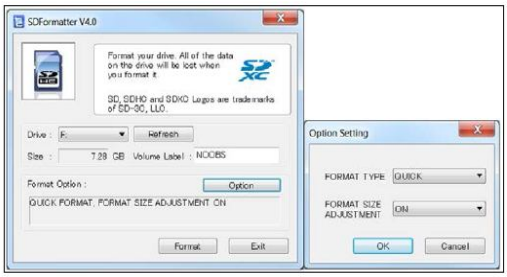

fig 7.1. sd card formatter

From the Option Setting dialog box, set Format Size Adjustment. This will remove all the SD card partitions that were created previously.

Follow these steps to download, install and use the Image Writer for Windows software to prepare the SD card for the Pi:

8. PROJECT DESCRIPTION

8.1 Working of the Proposed System

The project continuously monitors the industrial parameters such as temperature, pressure, smoke and light intensity. Traditional methods involve manual controlling of industrial parameters. Such approaches take longer time. Therefore there is a need of continuous monitoring of industrial parameters.

In the proposed system, the block diagram consists of several sensors such as temperature sensor, pressure sensor and LDR sensor is connected to core controller using MCP 3008. The core controller are accessing the sensor values and processing them to transfer the data through wifi. Raspberry Pi is used as a core controller. Raspberry Pi continuously reads sensors data and updates the webpage. If any of the sensor value exceeds the limit then the respective controlling action takes place.

8. RESULTS

The proposed system is implemented to monitor and control the parameters such as temperature, pressure,smoke and light intensity. The sensor values can be viewed over the internet and if sensor values exceed then the respective controlling action takes place.The results for the proposed system are shown below.

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Fig 8.1. Home Page Of Web Server

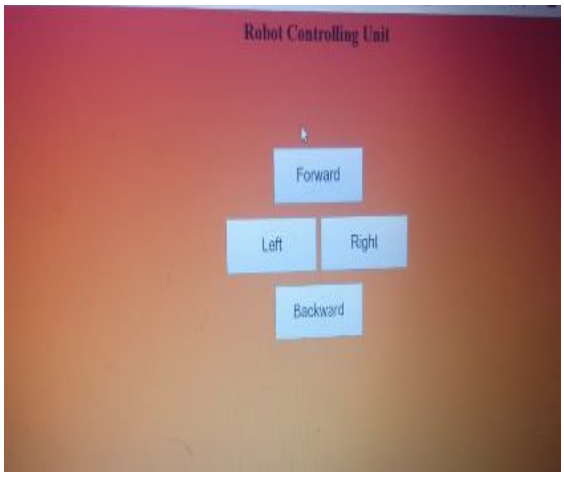

fig 8.2 data monitoring section

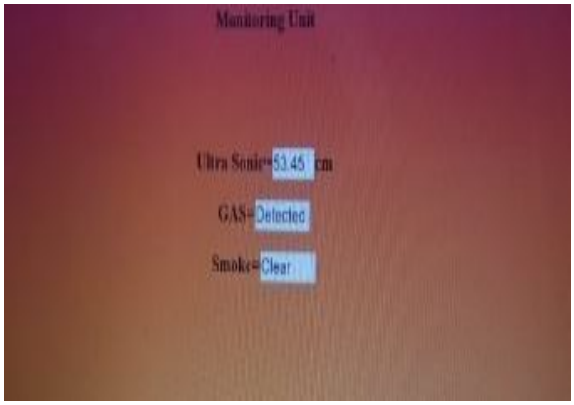

Fig 8.3. Data controlling unit

Fig 8.3Project kit

9.CONCLUSION AND FUTURE SCOPE

9.1 CONCLUSION

Raspberry Pi smart, economic and efficient platform for implementation of industrial data acquisition and controlling of different devices. The system of industrial module monitoring and controlling different parameter like Temperature, pressure, Light Intensity, smoke, from distant location using web server. Implementation of web server using Raspberry Pi for intelligent

monitoring is new method to monitor parameter. The whole system has low-cost and easy to maintain and given up gradation facility. Using Raspberry Pi can reduce cost as well as the complexity of monitoring industrial devices.

Real time data monitoring and controlling of devices from distant location is possible using Raspberry Pi and web server.

9.2 FUTURE SCOPE

Going further, most of the units can be embedded within the controller such as android application, with change in technology thereby improving the detection system.Combination of this Sensors network and other wireless devices would dominate in the near future. Many "works are in progress" that will surely develop into more usable devices in the future.

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