International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume 25 Issue 5 – APRIL 2018 (SPECIAL ISSUE).

DESIGN AND CONSTRUCTION OF ROVER TO COMMUNICATE USING RF (RADIO FREQUENCY) & MONITORING

Mrs.Thresa.P[#1] ,thresa.p@rmp.srmuniv.ac.in,Harish.K[*2], Mohd Danish[*3],Piyush Yadav[*4],Srinath.N[*5]

Asst.Professor[1], ECE Department, SRM Institute of Science and Technology

UG Scholars[2,3,4,5] , ECE Department, SRM Institute of Science and Technology

***ABSTRACT*-The project deals with the domain of robotics where an electro-mechanical machine that is guided by computer and electronic programming is built. Many robots have been built for manufacturing purpose and can be found in factories around the world. Design and control of the robot is managed using RF technology. Arduino can be interfaced to the RF module though UART protocol. According to commands received from the transmitter, the robot motion can be controlled. These robots can be re-programmable and can be interchanged to provide multiple applications.**

***Keywords*— Arduino, RF Tx, RF -Rx, L298 (Dual H-bridge Motor Controller), DC Motor.**

I INTRODUCTION

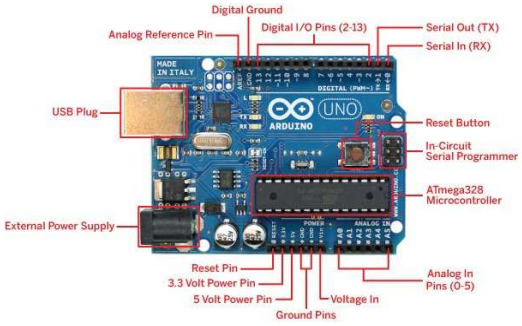
One of the aspects in the industrial entities and manufacturing companies that seeks importance is the monitoring of resources and products before the process is achieved and the resulting product is handed to the customer. Monitoring of several physical, chemical, biological, environmental and other parameters and collecting and analyzing the data is the conventional method for prevention of abnormalities that were to happen if left unattended. For example, in a chemical manufacturing company, if there are no monitoring devices present to sense any leakage of gas, it can cause a major catastrophe to the surroundings. Without knowing the problem, the solution for it cannot be found.

This paper attempts to provide the details about the design and construction principles of a Rover that uses Radio Frequency to communicate with the receiver.

II PROPOSED MODEL

Robots implemented for the purpose of monitoring and detection of issues such as leakage have simple considerations in their design. While life safety is a major benefit of gas detection, gas monitors also contribute to worker health, property protection and operational productivity. Limitations of such robots include impractical size of the rovers and also inability of differentiate hazards from simple changes in the surrounding ambience. The conglomeration of various sensors in this project overcomes such shortcomings. The use of barometric pressure sensor in the robot helps to correct the output of sensors that are sensitive to press fluctuations. The already existing systems have varying degrees of success, but their disadvantages generally attribute to not incorporating several methods into one product. This project is a solution approach for an overall vehicle with navigation, gas monitoring, harmful gas detection and alarming purpose focusing on greater accuracy and efficiency. It aims to mitigate such flaws and optimize resources to incorporate the fusion of several sensors to cope with the problems faced in the existing method.

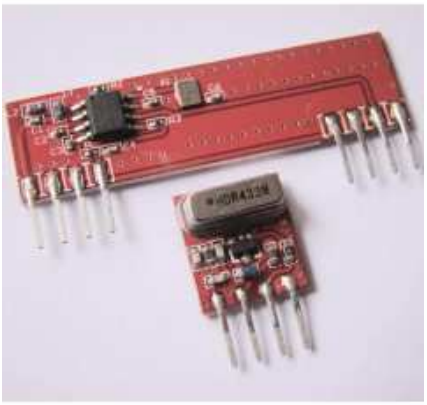
ARDUINO UNO



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 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

RF TRANSCEIVER

An RF module is a small size electronic device that is used to transmit or receive radio signals between two devices.



The main application of RF module is an embedded system to communicate with another device wirelessly. This communication may be accomplished through radio frequency communication. For various applications the medium of choice is radio frequency since it does not need line of sight.

A transceiver is a blend of a transmitter and a receiver in a single package. The name applies to wireless communication devices like cellular telephones, handheld two-way radios, cordless telephone sets, and mobile two-way radios. Sometimes the term is used in reference to the transmitter or receiver devices in optical fiber systems or cables.

Applications of RF Transceiver

RF transceiver module is used in wireless communication. The main application of this transceiver is to make information in the form of data/ voice / video apt to be transmitted over the wireless medium.

The main intention of this device is to alter IF frequency to RF frequency and vice versa.

RF transceiver module is used in for radio transmission, satellite communication, for television signal transmission, reception and in Wimax or WLAN, Zigbee or ITE networks.

SENSORS

Barometric Pressure and Temperature sensor

This pressure sensor is a BMP-180 based digital barometric pressure sensor module and is functional compatible with older BMP-085 digital pressure sensor with minimal power consumption, it is smaller in size and more accurate. BMP180 combines barometric pressure, temperature and altitude. The I2C allows easy interface with any microcontroller. On board 3.3V LDO regulator makes this board fully 5V supply compatible. BMP-180 can measure pressure range from 300 to 1100hPa (+9000m to -500m relating to sea level) with an accuracy down to 0.02hPa (0.17m) in advance resolution mode. BMP-180 is an improved replacement for BMP-085 sensor. BMP-180 uses piezo-resistive technology for high accuracy, linearity, EMC robustness and stability for a longer period of time.

GAS DETECTOR

Gas detectors measure and indicate the concentration of certain gases in an air via different technologies. Typically employed to prevent toxic exposure and fire, gas detectors are often battery operated devices used for safety purposes. They are manufactured as portable or stationary (fixed) units and work by signifying high levels of gases through a series of

audible or visible indicators, such as alarms, lights or a combination of signals. While many of the older, standard gas detector units were originally fabricated to detect one gas, modern multifunctional or multi-gas devices are capable of detecting several gases at once. Some detectors may be utilized as individual units to monitor small workspace areas, or units can be combined or linked together to create a protection system.

As detectors measure a specified gas concentration, the sensor response serves as the reference point or scale. When the sensors response surpasses a certain pre-set level, an alarm will be activated to warn the user. There are various types of detectors available and the majority serves the same function: to monitor and warn of a dangerous gas level. However, when considering what type of detector to install, it is helpful to consider the different sensor technologies.

Gas Detector Technologies

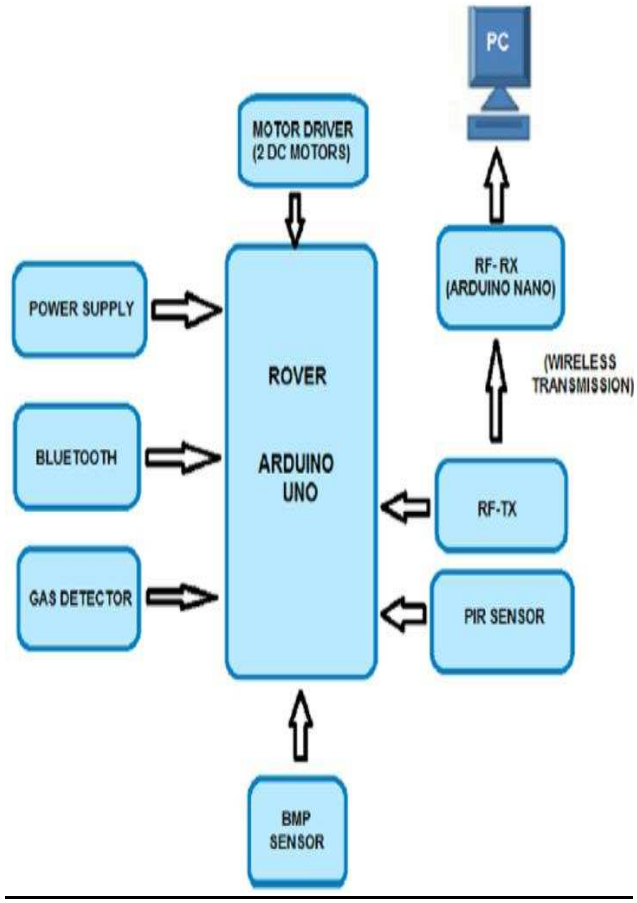
Gas detectors are categorized by the type of gas they detect: **combustible or toxic**. Within this broad categorization, they are further defined by the technology they use: catalytic and infrared sensors detect combustible gases and electrochemical and metal oxide semiconductor technologies generally detect toxic gases.

Bluedot Control Application

- Bluedot Control is an application which is used to control boards such as Arduino uno and Raspberry Pi.
- It is basically a Bluetooth remote and zero boiler plate.
- Simple python codes are used to give commands.
- The application contains of a button which appears on your mobile screen and behaves both as a joystick and button. When it is touched, we can control the movement of the rover with the Arduino board towards left, right, top and bottom.

The project is to design and control a robotic vehicle using Radio Frequencies (RF) and monitor parameters using sensors mounted on it. A Transceiver is used for the radio communication between the remote and the Rover. The transceiver is interfaced to the control unit. The RF-Rx (Radio Frequency Receiver) in the Transceiver interfaced to

III BLOCK DIAGRAM



Receiver) in the Transceiver interfaced to the Control Unit (Arduino) on the robot is for sensing the signals transmitted by the RF- Tx (Radio Frequency Transmitter) in the remote. The data received by the RF-Rx is conveyed to the control unit which moves the robot as desired.

Remote operation is achieved by the RF Transmitter-Receiver setup. With a PC receiving the information collected by the sensors which is transmitted through the RF-Tx in the Transceiver interfaced to the Arduino, the parameters are monitored.

At the receiver end, these commands are used for controlling the robot in all directions such as forward, backward and left or right etc.The movement of the

Rover is achieved by two motors that are interfaced to the Arduino. Data sent from the transmitter is received by the receiver and sends it to the Arduino. The program on the Arduino refers to the serial data to generate respective output based on the input data to operate the motors through a motor driver IC. The motors are interfaced to the control unit through motor driver IC.

IV RESULTS

The project has tremendous importance in chemical industry. It ensures that the company has a safe working environment. Presence of gas detector sensor as well as barometric pressure and temperature sensor keeps in check about safety. Some of the problems observed in the existing system are as follows:

They are not for multiple purposes since rovers do not come with sensors implemented on it.

- Reduced range due to limitations of the transmitter and receiver modules.
- Power drain leading to shorter operating life.

The solutions provided in the proposed model are:

- Addition of specific sensors such as barometric pressure sensor (gas sensor), liquid sensor and PIR sensor to have industry specific applications.
- To combine several applications to propose an overall model with greater accuracy and wider usage scope.

V CONCLUSION

- Therefore, the rover serves purposefully towards monitoring in all departments.
- In the chemical industry, the results of implementing multiple sensors results in accurate detection of gases, leakages in factory liquids and several other uses.

VI FUTURE SCOPE

- Flame sensor could be implemented to detect fire and shower water or spread oxygen gas automatically in case of any fire accident.
- The sensors could be connected with IoT for unlimited range.

VII REFERENCES

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