Virtual Instrumentation Based Surveillance System in Industry

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Abstract

The danger of life of human being is increasing with advancement of scientific development in different fields. The security of industry (Steel Melting industry) is important to human life. The security system can detect abnormal and dangerous situation and notify us. In this paper, Virtual Instrumentation based intelligent Surveillance system that contains an obstacle avoiding robot which we can monitor and control the hazardous and inaccessible places to humans, is presented.

Keywords- *security, sensor, virtual instrument.*

I.   Introduction

With tremendous growth of industries, there has been equal growth in industrial accidents. The importance of industrial safety was realized because millions of accidents occur which results in either death or disablement of employees and involve large amount of losses resulting from danger to property and men. Most cases of such show the lack of proper surveillance systems to notify the disaster in industries.

Unnoticed gas leaks, unnoticed smoke ejecting from industries, gas combiners etc., have seen devastating outcomes, due which there has been significant damage to the mankind. The main reason attributed to such situations is poor surveillance systems which often fail to monitor the conditions.

The disadvantages of the traditional instrumentation technology for monitoring conditions are

- These systems are fixed, (mobile monitoring is absent)
- These systems can do only one task (single sensor). Hence, need different systems for different purpose of detection
- They bank on portable display which is attached with the system
- They cannot be accessed from remote locations

To overcome the problems of traditional surveillance system a Virtual Instrumentation based Surveillance system is developed through which we can monitor and control the hazardous and inaccessible places to humans. The proposed multi-sensory security system is designed to have 4 sensors, it is provided with 2 wheels to provide continuous unmanned monitoring of

- Gas leakages
- sudden changes of temperature
- obstacle avoidance
- Smoke ejection.

and notifying through a wireless ZIGBEE module on a LABVIEW graphical interface.

The GENIE system offers flow chart microcontroller programming and simulation as well as full integration with circuit wizard.

GENIE Microcontrollers can be programmed using flowcharts. Flowcharts show the steps that will be followed by microcontroller when one's program is running. Flowcharts are drawn by selecting particular commands and then linking them together.
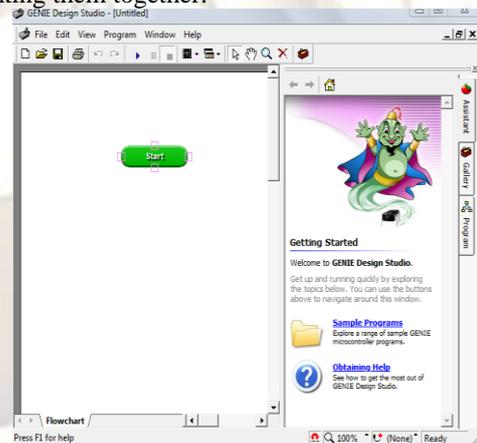

Fig.1.1. Genie design studio startup

Genie design studio has been used to program microcontroller for obstacle avoidance and the programmed flow chart for obstacle avoidance is shown below

Fig. 1.2. programmed flow chart for obstacle avoidance.

Lab VIEW is an integral part of virtual instrumentation because it provides an easy-to-use application development environment designed specifically with the needs of engineers and scientists in mind. Lab VIEW offers powerful features that make is easy to connect to a wide variety of hardware and other software. One of the most powerful features that lab VIEW offers engineers and a scientist is its graphical programming environment. With Lab VIEW, one can design custom virtual instruments by creating a graphical user interface on the computer screen through which one

- Operate the instrumentation program
- Control selected hardware
- Analyze acquired data
- Display.
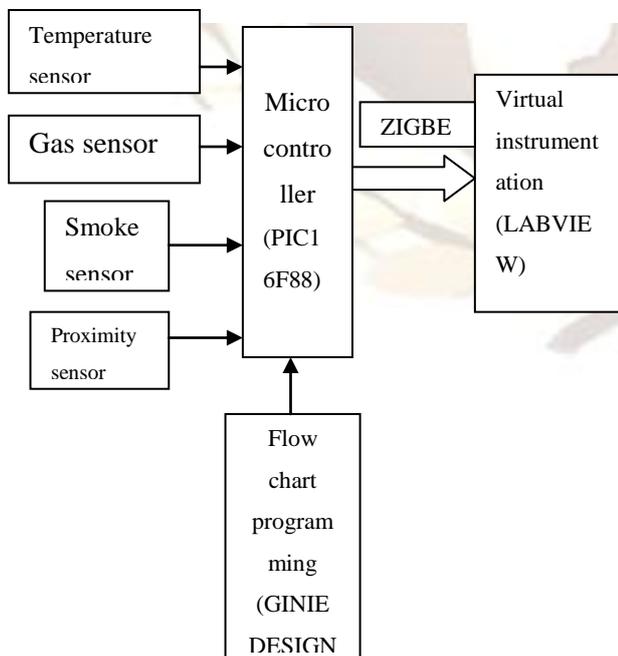
Fig.1.3. Block diagram   ZIGBEE

The four sensors are connected to the microcontroller, whose functioning is determined by flow chart programming, implemented through GENIEE design studio. And output is wirelessly transmitted by ZIGBEE modules and is accessed through LABVIEW graphical interface.

The heart of this paper is PICf88 which has 5 analog to digital output pins. The robot made here can detect the sudden changes in temperature such that it displays the value in centigrade on LABVIEW graphical interface. The circuit used here consists of a thermistor, its primary characteristic is its ability to alter its electrical resistance in response to changes in case temperature. It can be used to measure temperature, or to sense temperature changes and compensate for the temperature changes.

The obstacles that come in the middle of the path are avoided and the collision of the objects is prevented. For this L293d motor driver is used which gives the specified movement to the wheels whether in clockwise direction or anti clock wise direction.

The harmful gases leaking from the industries are detected and specified to us whether any harmful gas is present, .the gas sensorMQ6 present in the gas detection circuit plays the major role for identifying the gas whether dangerous gases are present. Smoke produced by a fire affects the intensity of a light beam passing through air. The smoke can block or obscure the beam. The light emitted by LED falls on IDR, if the smoke passes between them the blocking of light happens thus the smoke particles are observed.

The final values from all the components outputs are collected by the ZIGBEE which acts as serial port.

A gas detector is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can also sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave the area.

Fig1.4. MQ-6 GAS SENSOR

An MQ-6 gas sensor is applied in the gas sensor module. As per its datasheet, it has great sensitivity to propane, butane, isobutene, and LPG and all-natural gas. The sensor can also be

implemented to detect combustible gases, especially methane.

When smoke particles partially block the light beam, the reduction in light reaching the photosensitive device alters its output. The change in output is sensed by the detector's circuitry, and when the threshold is crossed, an alarm is initiated. Obscuration type detectors are usually of the projected beam type where the light source spans the area to be protected.
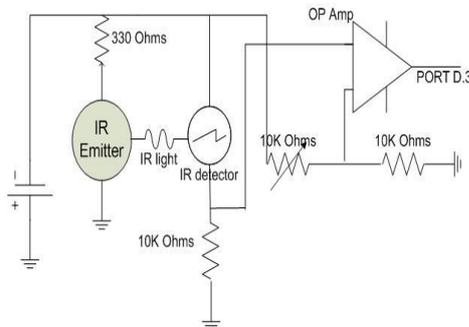

Fig. 1.5. Smoke detection circuit

The objective of the competition would be for the robot to reach the target in the shortest time. Autonomous robotic vehicle guidance for indoor navigation has been developed for Mobile Industrial Robot model. The resulting design will navigate the environs in a building without the need of human intervention. The guidance system consists of infrared sensors for avoidance. It can detect the obstacles within the range 10 to 80 cm. This paper represents mainly on software implementation of obstacle detection and avoidance system for Wheeled Mobile Robot. This system consists of infrared sensors and microcontroller.
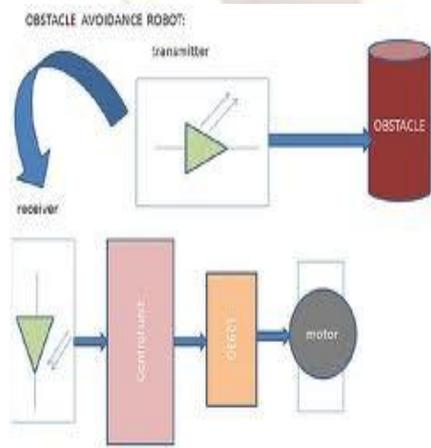

Fig. 1.6. obstacle avoidance robot

In this system three infrared sensors are used for left, front and right. In this robot system, the input signal is received from sensor circuit and PIC is operated according to the received sensor's signal. This robot if it senses the obstacle through the sensors will drive the motors in the alternative right turn until it detects the clean path. Here the comparator will set the reference point for the input signal which will help the controller to get strong input signal.

Temperature is one of the most common real-world characteristics that systems need to measure. Many industrial processes, from steel manufacturing to semiconductor fabrication, depend on temperature. Thermistors are available in several package types. The most common package is a disk, although they are also available with axial leads and can be purchased as chip or Metal Electrode Leadless Faces (MELF) components for surface mount applications. Selection of packaging style depends on the application and where the temperature measurement needs to be made Surface.

II. ZIGBEE WIRELESS MODULES

ZigBee is the name of a specification for a suite of high level communication protocols using small, low power, low data rate digital radios based on the IEE 802.15.4 standard for wireless personal area network (WPANs), such as wireless headphones connecting with cell phones via short range radio. The technology is intended to be simpler and cheaper than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications which require a low data rate, long battery life and secure networking.

ZIGBEE enables broad-based deployment of wireless networks with low-cost, low-power solutions. It provides the ability to run for years on inexpensive batteries for a host of monitoring applications: Lighting controls, AMR (Automatic Meter Reading), smoke and CO detectors, wireless telemetry, HVAC control, heating control, home security, Environmental controls and shade controls, etc.
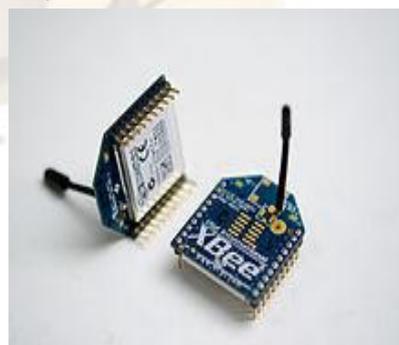

Fig.2.1. ZigBee module

III. IMPLEMENTATION AND RESULTS

Programming the microcontroller

The microcontroller in this paper is preprogrammed using GENIE DESIGN STUDIO. The flow chart for obstacle avoidance in our project is presented below. The software is provided with internal hex. Code generator. Once normal flow chart of the desired activity is designed it saved and run for signal flow after which when there is no error it is directly downloaded into the microcontroller and saved permanently in it.
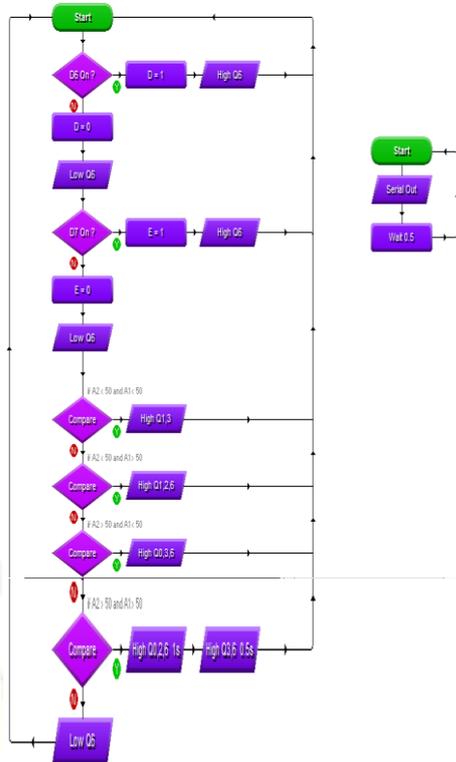

Fig.3.1 obstacle avoidance flowchart
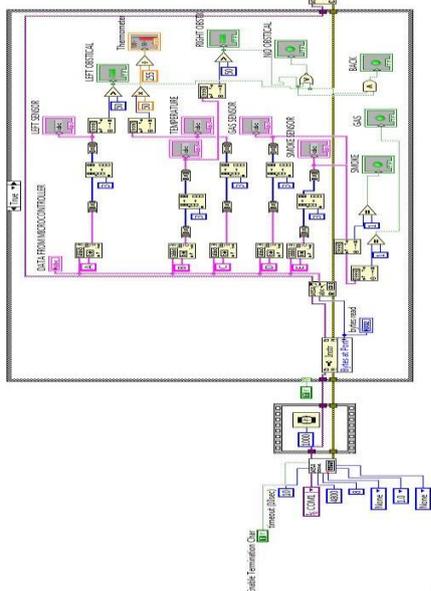
Fig.3.2 virtual instrumentation flow control
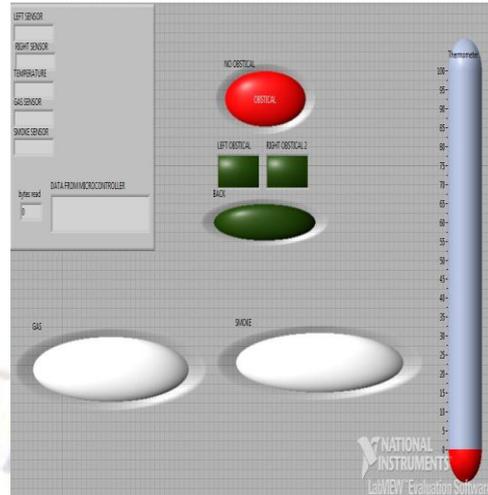
Fig.3.3 front panel view
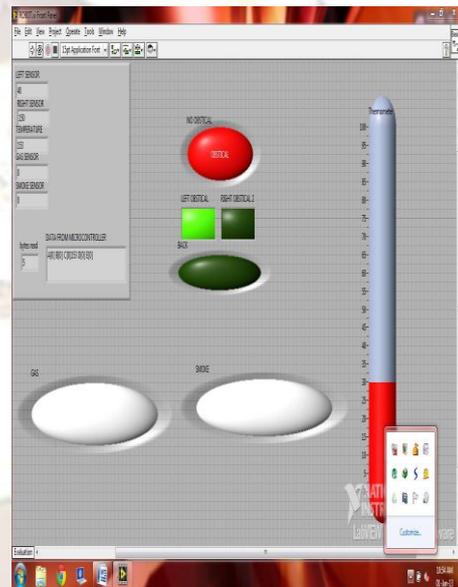
Fig.3.4 left obstacle
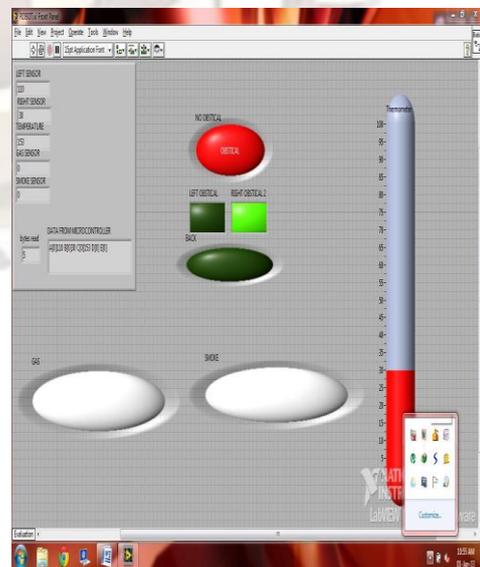
Fig.3.5 right obstacle
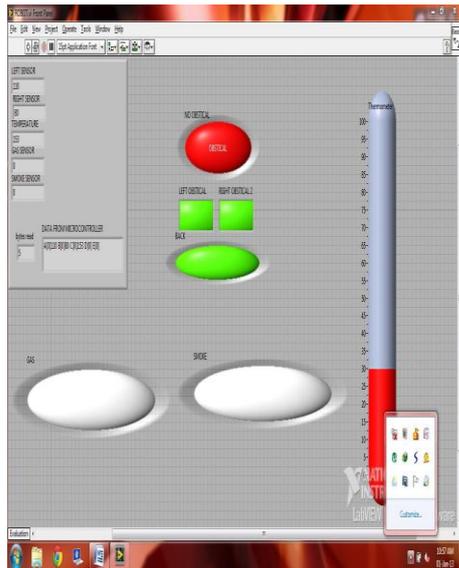
Fig.3.6 straight obstacle
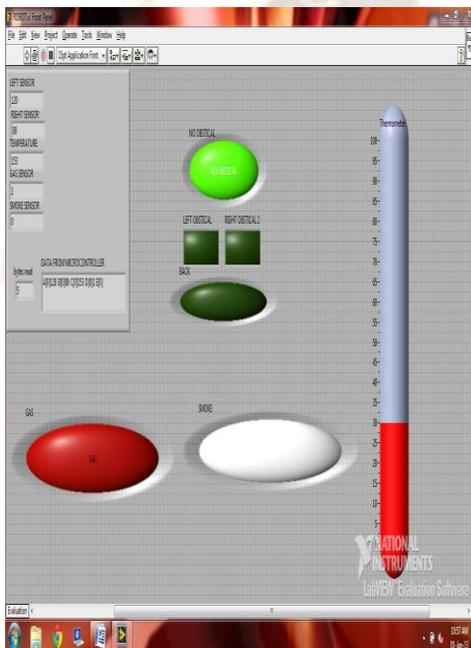

Fig.3.7 gas leak
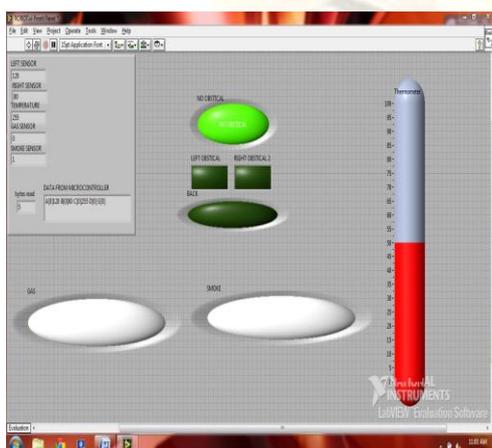
Fig.3.8 temperature rise

Fig.3.8 kit diagram

IV.   CONCLUSION

In this paper a virtual instrumentation based surveillance system to monitor the changes in surrounding, helping in preventing the disaster of fire, gas and smoke out breaks by notifying us the leak. In this paper we also introduced a latest software GENIE which is flow-chart based so it is a user-friendly. The results illustrate that the proposed Virtual Instrumentation based intelligent Surveillance system provide continuous unmanned monitoring of Gas leakages, sudden changes of temperature, obstacle avoidance etc,.

REFERENCES

[1] *Instrumentation technology* by Liptak, VOL II
[2] Hand book on the *measurement instrumentation and sensors* by John. G. Webster, 2nd edition
[3] *Measurement and instrumentation* by Mallon s Morris
[4] *Sensor technology*, by john. S Wilson
[5] A Practical *Hazardous Gas Monitors* Guide to Selection, Operation and Applications *by jack chou*
[6] http://students.chem.tue.nl/ifp10/project/gas.htm
[7] http://www.temperatures.com/thermistors.html
[8] http://www.technologystudent.com/pics/gen2.html
[9] chain based energy profient data gathering for wireless sensor networks, balamurugan, dr.k durai swamy (IJCST/992/1/a-161)
[10] Unmanned automation, by linda jone (IEEE) vol.3 pp 2001-2006,march 12th 2008
[11] J. K. Jones, Lab Notes for EE464K, Senior Projects, The University   of Texas at Austin, fall semester, 1994.