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Wireless Hospital Warning And Control System For Management Using Lab View

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Abstract

This brief presents a low cost and simple wireless continuous monitoring system to detect and monitor the harmful gases such as Carbon monoxide (CO), LPG, Flammable gas and also to monitor the pH and turbidity of water in the hospital. When the harmful gases in hospital exceeds the normal value, the respective sensor senses and feeds the signal to the Microcontroller. The Microcontroller processes the signal and controls the accidents by giving alarm to the technicians. It also provides electrical cut to that environment and turns on the sprinkler for fire caused by flammable gas. The output of the system can be monitored through LabVIEW. It aims to provide a safe and healthy environment in hospital.

Keywords: *sensors, sensing and control unit, Monitoring unit.*

1. Introduction

In most hospitals, homes and industries combustion gases are produced by appliances such as scan machine, anesthesia machine, gas-fired furnace, fuel-burning devices etc., this may cause severe accidents in the hospitals, home and industries when these toxic gases starts leaks. Other important thing we take into consideration is quality of water in the hospitals, in most of the hospitals the water is stored in the underground tank, So there is a chance of mixing any impurities in the water. This may cause a water to contaminate.

The toxic gases can be detected by using suitable sensors. For example in the Hospitals, helium gas is used in MRI, carbon monoxide gas is released in the incineration, LPG gas is used in the laboratories. Among these gases helium and LPG are flammable, carbon monoxide is a toxic gas. The quality of the water can be detected by measuring the pH level and turbidity. The pH level can be measured by using a pH electrode and the turbidity can be measured by using LED and detector.

2. Existing Method

In most of the hospitals, the centralized medical gas system include gases like Oxygen, Nitrous oxide which stored in the manifold room are distributed to other areas of the hospital through pipelines. Two kinds of alarm are incorporated into the medical gas system. One monitors the pressure of various gases at different areas of distributed system with audible alarm. The second, lamp lights up when either of the banks of cylinders becomes empty with audible alarm.

3. Proposed Method

In the proposed method a gas detector which detects and monitoring the gases such as carbon monoxide, LPG, flammable gas and warns the technicians when a certain gas concentration is exceeded with some control unit. The quality of the water can be detected by measuring the pH level and turbidity.

4. Block Diagram

The Block diagram contains two units sensing & control unit and and monitoring unit. The operation of sensing unit is follows: the sensor array which consists of CO, flammable, LPG sensors for the detection of dangerous gases. And the quality of water was found using pH electrode and to detect the presence of any substances in the water using turbidity test. These signals are further given to the SCU for amplification process and ADC is used to convert the analog to digital form, were the output of the sensor array and the SCU will be in analog form, to digitize that we have used ADC.The fire also detected in the area and given to the ADC, digital output signal can be the input to the microcontroller and it process those signals and produce the output in the form of same digital way. In the monitoring unit the ZigBee transmit those signals to the PC. Level converter is used as interfacing between the microcontroller and the ZigBee. In PC, the

simulation is further processed using LabVIEW and suitable output is obtained in graphical representation. And based on the output from LabVIEW the control operations take place. In control unit the relay is used to convert the low voltage into high voltage. In relay back emf is generated, to avoid the back emf driver is used.

5. Sensing and Control Unit

In Sensing unit which includes five sensors such as CO, LPG, flammable, fire, turbidity and pH electrode. When the detected gases exceed the normal value there will be increase in the voltage. When the high voltage is sensed, microcontroller turns on the alarm. By the same way turbidity sensor and pH electrode turns on the alarm. Control unit is designed only for the LPG, flammable and fire sensors. When high voltage is produced by those sensors microcontroller turns on the alarm and also sends the signals to the control unit. When the signal sensed by the control unit turns on the relay. When the relay is on, power supply will cut and sprinkler will turns on.

5.1 Sensors

There are five sensors used – CO sensor, flammable sensor, LPG sensor, Temperature sensor, Turbidity sensor and one pH electrode. These sensors sense the abnormal level and send the analog value to the signal conditioning unit.

5.2 Signal conditioning unit

The signal conditioning unit accepts input signals from the analog sensors and gives a conditioned output of 0-5V DC corresponding to the entire range of each parameter. This unit also accepts the digital sensor inputs and gives outputs in 10 bit binary with a positive logic level of +5V.

5.3 Analog to digital converter

ADC 0809 analog to digital converter is a successive approximation type analog to digital converter. The successive approximation technique uses a very efficient code search strategy to complete n-bit conversion in just n-clock periods. The circuit uses a successive approximation register to find the required value by trial and error. The ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog to digital converter, 8-channel multiplexer and microprocessor compatible control logic.

5.4 Microcontroller

The signal obtained from the ADC is compared with the signals stored in the microcontroller and also for generating the PWM signal. Hence we require a microcontroller that can process 8 bit information as well as has an on-chip flash program memory, on-chip data RAM, 32 addressable I/O lines, multiple 16-bit timer/counters ,full duplex UART multiple source, on-chip EEPROM and watch dog timer. Therefore ATMEL89S51 suits the hardware requirement.

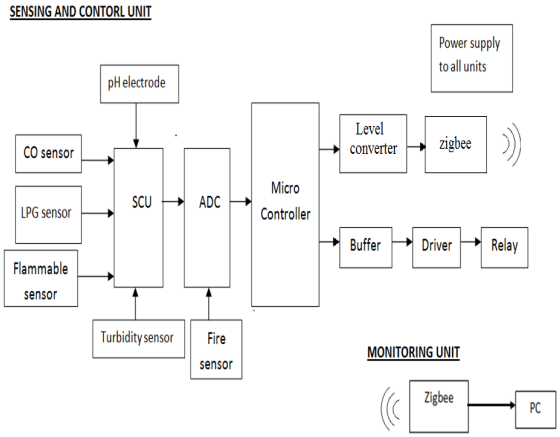

Fig.1 Block Diagram

5.5 ZigBee

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on Low-Rate Wireless Personal Area Networks (LR-16 WPANs), such as wireless light switches with lamps, electrical meters with in-home-displays, consumer electronics equipment via short-range radio. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking.

6. Sensor

There are five sensors – CO sensor, flammable sensor, LPG sensor, temperature sensor, turbidity sensor and one pH electrode is used.

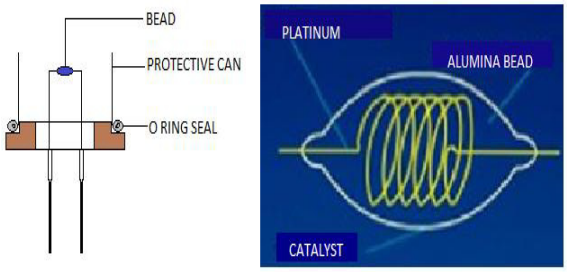

Fig.2 Principle of catalytic sensor

6.1 CO Sensor

This Carbon Monoxide (CO) sensor detects the concentrations of CO in the air and outputs its reading as an analog voltage. The sensor can measure concentrations of CO from 3410 to 10,000 ppm and flammable gas from 100 to 10,000 ppm. Connecting five volts across the heating (H) pins keeps the sensor hot enough to function correctly. Connecting five volts at either the A or B pins causes the sensor to emit an analog voltage on the other pins. A resistive load between the output pins and ground sets the sensitivity of the detector. Both configurations have the same pinout consistent with the bottom configuration. The resistive load should be calibrated for your particular application using the equations in the datasheet, but a good starting value for the resistor is 20 kΩ. CO sensors are designed to measure CO levels over time and sound an alarm before dangerous levels of CO accumulate in an environment, giving people adequate warning to safely ventilate the area or evacuate.

6.2 Flammable Sensor

These sensors are very sensitive to the flammable gases like helium. This flammable gas and smoke sensor detects the concentrations of combustible gas in the air and outputs as an analog voltage. The sensor can measure concentrations of flammable gas of 300 to 10,000 ppm. The sensor can operate at temperatures from -20 to 50°C and consumes less than 150 mA at 5 V.

6.3 LPG Sensor

The methane gas sensor detects the concentration of methane gas in the air and outputs its reading as an analog voltage. The concentration sensing range of 300 ppm to 35 10,000 ppm is suitable for leak detection. For example, the sensor could detect if someone left a gas stove on but not lit. The sensor can operate at temperatures from -10 to 50°C and consumes less than 150 mA at 5 V.

6.4 Temperature Sensor

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

6.5 Turbidity sensor

One of the most important parameters that require monitoring in a wash process is turbidity, a measure of the dirt, food or other particles suspended in the solution. Industrial grade turbid meters are used, for example, at water treatment plants to assess water quality in the treatment cycle. These meters are very precise and very expensive.

Current technology to measure turbidity depends on optical techniques, where water or other fluids pass through a tube or vessel and a beam of light is transmitted through a cross section of the vessel. As the photons that make up a beam of light pass through the liquid being tested, some are reflected by the particles suspended in the solution while others pass through unimpeded. Two optical detectors-one positioned head on to the light source, the other at an angle of 90° to the light source-measure the transmitted and scattered light photons respectively. The dirtier the water, the less light gets through and the more it is scattered. The turbidity of the water is determined by analysis of the ratio of the scattered light signal divided by the transmitted light signal. A visible light-emitting diode (LED) is used for a light source. Two photodiodes serve as optical detectors. Light on the detectors creates a current flow through the diodes which is converted to a digital representation by a delta-sigma analog-to-digital technique directly into the on-board microprocessor. A drive control circuit is used to eliminate adjustments to calibrate the LED intensity from sensor to sensor.

6.6 pH Electrode

A pH electrode measures hydrogen ion (H+) activity and produces an electrical potential or voltage. The operation of the pH electrode is based on the principle that an electric potential develops when two liquids of different pH come into contact at opposite sides of a thin glass membrane.

Today, modern pH electrodes use the same principles to measure pH in a variety of applications including water treatment, chemical processing, medical instrumentation, and environmental test systems.

The modern pH electrode is a combination electrode composed of two main parts, a glass electrode and a reference electrode pH is determined essentially by measuring the voltage difference between these two electrodes. At the tip of the electrode is the thin membrane which is a specific type of glass that is capable of ion exchange. It is this element that senses the hydrogen ion concentration of the test solution. The reference electrode potential is constant and is produced by the reference electrode internal element in contact with the reference-fill solution which is kept at a pH of seven**.**

7. LabVIEW Features

LabVIEW programs are called Virtual Instruments (VIs) because their appearance and operation imitate

actual instruments. However, they are analogous to functions from conventional language programs. VIs has both an interactive user interface and a source code equivalent, and accepts parameters from higher-level VIs. The following are descriptions of these three VI features.

VIs contains an interactive user interface, which is called the front panel, because it simulates the panel of a physical instrument. The front panel can contain knobs, push buttons, graphs, and other controls and indicators. Entering input data using a keyboard and mouse, and then views the results on the computer screen.

VIs receives instructions from a block diagram, which you construct in G. The block diagram supplies a pictorial solution to a programming problem. The block diagram contains the source code for the VI.

VIs uses a hierarchical and modular structure. We can use them as top-level programs, or as subprograms within other programs or subprograms. A VI within another VI is called a subVI. The icon and connector pane of a VI work like a graphical parameter list so that other VIs can pass data to it as a subVI. With these features, LabVIEW promotes and adheres to the concept of modular programming. First divide an application into a series of tasks, which can divide again until a complicated application becomes a series of simple subtasks. Build a VI to accomplish each subtask and then combine those VIs on another block diagram to accomplish the larger task. Finally, top-level VI contains a collection of subVIs that represents application functions.

8. Hardware Setup

8.1 Sensing and control unit

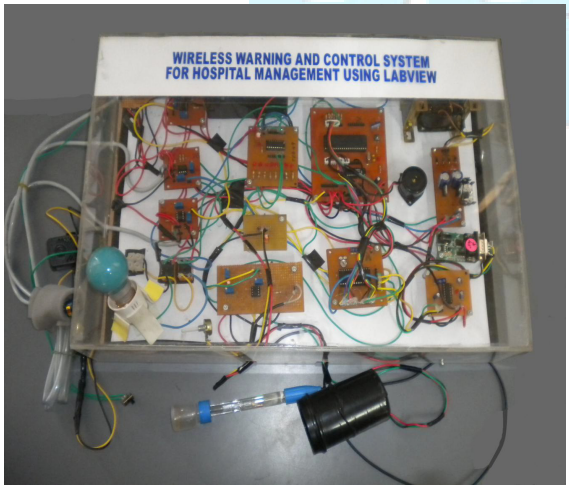

Fig.3 Sensing and control unit

8.2 Monitoring unit

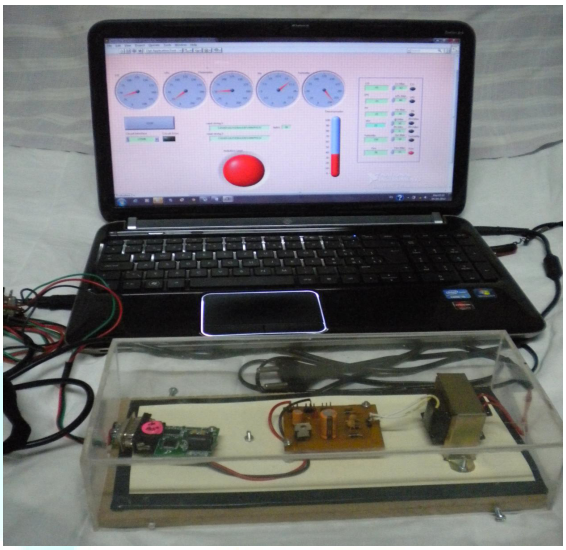

Fig. 4 Monitoring unit

9. Software Implementation

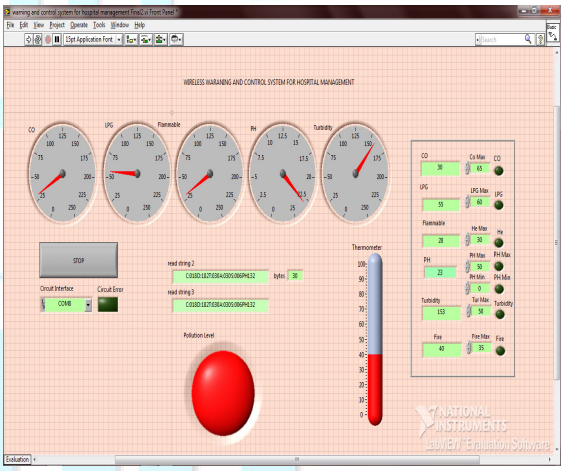

Fig. 5 Front panel

10. Conclusion

Thus, in our day to day life many accidents in the hospital occur due to the leakage of flammable and the toxic gases. The intake of the contaminated water may also cause the health hazards. To overcome this problem, the continuous monitoring and control system for the hospital management is developed. This system is wireless and alert the technicians if there is any abnormality in the gas and/or water. If there is any increase in the temperature and any flammable gas is detected, the controlling system will automatically cuts

the electric supply to the area and the sprinkler gets on. By using this method we can control the major accidents in the hospitals.

11. Future scope

Hopefully, the ideas in this dissertation will serve as a useful foundation for the development and the encouragement of future research. In future, it can be extended by including more sensor and control units. It can also implement in home, restaurant, automobiles and common water storage areas.

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