

Embedded System Based Sensor Failure Detection and Industrial Environment Control Over Wireless Network

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Abstract: This paper focus on sensor nodes failure detection monitoring and control process via GSM and ZIGBEE wireless module. The virtual instrumentation process does measure the sensor node characteristics value and control the environment by wireless network. The industrial need does uses four types of sensor gas, radiation, temperature, and smoke sensors. The error occurrence does it's to be detected and it will be control by the ARM controller. The performances measures does it can be monitor and also be indicated and also be control through the WSN network. The data logging of sensor monitoring and its control functions are realized through proteus stimuli view.

Keywords: wireless sensor network; sensor parameter instrumentation; proteus view.

INTRODUCTION:

Industrial environmental safety and pollution control does it's to be needed for human and resource to avoid defect over certain application process. The automation process does hold few mal functionalities provide major hazards effect to its resources. The sophisticated device that its leads to avoid the disorder functionalities. The instrumentation process of sensor calibration does it's achieved by various testing process. The conditional process does satisfy its basic relevant characteristics it's to be a good device. The control strategies does it polices various technologies based upon its protocol devices. The wireless technology is to be used for industrial safety and environmental pollution control which does it to be flexible for manual usages.

In industries the pollution controlling methodologies may differ based up on its application, the sensor failure does produce various damages over the substances. The safety and losses should be concern to ignore need recover from the failure modes. In real-time application wireless technology is more compactable for monitoring and controlling process.[1] Integration of wireless sensor network with virtual instrumentation in a hazards environmental in a industries does provides sensor nodes for temperature, gas, radiation, smoke, fire. The essential feature does to be useful for detection of butane and methane gas, temperature, smoke, fire, and radiation parameters are monitor and communicated via zigbee technology the mat lab view used for synthesis the model and characteristics is to be monitor by personal computer. [2] Gsm based irrigation control and monitoring system does sense the water level content over irrigation purposes. The water moisture is to be measured and control by pic microcontroller. [3]Enhancing mine safety with wireless sensor networks using

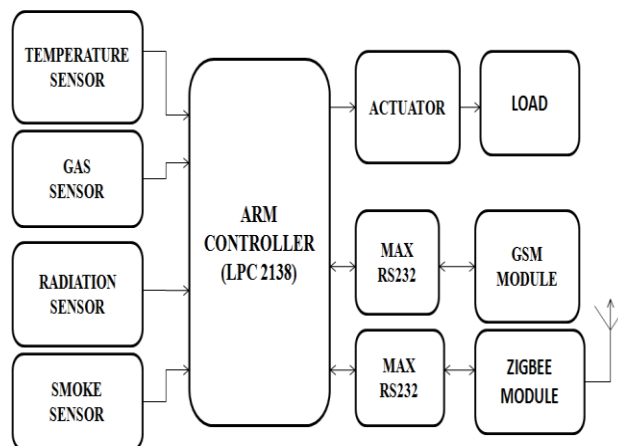
zigbee technology uses the temperature gas and ultrasonic sensors for to avoid damages and explosives under the coal mines. [4] Rescue and protection system for underground mine workers based on Zigbee. The hardware is attached to the mine worker and the monitoring does preferences a separate station. The carbon monoxide and methane gas leakages can be detected and controlled via pic microcontroller. [5] Remote monitoring of multi parameters using an embedded digital controller. A web Mediated digital embedded controller for thermal process has been discussed and presented. The web technology prefers collection of database information via internet protocol.

PROPOSING SYSTEM

The system does compose two modes, failure and normal mode. In normal mode the system operate as an existing system only sense and monitor via wireless communication. The failure mode sensor calibrated reading varies does also be indicated and also be controlled via ARM controller.

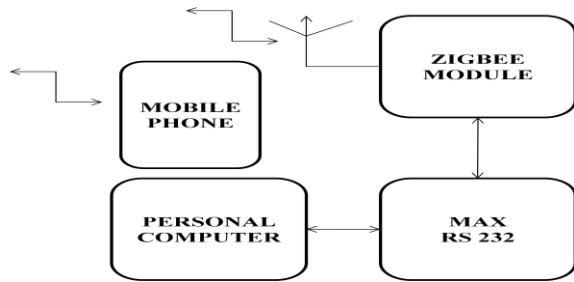
System design: The system view does represents sensing parameter limited 100*c-500*c for temperature sensor, the condition satisfies does operate in normal mode no control operation is to be needed and variation in sensor resistive parameter does its causes effect on resources, the signal conditioner does it's to be convert the sensor output voltage level into ARM controller supportive voltage level. The voltage level does it depends on internal resistive characteristics. The calibrated voltage level does vary ARM compares and control by alerting and responses by AT command communicated via GSM and ZIGBEE module.

BLOCK DIAGRAM



Controller Station

The system consists of base station and controller station, the system is to be performed to asynchronous communication.

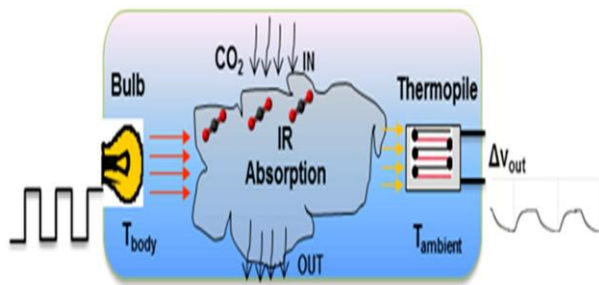


Base Station

The base station does also be a remote station which control the load through the ARM controller which sends AT command instruction to the ARM controller the station does its specifies wireless technologies and control the load by inter process communication.

A. Gas sensor:

The MQ 06 gas sensor is to be used for gas leakage sensing process. The leakage of butane, methane, harmful gas is to be detected by the sensor.



Sensor Principle

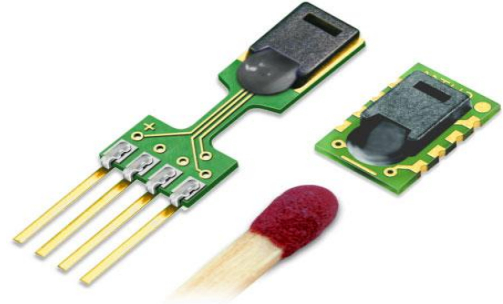
The CO₂ gas is more specific absorption for heat and IR. The coefficient does it utilizes the variation in the sensor filament. The resistivity varies does cause variation in output voltage level.



Gas sensor

B. Temperature Sensor:

Temperature LM 35 sensor measure the temperature level with in the resources. The temperature level does it's to be measure and controlled by the ARM controller. The specific temperature is to be calculated and measurement error occurs does be detected and indicated by the controller.



Temperature sensor

C. Smoke sensor:

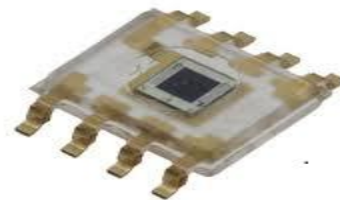
The smoke sensor sense higher specific content of carbon monoxide gases around the surrounding. The MCT-426 smoke sensor used for the sensing the smoke gases explosive.



Smoke sensor

D. Radiation Sensor:

The radiation sensor used to detect the radiation of light sources the higher radiation does causes the sensitive affect to our human. The TSL 250 sensor does sense the light radiation over the environment, the TSL 250 optical sources into voltage sources. The resistivity parameter variation does it's to be measured and controlled via controller station.



Radiation sensor

E. Microcontroller:

The ARM controller specifies good configuration and it's more compactable for real time applications. The ARM LPC 2138 specifies 10 bit ADC and DAC, 16 bit/32 bit controller. It also includes IC, SPI, and SSP serial interface.

The ARM controller is more reliable than PIC. 5V is needed for PIC, but ARM can operate in 3.3V and also its can interfaces usb directly with in it. PWM does also be inbuilt within it.

F. MAX RS 232:

The MAX RS 232 is a serial interface between controller and ZIGBEE and GSM protocol the serial interfaces does achieve the synchronous communication between the controller and the remote station (Base station).

G. GSM :(GLOBAL SYSTEM FOR MOBILE)

The gsm is a 2G network used for global communication. The gsm can communicate the controller which receives indication and send AT command instruction via GSM network.

Features of GSM:

- Band GSM/GPRS: 850 / 900 / 1800 / 1900 MHz's
- Built in RS232 to TTL or vice versa Logic Converter (MAX232).
- Configurable Baud Rate.
- SMA Quad (Subminiature version A) connector with GSM L Type Antenna.
- Built in SIM (Subscriber Identity Module) Card holder.

H. Zigbee:

The zigbee protocol is a wireless protocol; specific operates in the 2.4 GHz (ism) radio band the same band as 802.11b standard, Bluetooth, microwaves and some other devices. It is capable of connecting 255 devices per network. The specification supports data transmission rates of up to 250 kbps at a range of up to 30 meters. Zigbee technology is slower than 802.11b (11 mbps) and Bluetooth (1 mbps) but it consumes significantly less power.



Zigbee module

Zigbee characteristics

- 1 Dual phy (2.4ghz and 868/915 MHz)
- 2 Data rates of 250 kbps (@2.4 GHz), 40 kbps (@ 915 MHz), and 20 kbps (@868 MHz).

- 3 Optimized for low duty-cycle applications (<0.1%).
- 4 Csma-ca channel access yields high throughput and low latency for low duty cycle devices like sensors and controls.
- 5 Low power (battery life multi-month to years).
- 6 Multiple topologies: star, peer-to-peer, mesh.

I. Actuators:

The actuator is used to control the electrical load by driver circuits and relay switch. The ARM controller sends control signal to the driver circuit the output of ARM is only up to 3.3v, but relay switch need high voltage level based on driver switches ratings e.g. 12v, 24v 230v etc.

The relay switch does switch the load input power to ON or OFF stages based on the control input from the controller.

J. Load:

The load consists of dc motors and solenoid valve, Electrical load does it's to be control by the ARM controller and relay switch. The exhaust fan and solenoid valve does close and control the pollution over the environment.

The controller station does indicate via wireless network to the base station and control the electrical load by instruction of remote user. The ARM does intimate to the base station and responses user AT command via wireless technologies. The control strategy does used to protect the human, environment, and possessive materials.

L. Mobile:

The mobile is a communication device which communicates between the control station and user. The error indication indicated via message and response messages to the control station. The mobile node is to be activated by the network service provider; the GSM network does provide various services via mobile technology. It provides confidentiality, privacy, authorization, and authentication services over network.

M. Personal computer

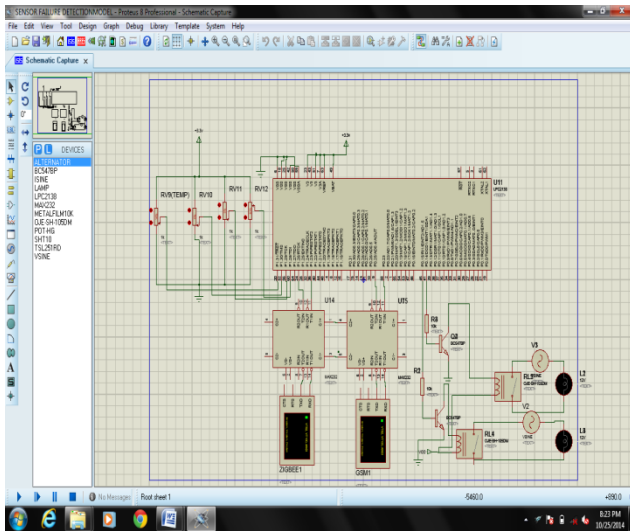
The personal computer used to monitor the gas, temperature, radiation, and smoke sensor values. The zigbee is a wireless protocol which communicates between personal computer and the controller.

SOFTWARE DESCRIPTION

The embedded system failure detection programmed in embedded c language uses KEIL C software for source programming. The tool used to compile to check error occurrences over programming. The PROTEUS 8.2 tool used to stimulate overall performances of circuit diagram. The hex coding is to be loaded in the stimuli tool ARM controller and check its design performances.

- KEIL C
- PROTEUS 8.2

PROTEUS 8.2 STIMULIATION OUTPUT:



Stimulation output

The sensor failure does it to be detected and control via zigbee and mobile wireless technology. The load can be controlled the indicator lamp can switch off state by instruction AT command message to the ARM controller. The message is to be send through wireless technology. The command does indicate to drive the load to ONN or OFF state of required load.

CONCLUSION

This paper analyze about the sensor failure and environment control over industries. The failure mode of operation does it's to be detected to avoid mal function process over a resources. The pollution can be prevented from hazard effect to be rectified by detection of sensor. The wastage of raw material can also be avoided by alerting and controlling process.

REFERENCES

- i. Sureshkumar A," Integration of Wireless Sensor Network with Virtual Instrumentation in a Hazardous Environmental"/international journal of innovative research in computer and communication engineering/Vol. 2, Issue 4, April 2014
- ii. Godfrey A. Mills et al.," gsm based irrigation control and monitoring system" / International Journal of Engineering Science and Technology (IJEST)/ Vol. 5 No.07 July 2013.
- iii. P.Raghuram," Enhancing mine safety with wireless sensor Networks using zigbee technology", / Journal of Theoretical and Applied Information Technology, 31st March 2012. Vol. 37 No.2.
- iv. Partha sarathi Das," Rescue and protection system for underground mine workers based on Zigbee"/ Int. Jr. Of Advanced Computer Engineering & Architecture.Vol 2 No. 2 (June-December, 2012).
- v. A. Balaji ganesh, /" Remote monitoring of multi parameters using an Embedded Digital controller"/ mobile and pervasive computing (compc-2008).
- vi. M. Argany, M. A. Mostafavi, F. Karimipour, and C. Gagme, "A GIS Based wireless sensor network coverage estimation and optimization: A Voronoi approach," in Transactions on Computational Science XIV, Vol. 6970. New York: Springer-Verlag, 2011, pp. 151–172.
- vii. Monitoring, Verification, and Accounting of CO2 Stored in Deep Geologic Formations, National Energy Technology Laboratory, Morgantown,WV, Jan. 2009, pp.
- viii. S. M. Klara, R. D. Srivastava, and H. G. Mcilvried, "Integrated collaborativeTechnology development program for CO2 sequestration in Geologic formations–United States Department of Energy R&D," Energy Convers. Manage vol. 44, no. 17, pp. 2699–2712, 2003.
- ix. S. Solomon, "Carbon dioxide storage: Geological security and environmental Issues-case study on the Sleipner gas field in Norway," Bellona, Tech. Rep. 1-2007, 2007, pp. 4–5.
- x. I. Brevik, Q. Eiken, R. J. Arts, E. Lindeberg, and E. Causse, "ExpectationsAnd results from the seismic monitoring of CO2 injection into a marine aquifer," in Proc. 62nd EAGE Conf., Glasgow, U.K., 2000, No. B-21.