Wearable Wireless Sensor System with RF Remote Activation for Industrial Applications

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Abstract—These days , Sensors are playing very important role in the world with combination of Wireless Technology.Wireless Sensor System makes the human life simpler and smarter . This emerging Technology helps in Industrial Applications .Safety and Security standards to employee position observation and industrial premises monitoring is also important towards safety Industrials. In this paper we are introducing advanced sensor system called Wearable Wireless Sensor System . It is the combination of Wireless Sensors and Wearable Technology for significant safety enhancement in Industrials. We built up a wearable wireless sensor framework which is appended in a consistent wearable format & utilized to work environment observation. Wireless Sensors are temperature, smoke sensor and LPG Gas sensor. The fundamental element of designed framework is likelihood could be actuated wirelessly through a RF module with radio signal at a frequency of 850MHz to 865MHz .It performs different wearable sensing module framework, for example, changing the framework from rest, estimation, and information transmission modes when outside RF sign is accessible. The exploratory information exhibit that the actuation separation distance is 2.8 m to a RF module with an intensity of 28 dBm. Advanced Wearable System framework can signalize about worker nearness in connection to offices. If any alert through high temperature, smoke or gas leakage RF wireless module alert us through buzzer and we control the same thing through Wireless Technology. All info and out modules are interfaced to ARDUINO Microcontroller with procedure input information and furnish yield with assistance of 5V controlled power supply. In this task we utilized Arduino ide programming to compose c program and accumulating.

Index Term: Arduino, LPG, Smoke, RF, WearableWireless Sensor.

I. INTRODUCTION

Present day level of hardware and data innovation permits fusing electronic parts legitimately into work garbs or regular citizen garments without carrying a bodily distress towards the wear.The wireless innovation furnishes dressable gadgets with RF association , additionally this is an association with significant system administrations for capacity and handling information of each wearer. This innovation additionally gives remote observing element, the information of dressable could be detected by equipped staff distantly and connection to elements of dressable gadgets is done. There are great deals of calling in industry and administration parts which are influenced by various risks. Simultaneously, the security benchmarks for modern plants become harder as for representative state observing and checking of working ecological conditions. Along these lines, it is important to give ongoing wireless observing of both worker state and working environment natural conditions. Different kinds of Wireless Sensor Networks(WSN) have been grown as of late. These systems comprises of little hubs and are furnished with handsets, chip and sensors. They can be utilized in various everyday issues such as ecological , human checking, home computerization and so on. With the help of proposed system, advanced safety and security in Industrial Applications is new era in present and also the employee safety and monitor is observed wirelessly through this system.

II. LITERATURE OVERVIEW

Writing Survey to neutralize the perilous impacts of gas spillage, critical endeavors was completed in manipulative and scaling down the gas break locating procedure. The events of gas release related occurrences are contemplated by a few analysts and have distributed factual information episodes. In 2012, Some vital detailed "Vitality Aware Gas Sensing Using Wireless Sensor Networks" concentrating on a sensor hub, hand-off hub, remote sensor system and a system organizer [1]. System organizer is a principle element of WSN. Bolsters a system activity by wireless correspondence dependent on the IEEE 802.15.4 standard and the ZigBee determinations. The system organizer is additionally in charge of alarming a system administrator or a crisis administration utilizing the internet system or alerting a SMS using GSM modem. Indeed, after accepting the alarm with the sensor hub, a system facilitator be able to carry out the primary oppose activity by switching off harmful gas emanation by means of the remote sensors. Similar creators have additionally added to the additional vehicle security through a truck lodge , air excellence screen utilizing CO & O2 gas modules , framework structured is created and on-street tried. The consistent observing gases of CO & O2 gives included vehicle wellbeing a caution and can be put off perilous gas focuses, driver's weariness / sleepiness and Fumes hazardous gas result suicides. CO groupings of 30 ppm & O2 gas levels less than 19% practiced when driving. A "GSM Based Gas spillage Detection System" by Srivastava and Prabhukar gives a practical and profoundly precise framework,

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which distinguishes the gas spillage as well as caution , mood killer the main power and gas supplies and sends a SMS. Ramada and Palaniappen detailed an "Implanted System for Hazardous Gas Detection and Alerting". The cautioning of gas spillage is through buzzer and SMS. A"WSN based Smart System for Detection of LPG and Combustible Gases" has been proposed by Hemiacetal [2],which distinguishes possibly unsafe gas spill inside a zone by methods for different sensors based electronic frameworks. These frameworks additionally utilize a discernible caution to alarm the individuals at whatever point a perilous gas is distinguished. These gas has10 identification framework which is enormous helpful , these frameworks are able to utilized to distinguish a broad scope of burnable, combustible & poisonous gases which effectively affect human wellbeing . "Plan Implementation of an Economic Gas Leakage Detector" [3] by Mahalingam gave the financially savvy broad media answer for LPG spillage discovery in homes and business environment and perceptibly alert the clients in the event of a perilous circumstance & give cautioning signal (blares)

III. EXISTING SYSTEM

Synergist, optical and semiconductor sensors are broadly utilized in checking ignitable hazardous gases continuously in Industrial applications. Synergist sensor modules are broadly utilized for ignitable gas with scope of Less explosive boundary, because of high affectability ,selectivity, straight reaction and minimal effort. Along those sensor modules we picked reactant remote sensor for the proposed wearable sensor system framework.In Present days we are utilizing Gas Detection modules, which can quantify information from working spot which gives alert. With this framework time utilization, Power utilization additionally is high and because more harm is happening to maintain a strategic distance . To secure worker and work place we are presenting Wireless Sensors which are savvy, low power and quick.

IV. PROPOSED SYSTEM

In the proposed system we introduced a wearable sensor framework which is assigned for checking natural consideration and giving representatives to wellbeing unsafe enterprises, for industrials. In this present wearable framework we are utilizing Temperature, LPG Gas and Smoke sensors which constantly screen the information and if any crisis condition occur it offer alarm to verify worker and work place. In this paper we are utilizing RF framework by which we can control gadgets remotely to screen the nearness of the worker. The wearable framework proposed in this work, gives information gathering and guarantees staff security. If there should arise alerts in the remote initiation area, association with WSN set up. With this framework time utilization, Power utilization is low and because recently more harm happening to maintain a strategic distance from and secure worker and work place we are presenting Wireless Sensors which are savvy, low power and quick. The proposed framework expands the security of representatives at mechanical offices by giving an ongoing checking of gas fixation, which for our situation is methane.

V. METHODOLOGY

The proposed framework is design for Industrial Applications. This framework comprising of Wireless Sensors such as temperature sensor, smoke sensor and LPG Gas sensor. RF Modules are RF Tx and RF Rx, LCD, Buzzer. Temperature sensor, Smoke Sensor, Gas Sensor detects the information and screen in LCD, if in case temperature or gas or smoke builds it ought to illuminate naturally caution give by the buzzer module. RF module is utilized to control the devises remotely. At the point when the individual went into the RF zone it will give the status of the worker present. By utilizing RF module we can control WSN sensors enactment from rest mode.
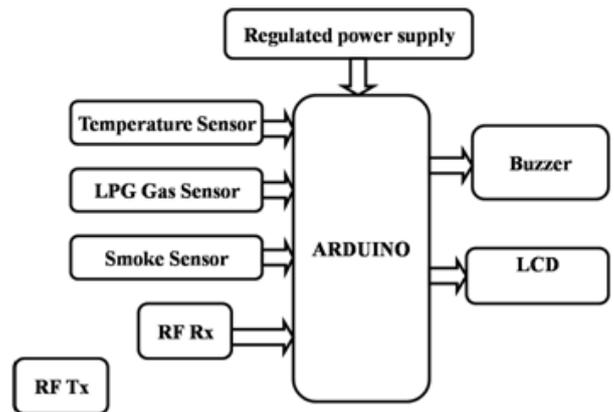
Fig. 1. Block diagram

VI. FUNCTIONAL DESCRIPTION

A. Regulated Power Supply

This is a little +5V managed power supply circuit. All things considered here are utilized by 7805 Voltage Regulator IC. 7805 is a +5 Volt controller IC from 78xx chips family. The circuit has inward current restricting and warm
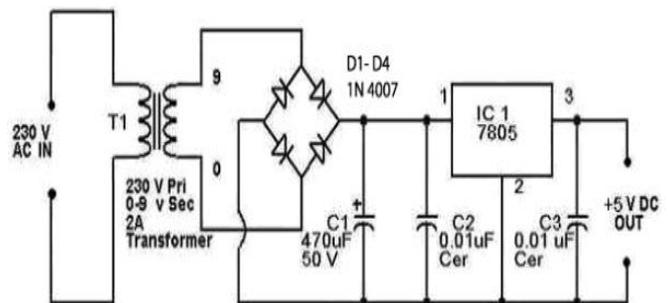
assurance limit.

Fig. 2. Block diagram

A 9V 2A step down transformer used which convert 230 v ac supplies to 12 v dc and bridge rectifier using four 1N 4007 diode to convert AC-DC. 470uF 50v as C1 is utilized for separating. This circuit is extremely simple to assemble. For good performance prescribed voltage is 5V-12V. On the off chance that over 400mA current is required at yield, at that point utilize a warmth sink with the 7805 IC.

B. ARDUINO Microcontroller

To design to the proposed system we are using ARDUINO microcontroller to interface input and output modules and as processing unit. Arduino uno is having 28 pins which are classified as analog and digital pins D0 to D13 are digital Pins,all digital sensors will connect to digital port. A0 to A5 are analog port ,all analog sensors are connected to analog port. It is 8 bit micro controller and having 32KB memory for data and program memory. Operating frequency is 16MHz. we are using ARDUINO development board and ATMEGA328 SMD IC.

Fig. 3. Arduino

C. LCD 16 × 2 Display

The proposed liquid crystal LCD display is viewed as the spotlight of this work as it consistently exhibits a few information synchronously more than 16 sections and 2 columns. The principle capacity of the proposed LCD display is to demonstrate the data announced by the utilized sensors as a few credits so as to explain the circumstance of the framework intermittently. The association plan is proposed to be interfacing with Arduino board for displaying data.

Fig. 4. 16*2 LCD display

D. RF Remote Control

RF module is one of very important wireless data communication device. It's having transmitter which sends data through transmitting antenna, which is inbuilt in module .It also have receiver which receives data and give to microcontroller. The role of the RF module in this method is to give smoke and temperature alerts and control devices automatically in industrial.
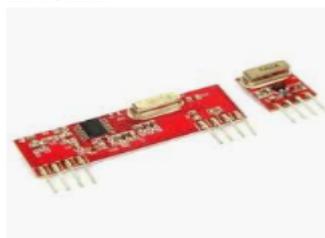
Fig. 5. RF Remote Control

Range of RF transmitter and receiver module is 500m , operating voltage is 5v , consumed current is 50Ma and operating frequency is 433MHz.

E. LPG gas sensor

MQ-6 Sensor used as LPG gas sensor. This sensor sense the liquid petroleum methane gases. This sensor circuit is having a device which acquire methane gas and gas particles and are converted to voltage. A sensor module having comparator circuit which than converts to logic level 0 and logic 1. The role of MQ-6 sensor is to sense the methane gas content and send alert to the micro controller than microcontroller activates the alarm.

Fig. 6. LPG Gass Sensor

F. SMOKE sensor

MQ-2 is a Sensor for Natural Gases Sensitive material. MQ-2 Sensor used as Smoke gas sensor. This sensor sense the carbon monoxide gases. This sensor circuit acquire a gas and carbon monoxide gas particle which are converted to voltage and after that sensor module having comparator circuit gets converted to logic level 0 and logic 1. The role of MQ-2 sensor is to sense the carbon monoxide gas content and send alert to the micro controller and microcontroller activates the alarm.

Fig. 7. Smoke sensor

G. Temperature sensor

Temperature sensor is used to measure the surrounding temperature and alerts when the threshold voltages across that. LM35 module used as Temperature sensor is having 3 terminals voltage, ground and data. Operating voltage is 5V and it can withstand voltage range from - 55°C to +150°C. Thermostat is capable of observing heat. The role of LM35 is that whenever temperature crosses the limit than automatically it alert microcontroller and controller takes action.

Fig. 8. Temperature sensor

H. Buzzer

Piezo buzzer is an electronic device which generate sound. The working of buzzer is when electrical signal applies on it than it gets converted to sound waves; simply voltage converted to sound than initializes by microcontroller. The role of the buzzer is to give alarm when ATM crime may happen. Buzzer is output module,its operating voltage is 5V.

Fig. 9. Buzzer

I. Software

Embedded system deals with both Software and Hardware. Software is very important module to develop programming code. To implement proposed methodology we used ARDUINO IDE Software for Embedded c language editing, compiling and dumping. Simulation is very important tool to design project virtually, before hardware implementation. We used proteus Software for simulation of complete project. Express SCH software used to design schematic diagram of project.

VII. RESULT AND DISCUSSION

We successfully interfaced all input and output modules to microcontroller. Controller performed and execute results as per the requirement. We obtained auto alerts of gas, smoke leakage and temperature high alerts. We controlled the wireless devices using RF successfully.

Fig. 10. Output Results

VIII. CONCLUSION AND FUTURE WORK

We designed a Wearable Wireless Sensor System with RF Remote Industrial Activation for Industrial Applications for safe and security of employee state and industrial environment. In this paper, we have created and effectively actualized a Remote Sensor framework designed in a uniform which is inclined to Wireless Sensors such as temperature sensor , smoke sensor and LPG Gas sensor .The system is monitored and controlled by RF module wirelessly which is implemented and executed successfully. In future we use IoT module with Wireless Sensor Framework to screen and control the information and sensor modules wirelessly. Likewise we can send information and screen all through the world.

REFERENCES

1   Lee, E.A.; Seshia, S.A. Introduction to Embedded Systems, A Cyber-Physical Systems Approach, 2nd ed.; MIT Press:Cambridge, MA, USA, 2017.
2   Security governs in coal mineshafts PB 05-618-07, Standard GOST (in Russian), 30.07.2003.
3   S. Matteo, A. Charleroi, "Wearable hardware and keen materials: a basic audit", Sens., vol. 14, no. 7, pp. 11957-11992, Jul. 2014, DOI: 10.3390/s140711957.
4   M. Chan, D. Estève, J.Y. Fourniols, C. Escriba, E. Campo, "Shrewd wearable frameworks: Current status and future difficulties", Artificial knowledge in drug, vol. 56, no. 3, pp. 137-156, Nov. 2012, DOI: 10.1016/j.artmed.2012.09.003.
5   S. Nabil, "Intelligent contemplations on the potential and difficulties of wearable innovation for medicinal services arrangement and restorative training", International J. of Information Management, vol. 35, no. 5, pp. 521-526, Oct. 2015, DOI: 10.1016/j.ijinfomgt.2015.04.010.
6   S. Scataglini, G. Andreoni, J. Chivalrous, "A Review of Smart Clothing in Military" in Proc. 2015 Workshop on Wearable Systems and Applications WearSys '15, Florence, Italy, 2015, pp. 53-54, DOI: 10.1145/2753509.2753520.
7   G. Ahmed Zeeshan " Design and Implementation of Child Activity Recognition Using Multi Sensors on Arm Processor " IJESC Vol. 6 ISSUE 8 August 2016.
8   G. Ahmed Zeeshan " IoT based Mining Workers Safety Monitoring and Alerting System by using Raspberry Pi " IJRECE Vol. 6 ISSUE 3 July 2018.

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