Lifetime Optimization of Wireless Sensor Networks for Gas Monitoring in Underground Drainage

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ABSTRACT: Drainage activities releases toxic and very harmful gases. This causes lot of pressure in the drainages industry. Thus to increase the productivity and reduce the cost of drainage along with the consideration of the safety of workers, an innovative approach is required. A real time monitoring system uses WSN, with multiple sensors. This system monitors surrounding some environmental parameters such as moisture, toxic gases and land sliding with the help of two wireless sensor nodes using GSM. This system displays the parameters on the Monitor at the underground section, where sensor units are installed as well as on the monitoring unit. It is helpful to all miners who are present inside the drainages to save their life before any causality occurs. An alarm triggers when the sensor values crosses the threshold level. This system also stores all the data in the computer for future inspection. Underground drainages required equipment and man power to operate under the earth surface. Each sensor has its own advantages and constraints, like some sensors are better for sensing toxic gases and some are better for combustible gas detection. The paper enumerates operating principle, working procedure and application of different types of sensors for monitoring toxic and flammable gases in hazardous areas. In any type of industry one of the most vital parts is the safety. Negligence in the safety may cause loss of human life or may cause damaging of high quality equipments.

I. INTRODUCTION

The safety issues of drainage have gradually turned in to a major concern for the society and nation. Since 1900, over100, 000 workers have been killed in drainage in the U.S.(Alford, 1980) and many more have been injured and disabled. Underground drainages are exposed to a wide range of hazards including gas explosions, shifting rock, falls, and machineries and mobile equipment accidents. Drainages as an important source of energy in industrial production, it plays a pivotal role in the national economy. So the miner safety is very important factor to be considered. Presently miner have only helmet for purpose of protecting the head. In this paper to develop a smart helmet for monitor the concentration level of harmful gases and hazardous event of drainages and transmit the data to the base station using ZIGBEE. To monitor the concentration level of harmful gases present in drainages like SO2, NO2, CO etc. The semiconductor gas sensor are used. It also considering the health condition of person using fall detector accelerometer. The removal of miner helmet is also a important factor under consideration. The limit switch is used to detect the miner's wear the helmet or not. All data is transmitted from helmet to base station using ZIGBEE. The data at receiver side is transmitted on be a difficult process bearing in mind the everyday. Underground mines are very dark places and therefore the miners use safety helmets with attachable mining lights. The equipment used in underground mines can create a lot of noise and vibrations, which are compounded by the cramped conditions in the underground tunnels. The problem associated with the noise is that warning a miner with a speaker, alarm, vibration unitand LED system when a fellow miner is experiencing a hazardous event would most probably be in vain as the miner would not hear the alarm. It was therefore decided to implement a system that will warn the miner by flashing the mining light a few times. Using this warning method has the added benefit of using the mining helmet light of the miner who is experiencing the

hazardous event. Flashing the light constantly simultaneously show who is experiencing the problem as well as indicate the location of the miner. Also headphone and speaker are used to send the emergency message signal.

II. LITERATURE REVIEW

Author, *M.R. AKSHAY D. PRABHU, MR. ASHWIN D.PATHAK* **gas leakage detector uses ARDUINO UNO microcontroller** is the gas leakage sensor is a such a device with detects gas leaks at initial level and warns the people of the same. Author, *ARAVIND BELIRAYA* **GSM based gas leakage detection** system is the gas sensor can be used which has high sensitivity for propane (C_3H_8) and butane(C_4H_{10}).Gas leakage system consists of GSM module, which warns by sending SMS. Author MUHAMMED MOSTAFA **GSM based gas leakage detection system using ARDUINO** for the toxic gases like butane (also known as LPG), methane and carbon monoxide are sensed and displayed on the LCD display. The concentration of the gasses will be shown in the form of percentage by LCD display. In JERRY SILVIOUS, DAVE TAHMOUSHh **Detection Of Liquefied Petroleum Gas Using Sensor Through ARDUINO Uno Microcontroller** for in this paper the leakage of gas is sensed by MQ2 sensor and notified to the user through SMS and a phone call using GSM, which is help for transforming this simple device .The block diagram which is content different types of sensors like Dust and Co2 sensor ,Vibration sensor, Soil Sensor ARDUINO , ZIGBEE, LED light, buzzer etc. Under the normal condition sensors are inworking conditions means it sense the all the parameter to respective sensors. When abnormal condition is occursensor sense the signal and give to the ARDUINO. ARDUINO compare the value and check which is greater than predeterminedvalue. If it is greater than that given value it give the signal to the buzzer as well as LED light which isstart to alarming and glowing. This process starts at time in underground section simultaneously ARDUINO gives thesignal to the Xbee. ZIGBEE works as trance-receiver it transmit the signal from one node to next node.

III. SYSTEM DESIGNING

Block Diagram
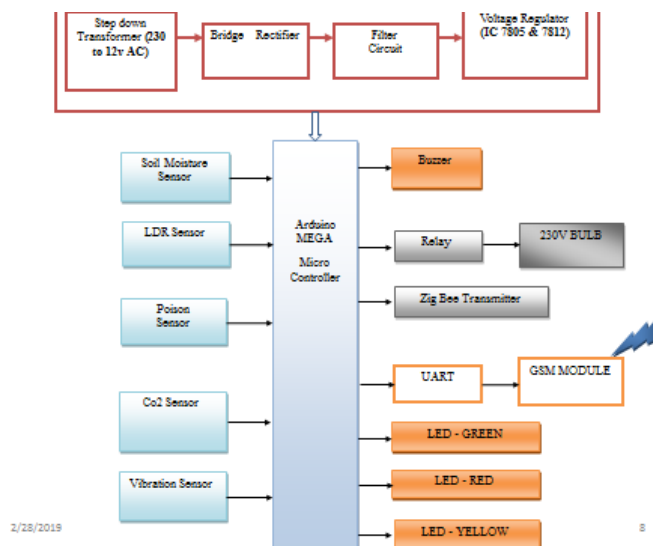
POWER SUPPLY UNIT:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

Fig : Power Supply unit

ARDUINO MEGA MICROCONTROLLER OVERVIEW

The ARDUINO Mega 2560 is a microcontroller board based on the ATMEGA 2560(datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs),16 ANALOG inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, 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 Mega is compatible withmost shields designed for the ARDUINO DUEMILANOVE

VIBRATION SENSOR:

It works on electromechanical principle vibration velocity sensors operate in accordance with the electrodynamics principle and are used for measuring the bearing absolute vibration based on the piezoelectric effect. Change in resistance due to the force acting on it and convert it into 4 - 20 mA. They are measuring differences in oscillation, so they probably want a -12 and +12swing with 0 as the base linear we have piezoelectric sensor which detects the vibration created on the surface. We can also use shock sensor to detect vibrations.

CO2 SENSOR

CO2 sensor is a chemical optical sensor utilizing the acidic nature of CO2 for detection. It consists of a gas-permeable membrane in which a pH-sensitive luminescence dye is immobilized together with a buffer and an insert reference luminescent dye. CO2 Permeable into the membrane changes the internal pH of the buffer. With this changes the luminescence of the pH-sensitive dye. Together with the inert reference dye internal referencing is made for detection of the luminescence lifetime of the sensor. The measurement signal detected by the pCO2 mini correlates to the partial pressure of CO2 ambient.

SOIL MOISTURE SENSOR

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors.This Soil Moisture Sensor can be used to detect the moisture of soil or judge if there is water around the sensor, let the plants in your garden reach out for human help.Insert this module into the soil and then adjust the on-board potentiometer to adjust the sensitivity. The sensor would outputs logic HIGH/LOW when the moisture is higher/lower than the threshold set by the potentiometer

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. UART is also a common integrated feature in most microcontrollers. The UART takes bytes of data and transmits the individual bits in a sequential fashion. Serial transmission of digital information (bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires. Communication can be "full duplex" (both send and receive at the same time) or "half duplex" (devices take turns transmitting and receiving).
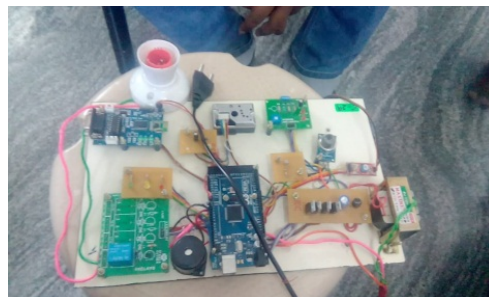

IV. RESULT AND DISCUSSION

The result of this project is determined by using a vibration sensor to sense the gas monitoring and its notification for GSM module.
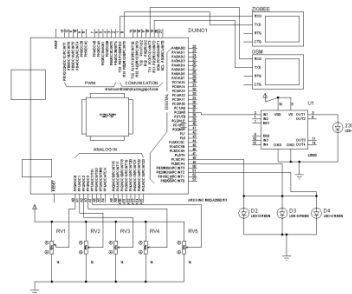
OUTPUT

V. CONCLUSION AND FUTURE WORK

Provide with the given features this system can be made more serviceable by adding few more basic small input like
LED: It can also add-up to its indicating credibility by flashing indicating gas leakage.
SENSOR: continuous and productive involvement and addition of relevant and upcoming new technology based sensors

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