Implementation of WSN for Industrial Safety

Shreyas Lokhande[1], Narendra Choudhary[1], Aniket Chaudhary[1], Suraj Pethekar[1], Prof. Ajita Mahapadi[2]

[1]UG Student, Department of Computer Engineering, Dr. D Y Patil School of Engineering, Pune, Maharashtra, India

[2]Assistant Professor, Department of Computer Engineering, Dr D Y Patil School of Engineering, Pune, Maharashtra, India

ABSTRACT

This paper provides a in effective study about the implementation of Wireless Sensor Network in Industrial environment to ensure the safety of the infrastructure and the employees. It also discusses the sensors as well as the console required for the smooth conduct of the project. The paper focuses on simplifying the implementation such that the project can be used in various industries and can be modified as per industrial requirement.

Keywords : Wireless Sensor Network,

I. INTRODUCTION

We live in growing industrial environment, year after year all industries are seeing immense growth. With the higher demand, production rates and manufacturing rates of all the industries are rising every year. To cope up with the high demand, industries have to do all kinds of adjustments. From expanding number of factories to upgrading to the latest machinery, year after year the growth is unstoppable.

But with this growth comes a larger demand of employees, and with huge number of employees working with high end machines, many accidents are prone to occur. Safety of the employees and the entire working environment is very important.

This project will check various environmental factors inside the work space and help the administration to ensure the safety of everyone.

II. THEORY

WSN: Wireless sensor network (WSN) can be called as a group of spatially dispersed as well as dedicated sensors that are useful for the purpose of monitoring and then recording the physical conditions of the environment and then centrally collecting the organized data.

WSN measures various kind of environmental conditions such as humidity, temperature, wind, sound, pollution levels, etc. The Wireless Sensor Network include interconnected nodes which can range from a few to even thousands.

Each sensor network node has several parts which includes a radio transceiver with a microcontroller, antenna (external or internal), an electronic circuit for the purpose of interfacing with the sensors and an energy source, which is generally a battery.

Arduino: Arduino Uno is a ATmega328P Microchip based open-source microcontroller developed by Arduino.cc. The board consists sets of analog and digital input/output (I/O) pins that can be interfaced to various boards as well as other circuits. The board has 14 digital Input Output pins, 6 analog I/O pins, and is programmable with the Arduino Integrated Development Environment, via a type B USB cable.

It can be powered by an external 9-volt battery or by the USB cable, though it accepts voltages between 7 and 20 volts.

Similar to Uno, there are the Arduino Nano and Leonardo.

Sensors: 1) Mq135 - MQ-135 gas sensor applies SnO2 which features a higher resistance within the clear air as a gas-sensing material. When there's a rise in polluting gases, the resistance of the gas sensor decreases along with that.

2) Dht11 - The DHT11 Sensor is factory calibrated and outputs serial data and hence it is highly easy to set it up. the data pin is connected to an I/O pin of the MCU and a 5K pull-up resistor is employed. This data pin outputs the worth of both temperature and humidity as serial data. If you're trying to interface DHT11 with Arduino then there are ready-made libraries for it which may provide you with a quick start.

III. IMPLEMENTATION

Fig 1. Example of industrial setup

As shown in the sample figure above the sensor nodes will be installed in various part of the workspace according to the type of sensors as well as the work being carried out at that area. For example, the gas sensors can be installed near the chimney of the factory or the temperature sensor can be installed near some large machinery that tend to generate more heat.

By proper installation of the sensor nodes the first and the most important step is completed, this step is important because these will be our source of information.

The sensors will catch the data from environment where they are installed, each of the sensors will have specific functionality to collect the required data. Effective data collection at this point will guarantee in the best implementation of the system.

This collected data will be then sent to the controller, the controller will further send the data to the next node for the next process. This data transfer will be doing using transmitters.

Trans receiver on the other node will receive the data and move it and combine data of that controller.

This step will be repeated by all the nodes until it reaches the final node. This process of data transfer is done for the purpose of making the data reach its desired position from where it can easily be displayed.

This wifi module will be used to upload the data to the database. The database will help the administration to monitor the data and keep track on all the necessary parameters.

All the data that is collected will then be compared to the guidelines given by government authorities and then it will the administration to take the appropriate action.
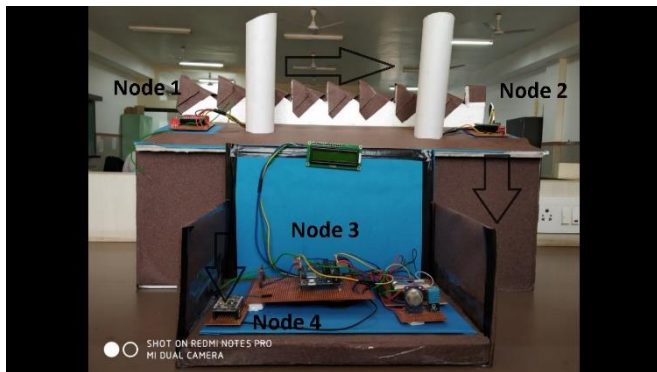
IV. ACTUAL SYSTEM

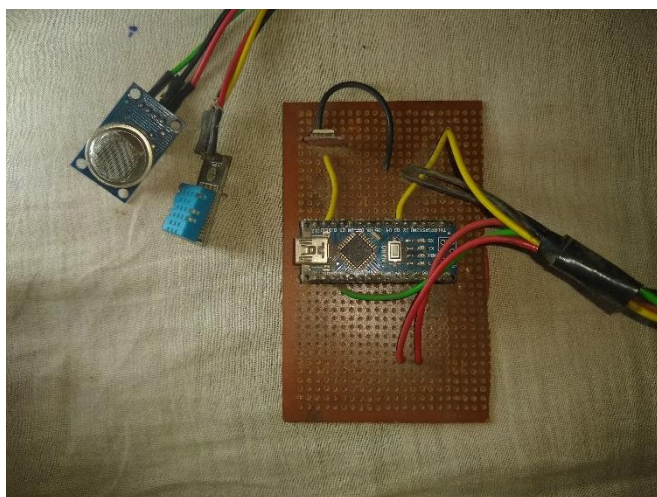Fig 2. Sensors connected together for a dummy factory.

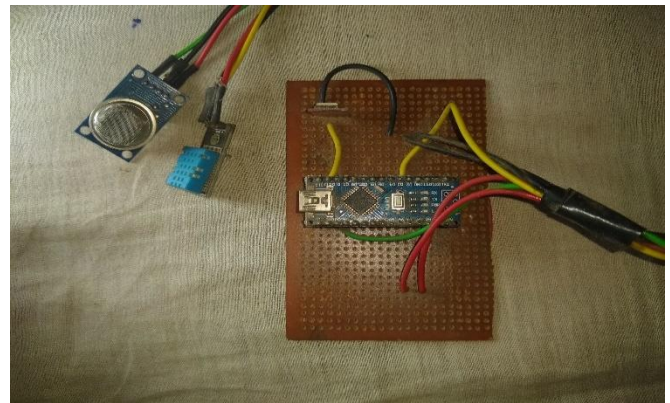Fig 3. Transreceiver and Arduino UNO

Fig 4. Arduino Nano and sensors

Note: Due to the Covid-19 Global pandemic and the lockdown, all the sensors are not available when we are writing this paper. We will add all the other sensors as soon as they are available to us.

V. CONCLUSION

To conclude, we all know that safety is one of the most important things in everyone's life, considering all the accident-prone industrial scenarios it is high time to have a proper safety measure installed in the workspace. To help the society our project helps to make sure that no accident will take place by any of the environmental factors. The system has features of preventing gas-leakage, fire prevention, etc. It can effectively improve the safety management of the plat in the plant. By this use of technology, we can protect the factory employees and the safety of public property. The system will monitor the data continuously and help the administration.

VI. REFERENCES

[1]. Design of Safety Monitoring and Alarming System for Petrochemical Plant Based on WSN by Wang R and Zhu L.
[2]. Survey On Security In Wireless Sensor Network by Faris Fazlic and Seyed Ali Hashemi