International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 04 | Apr 2022 www.irjet.net p-ISSN: 2395-0072

Smart Helmet for Industrial Workers Safety

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Abstract - *During our internship at industrial sectors, we began our exploration adventure for the project of Smart Helmet for Industrial Workers Safety. Because several of our group members worked in the industrial sector, we were all aware of the need of safety. When workers are concealing from safety engineers and security cameras, they usually put their helmet away from their heads & this is when their safety is endangered.*

The goal of this research project is to create a smart helmet prototype for industrial safety. Many injuries occur on the factory floor and on construction sites in modern civilization, and these injuries are almost always caused by accidents caused by inadequate visibility, bad illumination, and noise. Workers must be provided with a helmet to prevent injuries and promote safety in industrial settings.

A smart helmet is one that has sensors built into it that can measure the forces and pressures applied on a person's head during a collision. These data can be used to calculate the likelihood of a collision and to calculate the cost of a collision. This paper describes a smart helmet prototype.

Key Words: Safety Helmet, Workers Safety, Work Security, VLSI technology, Environmental factors, etc

1.INTRODUCTION

Conventionally, helmets with minimal protection and LED lighting are used in Industrial plants, Forging, MCD, underground coal mines because of their light weight and low power consumption. However, with the advancement of VLSI technology and the creation of efficient embedded intelligent systems, it is now possible to create a smart, efficient electronic system that can be installed into these helmets to give improved security without sacrificing weight or power consumption.

This system is useful for ground control because it can also be utilize for real-time staff surveillance. The inclusion of a tiny temperature and humidity sensor assures a light and power-efficient circuit, while the use of an RF module aids in wireless communication between ground control and crew.

1.1 Overview

Conventionally, helmets with minimal protection and LED lighting are used in Industrial plants, Forging, MCD, underground coal mines because of their light weight and low power consumption.

1.2 Need

Working in the forging and mining fields is a risky profession. Employees in such fields are more likely to be harmed or suffer serious injuries than those in private sector, where injuries are more likely to be severe. Supervisors will be held responsible for all wounds that occur under their supervision, thus they must assess the potential for dangerous situations.

The problem we're trying to solve with this project is to create a prototype of a safety helmet that will provide enhanced safety attentiveness among mine and forge workers.

2. WORKING & TECHNICAL DETAILS

Industrial safety is one of the main aspects of industry . Working environment hazards include suffocation, gas poisoning and gas explosion. Hence air quality and hazardous event detection is very important factor in industry.

In order to achieve those safety measures, the proposed system provides a wireless sensor network for monitoring real time situation of working environment from monitoring station. And we got this idea about smart helmet.

A smart helmet is one that has sensors built into it that can measure the forces and pressures applied on a person's head during a collision. These data can be used to predict the likelihood of a collision and issue alerts about potential dangers. The smart helmet will be able to change to the form of a person's head to make it more comfortable.

A sensor for measuring the form of a head, as well as a mechanism for altering the helmet's position, should be included in the helmet for this purpose. Cameras, sonars, and laser scanners can all be used to detect impediments in a smart helmet.

Block diagram for Safety Helmet

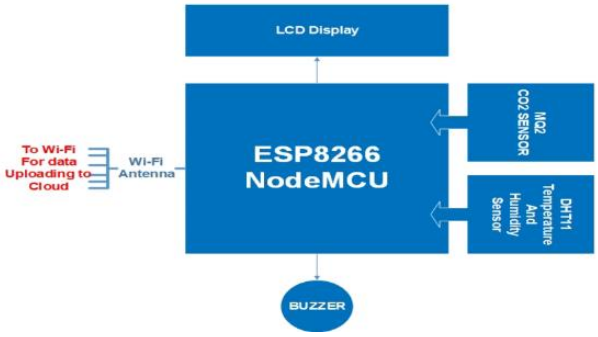
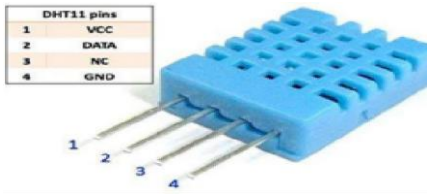


Fig -1: Block diagram

The temperature, humidity, and gas data was collected by the sensors in the helmet and sent to the remote monitoring unit.

Role of Sensor used in circuitry

1. Humidity and Temperature Sensor



DHT11 Temperature & Humidity Sensor has a temperature & humidity sensor complex with a calibrated digital signal output. It offers high dependability and outstanding long-term stability by employing an innovative digital-signal-acquisition technique as well as temperature and humidity sensing technologies.

This sensor links to a high-performance 8-bit microcontroller and combines a resistive-type humidity measurement component and an NTC temperature measuring component, providing great quality, fast response, anti-interference ability, and cost-effectiveness.

2. MQ2 Sensor

The MQ2 gas sensor is one of the most widely adopted in the MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor, also known as Chemiresistors, because the detection is dependent on a change in the sensing material's resistance when the Gas comes into contact with it.

Gas concentrations can be sensed using a simple voltage divider network. The MQ2 Gas Sensor runs on 5V DC and consumes about 800mW. From 200 to 1000 RPM, it can detect LPG, SMOKE, ALCOHOL, PROPANE, HYDROGEN, METHANE, AND CARBON MONOXIDE quantities.

3. Air Quality Sensors

Atmospheric conditions continue to deteriorate each year due to the growth of civilization and increasing unclean emissions from industries and automobiles. In recent years, introduction of technologies such as the Internet of Things (IoT) and cloud computing has revealed new capabilities of real-time monitoring in various fields.

By adding air quality sensors to smart building systems, engineers can implement early warning of the buildup of hazardous gasses and chemicals, but commercial air quality sensors lack the integrated capabilities required to join smart building network.

Working Process for Safety Helmet

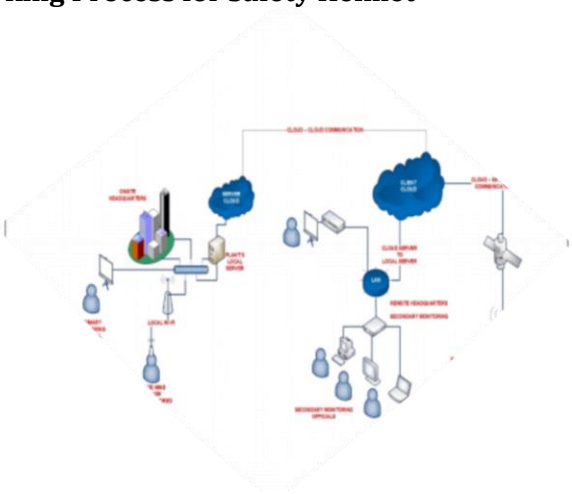


Fig -2 Work diagram

To address the issue, we're working on a smart helmet for workers in the industry sector.

To begin, each worker will be given a unique tag to help them be identified. The data of the person will be relayed to the PC through Wi-Fi.

- Once the tag has been identified. IR sensors are used to determine whether the worker has been wearing the helmet or not.
- The gas sensor in the helmet will identify any harmful gases in the environment.

- When gas is detected, a voice warning will be broadcast through the speaker.
- The occurrence of head traumas will be detected using a MEMS sensor.
- Through the Wi-Fi transceiver, all sensor data will be uploaded to the PC.

Process, Results & Discussion

Talking about tools as we have mentioned before there are four main sensors been used for different purpose like for humidity detection (MQ2 Sensor), For Temperature Detection (DH 11 Sensor), For Location (GPS Technology) & To connect all of this we've used Controller as a heart of the process.With the right program & mounting circuitry all tools output will be provided to person in operator office.

As our project is actually a perfectly settled even though discussion sessions with Prof. V. P. Mohite lead us to finding another addition in the circuitry which is IOT sensor which is helpful in finding the clarity of air

3. CONCLUSIONS

The Smart Helmet is a personal protection equipment for industrial employees that aids in preventing head injuries while on the job. It is one of the most innovative ideas in the history of the industrial sector. We reviewed the benefits of the Smart Helmet for industrial safety during the overall lecture. The helmet features a built-in WiFi-attachment that can report all signal outputs to the operator at all times, which is very useful for industrial employees.

Furthermore, there is a built-in GPS module that can provide the wearer's actual location at any moment. Furthermore, there is an anti-fall alarm that alerts the worker when there is a risk of falling and requires the worker to put on safety equipment. As a result, there's a MQ2 sensor for measuring humidity in the air and a DH11 sensor for measuring temperature.

With all of these protections in place and all of the efforts taken to eliminate all potential hazards at work, I believe we've successfully solved every challenge.
Additional sensors and circuits made the safety helmet project more effective by ensuring optimal weight balance.

ACKNOWLEDGEMENT

The authors are thankful to the department of Electrical Engineering in Jaywant College of Engineering and Polytechnic for providing laboratory facility for this research work and special thanks to our honourable chancellor Prof. V.P. Mohite & Our Department HOD Mr. Deshmukh Sir for their constant support and encouragement to carry this research work.

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