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A Project Synopsys for

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Project Title: Chanaksha Kholaka: An IoT Based Smart Helmet for Industrial and Mining Workers

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KEYWORDS

Smart Helmet, Internet Of Things (IoT), Arduino IDE, ThingSpeak, ESP32, LCD, DHT11 Sensor, MQ2 Gas/Smoke Sensor, LDR Sensor, MEMS Sensor, Light Emitting Diode, Power Supply Circuit.

INTRODUCTION

The death rate of the construction workers at the industrial and mining sites are increasing day by day. But still there are no such chances to reduce this fatality rate. So, for providing continuous observing of the labours and to prevent them from any health hazards during working, this system proposes a smart flexible helmet for the construction workers to provide security and rescue measures in case of any panic situations. The aim of this project report is to describe a prototype system and integrating some different IoT technologies and some safety levels for the industry construction site.

The proposed system describes a smart low-cost helmet for the workers. Specially, safety becomes a main issue when you consider industrial and mining business. The project aims to provide a secure and safer working environment for labours thus to reducing the number of deaths happening in industrial and mining sites. The helmet includes different sensors such as temperature Sensor, gas Sensor, light Sensor etc. attached to ESP32 microcontroller to send signals over the Wi-Fi. The System stores the data in database using ThingSpeak Server which can be accessed by the authorities remotely.

Jingjiang Song, Yingli Zhu proposed automatic monitoring system for industrial safety based on wireless sensor network. The sensor groups of the system intensively monitor temperature, humidity in the working area. The parameters measured are sent to wireless communication module by the micro- controller. The collected information is sent to long-distance monitoring centre by cable. So, the reliability and long life of conventional communication system is poor. Another problem is that the working condition of industries is very noisy and if the distance of the workers and system is long, workers will not get proper message.

OBJECTIVES

The main objective of this project is to design a smart helmet that is capable and limited to the following:

• The main objective to this system is to design a helmet that provides safety to the construction and mine workers before any accident happens at the working site.

• It mainly helps them protect themselves from fire outbreaks or harmful gases in their surroundings.

• Also, it notifies the superior authorities about any threats that present themselves during the work period. This can prove a great help in saving human lives at work.

• To build an effective method for workers to provide security and rescue measures in case of any panic situations.

• To develop an integrated smart helmet for workers that is capable –

1)To give alert messages if helmet is not worn by workers.

2)To detect mentioned accident situations well in advance.

3)To alert workers and authorities about leakage of harmful gases and fire breakouts.

METHODOLOGY

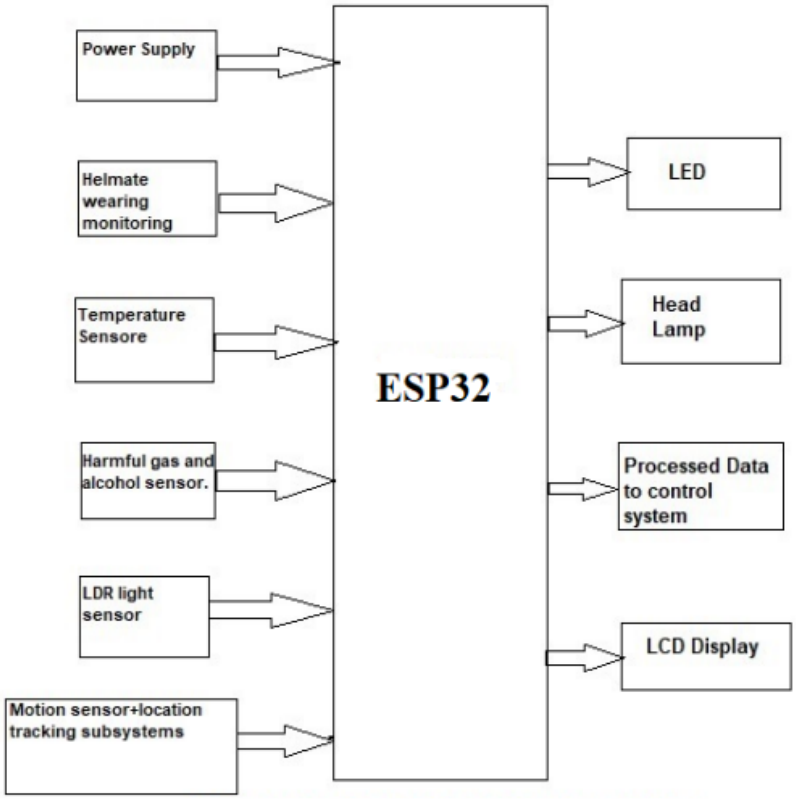


Fig 1: Block diagram of ESP32 Module attached with sensors

The gas sensor data is given as input to ESP32 through Analog pins of it. It constantly senses the harmful gases such as methane, butane, LPG and smoke and gives input to Arduino board. Microcontroller in turn gives alert message through LCD display and buzzer. The Photoresistor is used for helmet wearing monitoring. If helmet is worn, it will be in same condition. If not worn, photoresistor which is connected to module gives signal to it which in turn makes green LED to glow and gives an alert message to wear it along with buzzer. Fall detection of workers is monitored by employing a MEMS motion sensor connected with module as shown in figure (a). When fall occurs, system sends an alarming buzzer and alert message to the site manager and authorities through Wi-Fi module connected so that appropriate corrective measures be taken. The added application is to measure the body temperature of the workers with the help of a DHT11 temperature and humidity sensor which is connected to Analog input to the module as shown in the figure 1. The normal body temperature of human being will be 370C.The sensor will constantly monitor and record the body temperature of the workers and this data can be stored in cloud for individual health monitoring. If body temperature of the worker exceeds 380C, system will give an alert signal as "Abnormal body temperature" so that necessary

actions can be taken to reduce further hazards. A LDR is used for detecting intensity of light around the worker so that if light is of low intensity (i.e, dark) the microcontroller will turn ON the head lamp.

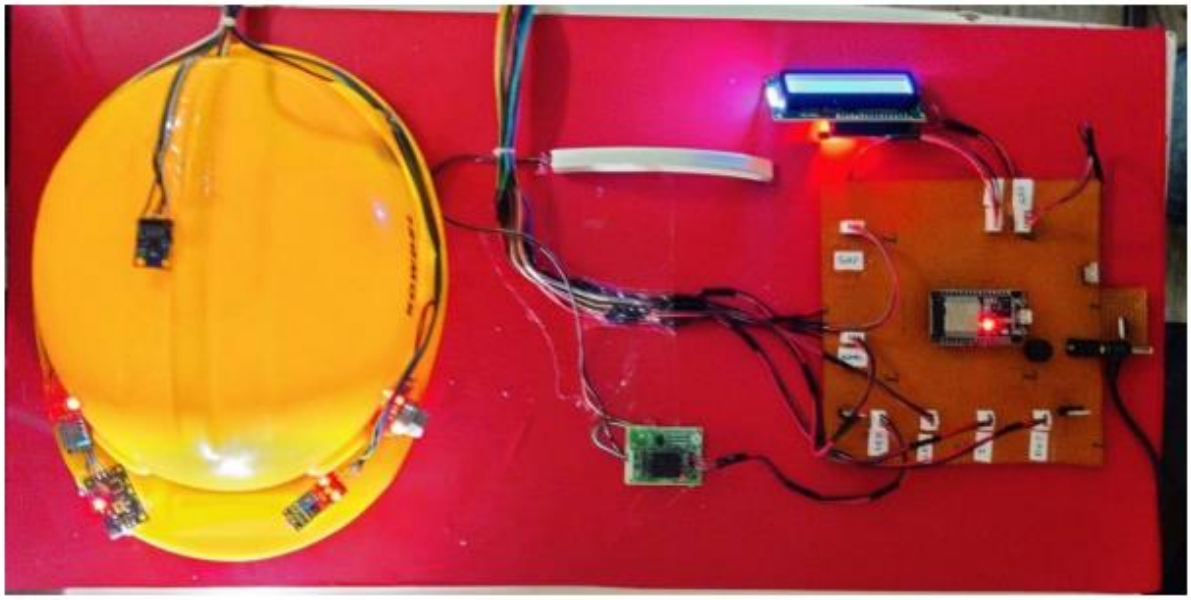


Fig 2: Working Model of Smart Helmet

RESULTS AND CONCLUSION

Fig 3: LCD Display for Various Conditions

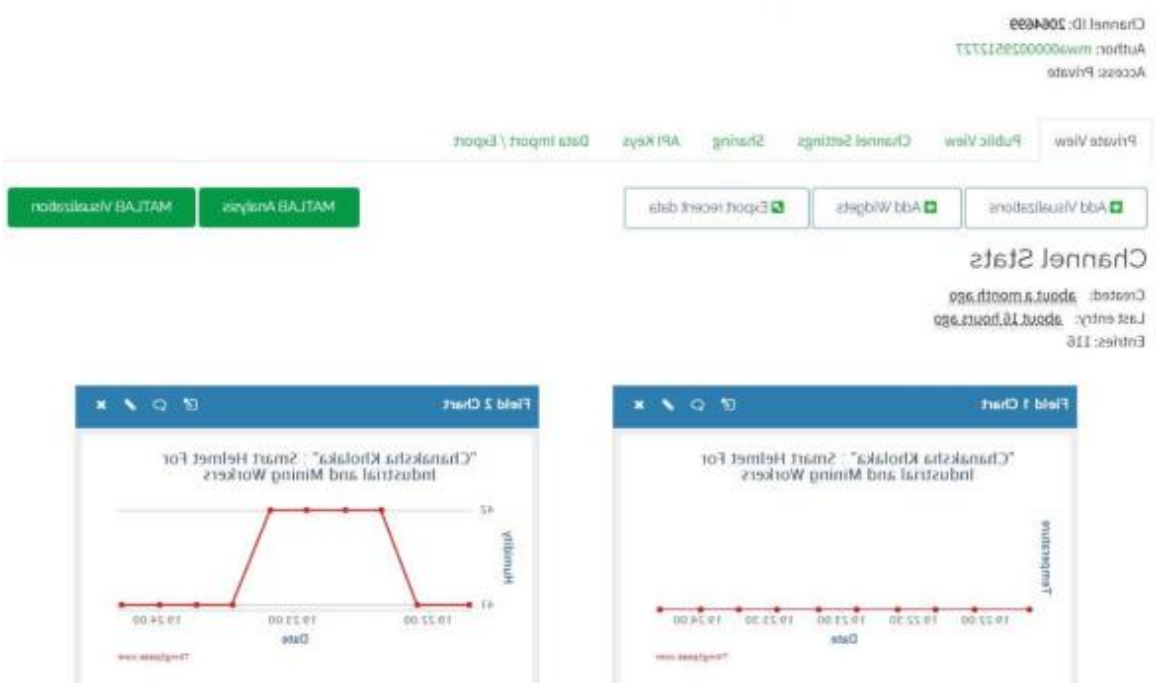
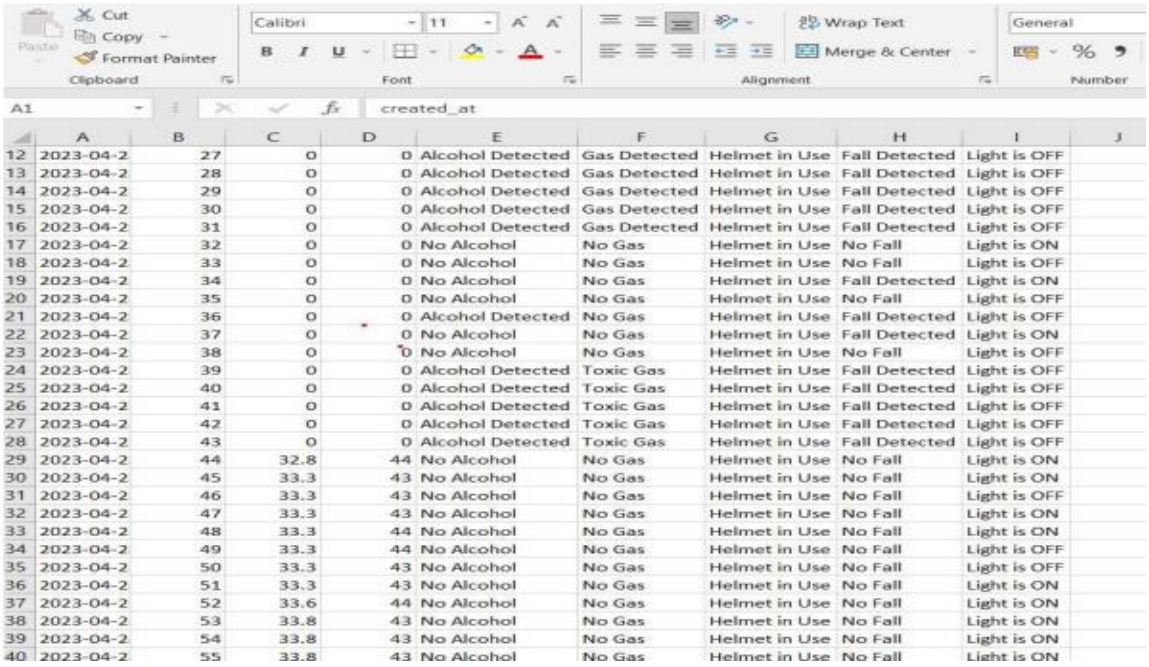


Fig 4: User Interface Dashboard of ThingSpeak



	A	B	C	D	E	F	G	H	I	J
12	2023-04-2	27	0	0	Alcohol Detected	Gas Detected	Helmet in Use	Fall Detected	Light is OFF	
13	2023-04-2	28	0	0	Alcohol Detected	Gas Detected	Helmet in Use	Fall Detected	Light is OFF	
14	2023-04-2	29	0	0	Alcohol Detected	Gas Detected	Helmet in Use	Fall Detected	Light is OFF	
15	2023-04-2	30	0	0	Alcohol Detected	Gas Detected	Helmet in Use	Fall Detected	Light is OFF	
16	2023-04-2	31	0	0	Alcohol Detected	Gas Detected	Helmet in Use	Fall Detected	Light is OFF	
17	2023-04-2	32	0	0	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
18	2023-04-2	33	0	0	No Alcohol	No Gas	Helmet in Use	No Fall	Light is OFF	
19	2023-04-2	34	0	0	No Alcohol	No Gas	Helmet in Use	Fall Detected	Light is ON	
20	2023-04-2	35	0	0	No Alcohol	No Gas	Helmet in Use	No Fall	Light is OFF	
21	2023-04-2	36	0	0	Alcohol Detected	No Gas	Helmet in Use	Fall Detected	Light is OFF	
22	2023-04-2	37	0	0	No Alcohol	No Gas	Helmet in Use	Fall Detected	Light is ON	
23	2023-04-2	38	0	0	No Alcohol	No Gas	Helmet in Use	No Fall	Light is OFF	
24	2023-04-2	39	0	0	Alcohol Detected	Toxic Gas	Helmet in Use	Fall Detected	Light is OFF	
25	2023-04-2	40	0	0	Alcohol Detected	Toxic Gas	Helmet in Use	Fall Detected	Light is OFF	
26	2023-04-2	41	0	0	Alcohol Detected	Toxic Gas	Helmet in Use	Fall Detected	Light is OFF	
27	2023-04-2	42	0	0	Alcohol Detected	Toxic Gas	Helmet in Use	Fall Detected	Light is OFF	
28	2023-04-2	43	0	0	Alcohol Detected	Toxic Gas	Helmet in Use	Fall Detected	Light is OFF	
29	2023-04-2	44	32.8	44	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
30	2023-04-2	45	33.3	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
31	2023-04-2	46	33.3	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is OFF	
32	2023-04-2	47	33.3	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
33	2023-04-2	48	33.3	44	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
34	2023-04-2	49	33.3	44	No Alcohol	No Gas	Helmet in Use	No Fall	Light is OFF	
35	2023-04-2	50	33.3	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is OFF	
36	2023-04-2	51	33.3	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
37	2023-04-2	52	33.6	44	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
38	2023-04-2	53	33.8	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
39	2023-04-2	54	33.8	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	
40	2023-04-2	55	33.8	43	No Alcohol	No Gas	Helmet in Use	No Fall	Light is ON	

Fig 5: Accessing Data from Database

It is ensured that the working conditions of individual worker in the organization are safe by using smart helmet.

Monitoring whether the helmet is worn or not by the worker is now made simple for the authorities.

Health conditions of the user wearing helmet are monitored constantly through constantly checking body temperature and immediately take necessary rescue actions if in case of any abnormal conditions are detected.

Organizations which involve working with gases which are considered harmful for human beings, animals and environment such as carbon dioxide, methane, smoke, LPG, Methane etc are kept in check with the help of helmet.

Accidents occurring due to leakage of these gases which may cause potential damages can be avoided well in advance with the help of smart helmet which gives alert messages to the user through LCD display. Any potential harms being caused by accidents and fall to the workers can be tackled efficiently with the help of alert messages of the helmet warning about the accidents.

The experimental results indicate that the proposed approach is a valuable approach, which can significantly support an accurate detection of accidents, harmful gas leakage, fire breakouts effectively in a little computational effort.

SCOPE FOR FUTURE WORK

The future scope of this project will be with respect to its scalability. We can make this project to have further more features like:

➢ Solar powered batteries can be used in helmet for the power-supply.

➢ It can be used for location tracking by implementing GPS module.

➢ The researchers are working vigorously in the material with low weight and excellent mechanical properties that a helmet should have.

➢ System to save emergency contacts numbers and to immediately call or send alert messages can be developed.

➢ Biometric attendance tracking of the individual workers can be implemented in the helmet with unique identity numbers.

➢ We can use small camera in the helmet for recording the workers activity.