

## ZIGBEE BASED SMART HELMET FOR COAL MINERS

### **AIM:**

Design and development of Zigbee based smart helmet for coal miners.

### **PURPOSE:**

Coal mines are very dangerous and prevention of accidents is very tough. Coal miners sacrifice their life while doing work inside the mines. Once coal miners went into mine there is no safety available inside. They have safety helmet that will provide only head injury safety. We can use wireless sensor technology and will provide safety to coal miners. Sensors like temperature, humidity, Gas and LDR will provide corresponding information to monitoring room through zigbee wireless communication. These sensors and zigbee placed on safety helmet. We can call this complete system – Zigbee based smart helmet for coal miners using Arduino.

### **DESCRIPTION:**

Arduino interfaced with zigbee through UART communication. DHT11, LDR, MQ series sensors connected to Arduino digital input pins. DC light will controlled through relay and relay connected with Arduino digital input pins. Other side zigbee connected to PC through USB to serial adaptor.

### **WORKING:**

Temperature and humidity sense by DHT11 and it was on top of helmet. Methane gas sensed by MQ4, Air quality sensed by MQ135 and Carbon monoxide sensed by MQ2. These sensors also placed on helmet to detect gases inside mine while coal miners are in inside the mine. When Coal miner is in dark then light will be ON. All this information passed to monitoring system through zigbee. Monitoring system is at PC side. We can monitor all sensors data on serial window in PC or laptop.

## TECHNICAL SPECIFICATIONS:

### HARDWARE:

Microcontroller	:	Arduino Uno
Crystal	:	16 MHz
LCD	:	16x4 LCD display
Zigbee module	:	2.4 Ghz HC-12
Temperature Sensor	:	DHT11
Humidity Sensor	:	DHT11
Methane Sensor	:	MQ4
Air Quality Sensor	:	MQ135
Carbon Monoxide	:	MQ2
Light Sensor	:	LDR
Relay	:	12v DC Electromagnetic
Light	:	5v DC
Buzzer	:	5vDC
Power Source	:	12v 1 amp DC Adaptor

### SOFTWARE:

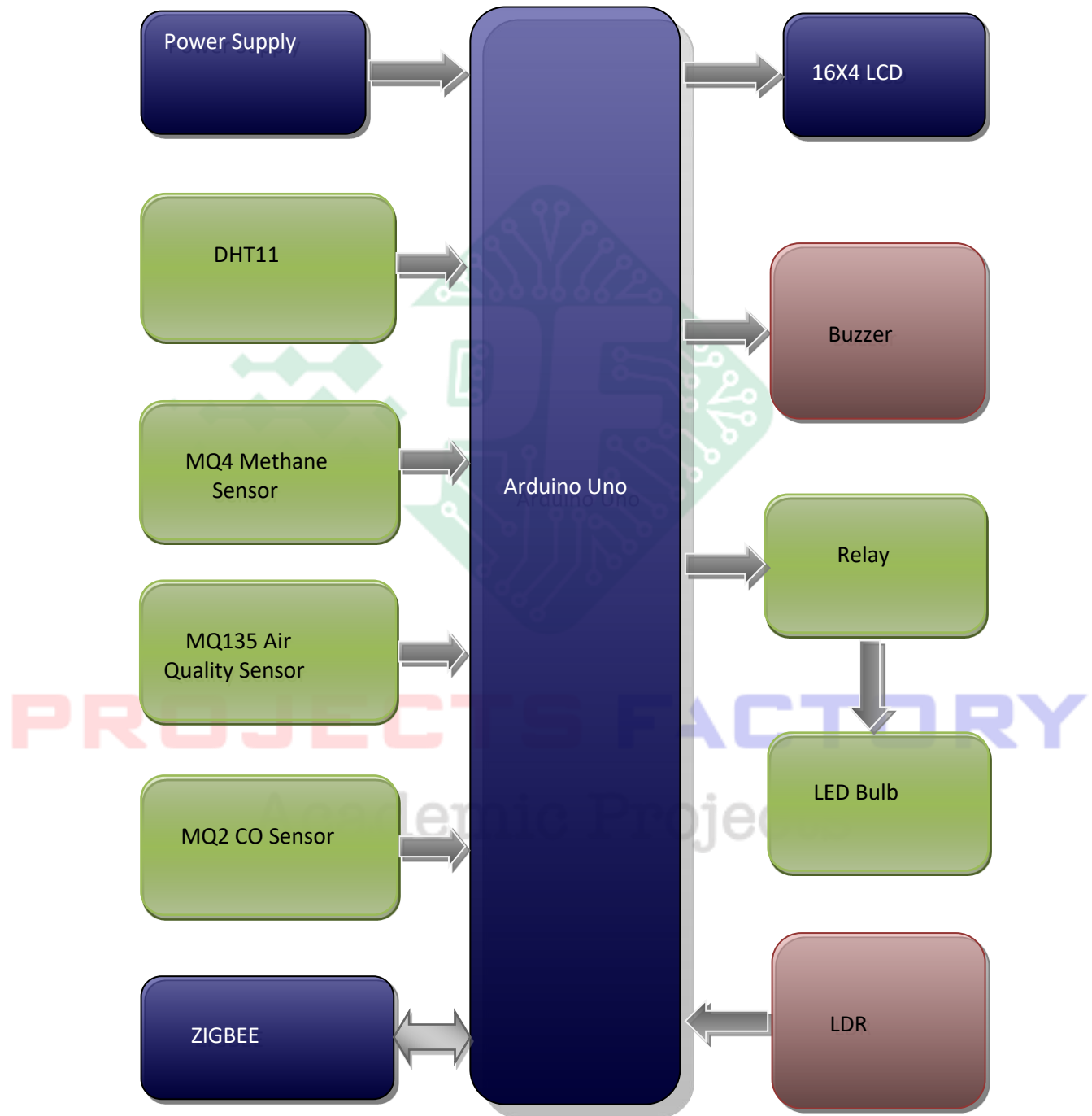
Arduino IDE

Proteus based circuit diagram

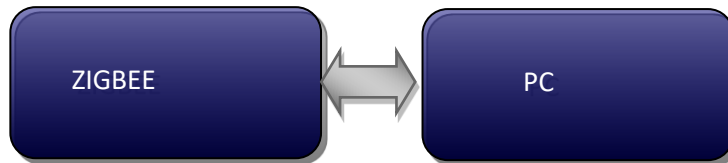
### APPLICATIONS:

- Zigbee based Smart coal mine helmet
- Wireless smart helmet
- Zigbee based intelligent smart coal mine helmet

## BLOCK DIAGRAM: (Helmet)



### MONITORING SYSTEM:



### POWER SUPPLY BLOCKDIAGRAM:



### INTERFACES COVERED:

- We have covered Arduino programming
- Zigbee module interface with Arduino and PC
- DHT11, LDR and MQ series gas sensors