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Design and Implementation of IOT Based Augmented Industry Ammunition by using Arm Store Multiple Mechanism

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Abstract: ***IOT plays major role in industry protection. The IOT industry protection and controlling system using ARM STM32 micro controller designed to protect industries from lossesdue to unexpected accidents. The term internet of things stands for connecting the different devices with internet. Along with losses it also identifies the fire accidents such as furnace blasts, The temperature of machines, weather conditions in industries such as humidity levels, gas leakages, Low lighting, and smart power handling. The system makesuse of ARM STM32 to achieve this functionality. The system makes use of temperature sensors, gas sensors, level sensors, also sensors to detect the low lighting to avoid any industrial accidents and prevent losses. The system consists of sensors, light, LCD screen and alarm. The sensor data is constantlyscanned to record the values and check for fire, gas leakage or other issues, then the data is transmitted online. The Wi-Fi module in the system used to achieve internet functionality. The data from the sensors is uploaded in server then it displays the information online in a industry website, by this the industry is monitored remotely and controlled remotely. The theme of this project is to reduce the probability of accidents occurrence in industries smartly.***

Keywords: ARM, LCD display, Gas sensor, Light sensor, LevelSensor, Thing Speak.

I. INTRODUCTION

An embedded system is a system which is going to do a predefined specified task is the embedded system and is even defined as combination of both software and hardware. A general-purpose definition of embedded systems is that they are devices used to control, monitor, or assist the operation of equipment, machinery, or plant. "Embedded" reflects the fact that they are an integral part of the system. At the other extreme a general-purpose computer may be used to control the operation of a large complex processing plant, and its presence will be obvious. All embedded systems are including computers or microprocessors. Some of these computers are however very simple systems as compared with a personal computer. The very simplest embedded systems can perform only a single functionor set of functions to meet a single predetermined purpose. In more complex systems an application program that enables the embedded system to be used for a particular purpose in a specific application determines the functioning of the embedded system. The ability to have programs means that the same embedded system can be used for a variety of different purposes. In some cases, a microprocessor may be designed in such a way that application software for a particular purpose can be added to the basic software in a second process, after which it is not possible to make further changes. The applications software on suchprocessors is sometimes referred to as firmware. The Internet of Things may be a hot topic in the industry but it's not a new concept. In the early 2000's, Kevin Ashton was laying the groundwork for what would become the Internet of Things (IoT) at MIT's Auto ID lab. Ashton was one of the pioneers who conceived this notion as he searched for ways that Proctor & Gamble could improve its business by linking RFID information to the Internet. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicated with each other and be managed by computers. In a 1999 the vision required major technology improvements. After all, how would we connect everything on the planet? What type of wireless communications could be built into devices? What changes would need to be madeto the existing Internet infrastructure to support billions of new devices communicating? What would power these devices? What must be developed to make the solutions cost effective? There were more questions than answers to the IoT concepts in 1999. Today, many of these obstacles have been solved. The size and cost of wireless radios has dropped tremendously. IPv6 allows us to assign a communications address to billions of devices. Electronics companies are building Wi-Fi and cellular wireless connectivity into a wide range of devices. ABI Research estimates over five billion wireless chips will ship in 2013.2 Mobile data coverage has improved significantly with many networks offering broadband speeds.

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While not perfect, battery technology has improved, and solar recharging has been built into numerous devices. There will be billions of objects connecting to the network with the next several years. For example, Cisco's Internet of Things Group (IOTG) predicts there will be over 50 billion connected devices by 2020. IoT describes a system where items in the physical world, and sensors withinor attached to these items, are connected to the Internet via wireless and wired Internet connections. These sensors can use various types of local area connectionssuch as RFID, NFC, Wi-Fi, Bluetooth, and Zigbee. Sensors can also have widearea connectivity such as GSM, GPRS, 3G, and LTE. The Internet of Things will:

II. PROPOSED METHOD

The block diagram of proposed system is shown in the figure 2.1 in which ARM is heart of the system. The ARM is used in the project to control all transfer signals among different devices. The proposed system sends the signal from different sensors, i.e. Temperature, Gas, Fire, LDR and Level sensor to the ARM. ARM then sends this data to the Wifi module it will push data into thingspeak, LCD onboard also displays data that is being sent to thingspeak and at certain time when system reaches and crossed the required threshold then immediately buzzer indicates with ring.

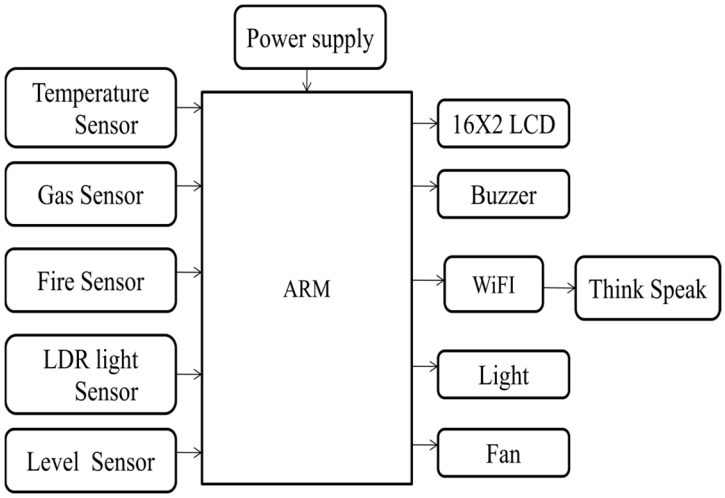


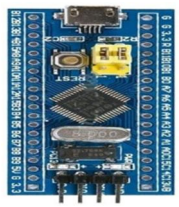
Fig. 2.1: Block diagram of proposed system

A temperature sensor is used to detect the temperature greater than threshold and then buzzer is activated automatically as notification. A gas sensor is used to detectthe gas leakage in industry and a light is provided for giving alert notification. Fire sensor is used to detect any fire occurred in industry and fan is provided forcooling action and can also act as an exhaust if there is gas leakage. The LDR is a light detection sensor used to monitor and detect the light in the industry it is ofday time and activated in night time. If the light is detected in daytime also then buzzer is activated and then displayed the data in LCD and think speak website. Similarly, level sensor is used to detect the water or any liquid level greater than the threshold value and the same controlling action can be take place for this condition also as light detection. The respective data is available LIVE on a Think speak website there by immediate action can be taken in each case. ARM is programmed to turn ON the buzzer when the sensors detect parameters greaterthan a threshold value. At the same time, the LCD would display informative messages for each scenario. The WiFi technology is used to control the loads like Fan and Light in the building through Think Speak. The entire information of monitoring system continuously displayed in the 16X2 LCD. This system is user- friendly and easy handling technology such that it can be installed in houses and insmall places.

A. Hardware Components Used In The Proposed System

1) ARM STM 32

The Blue Pill is a development board based on ST Microelectronics' STM32F103C9T6 microcontroller that has an ARM Cortex-M3 core that runs at 72MHz max. Software libraries are available that allow users to program the chip using the Arduino IDE. The Blue Pill is a 32-bit Arduino compatible development board that features the STM32F103C8T6, a member of the STM32 family of ARM Cortex-M3 coremicrocontrollers. This board aims to bring the 32-bit ARM core microcontrollers to the hobbyist market with the Arduino style form factor.



ARM STM 32



GAS SENSOR



ESP8266 WIFI MODULE



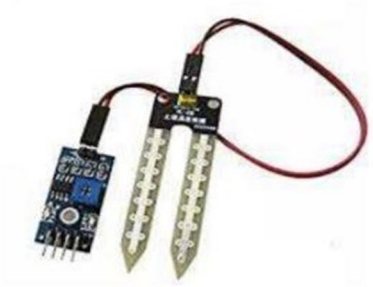
LEVEL SENSOR



LM35 TEMPERATURE SENSOR



FIRE SENSOR



MOISTURE SENSOR

Fig 2.2 : List of Hardware Components Involved in The Proposed System Design

The Blue Pill has 37 GPIO pins spread across four ports – A and B (16 pins), C (3 pins) and D (2 pins). Each pin has a current sink/source ability of 6mA. Pull-up and pull-down resistors can be enabled on each of the pins.
Most pins have extra functionality as well:

a) Serial ports – receive and transmit data via the UART protocol
b) I^2C ports – two-wire communication via the IIC protocol
c) SPI – serial communication
d) PWM
e) Pin 13 has a built-in LED

2) LM35 Temperature Sensor

Here LM35 series is also one of the sensors in precision integrated-circuit temperature. Its result volts are proportional to linearly the more range of temperature values in Celsius temperature. The Here to calculate the LM35 thus has an upper hand over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. It doesn't used exterior adjust to provide 25%°C of room temperature and ±50%°C and −55 to +150°C is a overall its temperature range.

3) LCD Display

This device is most used in every embedded project; because of it's a low cost and also frees friendly available and programmer. Now a day's most of us would have come across these displays in calculators. Now get a bit technical the appearance using a 16×2 LCD.Here get sixteen Columns and two Rows have a 16×2 LCD. In these have an 8×1, 8×2, 10×2, 16×1 different columns and rows. Here mainly usedin 16×2 LCD.

4) Gas Sensor

The gas sensor uses a small heater inside with an electro-chemical sensor. It is sensitive for a range of gases and are used mainly indoors at room temperature.

This sensor can be calibrated, but a known concentration of the measured gas or gases is needed for that calibration. Gas sensors are like the chemical ones but are specifically used to monitor changesof the air quality and detect the presence of various gases. Like chemical sensors, they are used in numerous industries such as manufacturing, agriculture and health and used for air quality monitoring, detection of toxic or combustible gas, hazardous gas monitoring in coal mines, oil & gas industries, chemical laboratory research, manufacturing – paints, plastics, rubber, pharmaceutical & petrochemicaletc.

5) Light Sensor

A photoresistor or light dependent resistor or cadmium sulfide (CdS) cell isa resistor whose resistance decreases with increasing incident light intensity. It can also be referred to as a photoconductor. A photo resistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

A photoelectric device can be either intrinsic or extrinsic. An intrinsic semiconductor has its own charge carriers and is not an efficient semiconductor, e.g., silicon. In intrinsic devices the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire bandgap. Extrinsic devices have impurities, also called dopants, added whose ground state energy is closer to the conduction band; since the electrons do not have as far to jump, lower energy photons (i.e., longer wavelengths and lower frequencies) are sufficient to trigger the device. If a sample of silicon has some of its atoms replaced by phosphorus atoms (impurities), there will be extra electrons available for conduction. This is an example of an extrinsic semiconductor.

6) Level Sensor

This level sensor has 3 parts– first pin is input of voltage; another pin is groundand third one is analog input. Here by using a sensor, calculate the level content of the water or any liquid level (volume %). To calculate percentage of the saline content, the value of analog is to be combining in the range of 0-100. The electrical resistance of saline is used in this sensor. And have 2 analyses that allow permission transfer the power through the soil. Here to calculate the content of the level then by using the value of resistance. Hence, when the increases the level content then automatically increases the conduction of electricity and also at the same time decreases the resistance. The percentage of the saline is decreases when the saline is utilized; it tends to high in level of resistance. Here to calculate in saline level uses the properties of resistance by using a 2 various ways Analog and Digital mode are it could be combined.

7) ESP8266 WiFi Module

The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Espress if Systems in Shanghai,China. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simpleTCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

8) Buzzer

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. Electromechanical Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz (the contacts buzz at line frequency if powered by alternating current) Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

a) Mechanical

A joy buzzer is an example of a purely mechanical buzzer, and they require drivers. Other examples of them are doorbells.

b) Piezoelectric

A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep. Interior of a readymade loudspeaker, showing a piezoelectric-disk-beeper (With 3 electrodes ... including 1 feedback-electrode (the central, small electrode joined with red wire in this photo), and an oscillator to self-drive the buzzer. A piezoelectric buzzer/beeper also depends on acoustic cavity resonance or Helmholtz resonance to produce an audible beep.

9) Axial-Flow Fan

Axial-flow fans have blades that force air to move parallel to the shaft about which the blades rotate. This type of fan is used in a wide variety of applications, ranging from small cooling fans for electronics to the giant fans used in cooling towers. Axial flow fans are applied in air conditioning and industrial process applications. Standard axial flow fans have diameters of 300–400 mm or 1,800–2,000 mm and work under pressures up to 800 Pa. Special types of fans are used as low-pressure compressor stages in aircraft engines.

B. Things Speak Software

Thing Speak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. Thing Speak provides instantvisualizations of data posted by your devices to Thing Speak.

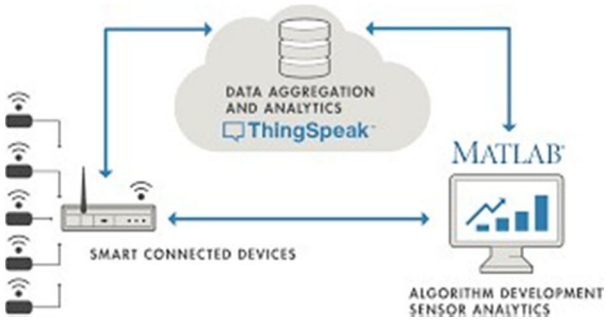


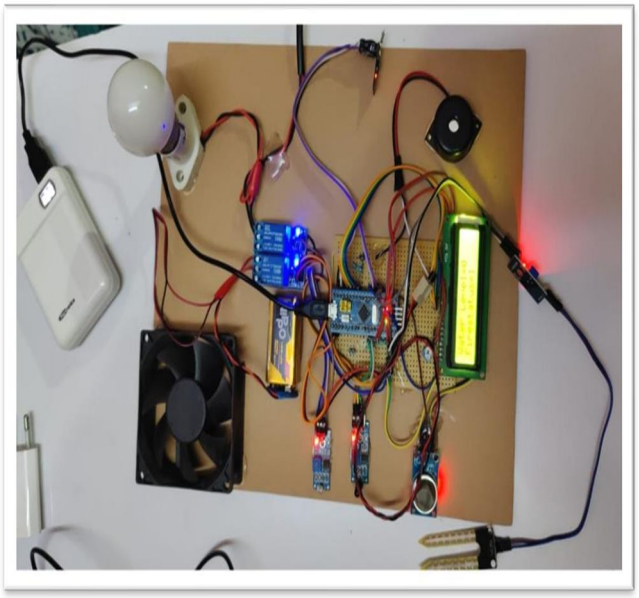
Fig: 2.3: Architecture of Things Speak

The system uses WiFi module which is used to push the data into the thingspeak server. This operation is fully based on the software program dumped into the core of the system ARM STM 32 series. In the Thingspeak, user have to create account by login using mail id. Once user logged in then thingspeak home page will ask to create channels and fields to display data which is received from outer source through WiFi module (proposed system). After creating channels and fields it will give API Keys to receive data and also to transmit data. Hence what ever the code we are going to dump into the core should have these API Keys involved in the piece of program to be dumped into the core. Hence based on these keys the data will be Received and transmitted to and from the various channels and fields we previously created in thingspeak.

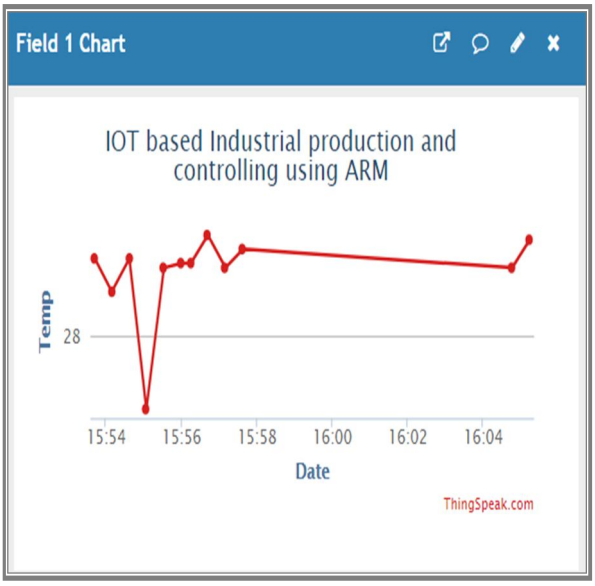
III. RESULTS

The proposed system kit and its result are shown below and it consists of sensors and ARM STM32 Microcontroller, Fan, Buzzer, Light, LCD screen. The thingspeak output results are also shown below that indicates different sensors data received from the proposed designed system. Automation is one of the increasing needs within industries as well as for domestic applications. Automation reduces the human affords by replacing the human affords by system which are self-operated, The Internet is one way of the growing platform for automation, through which new advancement are made through whichon easily monitor as well control the system using internet. As we are making use of Internet the system becomes secured and live data monitoring is also possible using IoT system. Within industries the various hazardous gas is being processed, hence, to provide security to those employ working within those industries, it becomes important issue to work on their security, If leakage of gas takes place then these system alerts by turning ON alarm which notifies the employers. This system also helps us take some crucial decision from any point of the world within internet network. Wi-Fi shield is being used to act as service point between network and connecting network. The paper focuses on the man-made disasters like leakage of gas or the worst case of a fire. Toxic and inflammable gases are widely used in industry, heating systems, home appliances and vehicles.

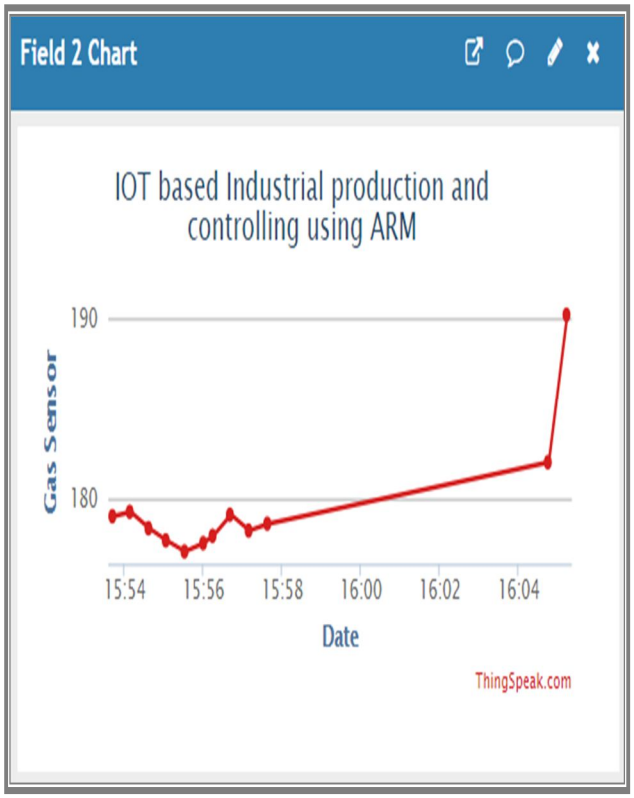
Thisincludes combustible gases like propane, ethane, butane, methane, ethylene etc. Liquefied Petroleum Gas (LPG), also referred to as propane or butane are normallystored in pressurized cylinders in liquid form and they vaporize at normal temperatures. A leakage can ignite and cause an explosion.



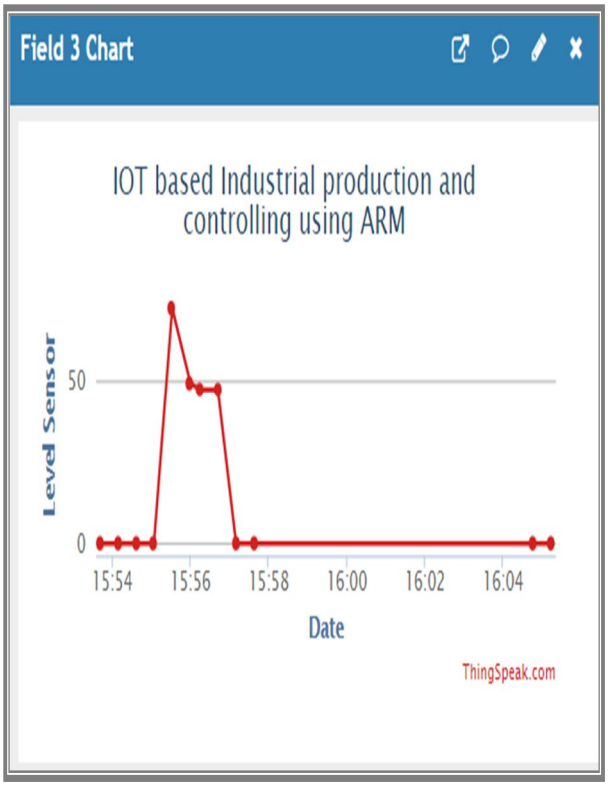
(A)



(B)



(C)



(D)

Fig 3: (A) Final prototype kit (B) Thingspeak Graph for Temperature sensor (C) Thingspeak Graph for Gas sensor (D) Thingspeak Graph for Level sensor.

IV. CONCLUSION

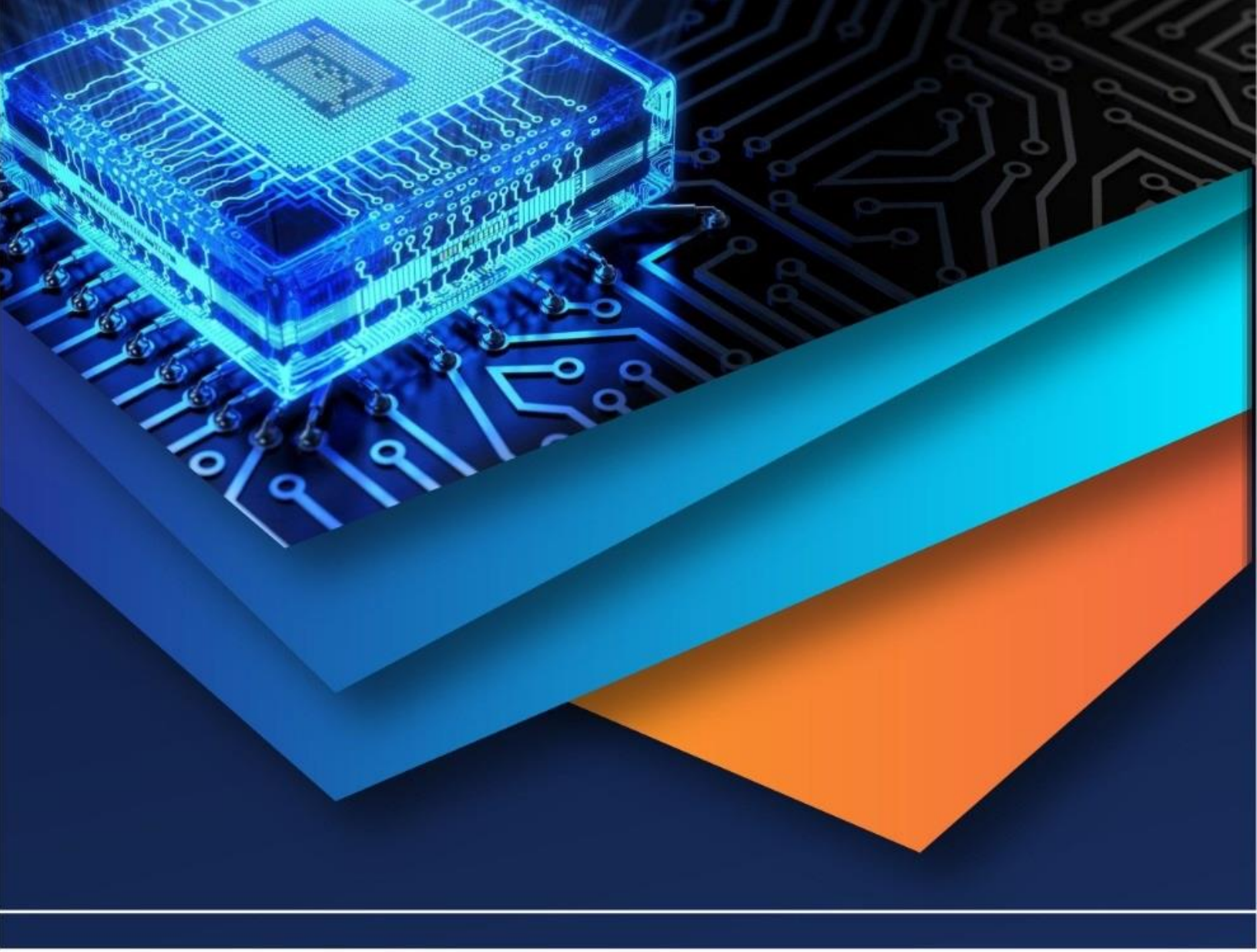
This paper describes an IOT Based industrial protection and controlling system. This IOT based Smart Industry Monitoring and Controlling System gives real-time monitoring of weather conditions of Industry. It monitors temperature, humidity, level of chemicals, also detects the Leakage of gas, and detect the smoke when fire Accidents done. Information can be seen from anywhere in the world. By using this system, the personcan continuously monitor the changes in environmental situations without any interaction. ARM controller itself acts as a server. This is efficiently carried out by operating system with Low cost and small size and Protects from fire Accidents and Damages in the industry with remote monitoring. The system is working properly and achieved its objective successfully.

V. FUTURE SCOPE

Many interesting directions are remaining for further research around Wireless Sensor Networks in IoT environment. Using additional sensors all possible safety issues could be monitored such as dust, vibrations, air purifiers etc. The automation includes thingspeak channels and fields and also MQTT servers also used to implement IoT based security systems. The other important data can be communicated through this system making it feasible where wired communication is a hindrance.

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