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A Smart Industry Advance Operation Using IOT

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ABSTRACT: In recent days most of the manufacturers aimed to implement the advancements and automations in their industries through internet of things. An Industrial automation has been performed with traditional wired systems. The wireless communication is rapidly emerging in industrial communication due to its advancements, operations and easy installation. Also these wireless systems are installed in locations where wired systems are cumbersome or impossible, instance of such places like rotating machinery and mobility systems. An IOT is being utilized more extensively to reduce the man power and helps in complex situations. In the project, we are trying to monitor and alert the plant in charge through wireless communication with the help of IoT.

KEYWORDS: GSM, Arduino, Sensor Technology, SMS (Short Message Service), AT Commands, Automation.

I. INTRODUCTION

The Internet of Things is a network of physical objects that are connected to the Internet so that they can exchange data and information in order to improve productivity, efficiency, services, and more. IoT technology can be found in a growing number of places, including industry, enabling the concept of a smart home to become a reality, and even to assist the infrastructure of an entire smart city.

Industrial automation is the use of data-driven control systems, such as industrial machines, atmospheric conditions and various equipments, that reduces the need for human action by operating industrial processes or machinery. The industrial internet of things plays an important role in industrial automation as we see the number of IoT appliances increases. IoT helps in industrial automation to **create systems that are effective, affordable and flexible to customer needs**. Connecting industrial equipment - and sharing real-time data can drastically impact the efficiency, production and uptime and helps to develop next generation machines.

There are four different sections that we are going to make an upgradation with the help of the IoT platform to automate, reduce human intervention and to monitor the equipments continuously. This project is going to deal with the following four devices, they are circuit breaker, generator, exhaust fan and soil resistance.

Circuit breaker is a important component of Industrial Electrical System. It is used for protection & switching. Hence, reliable operation and continuous monitoring of circuit breaker is essential. The three variables affect soil resistivity. They are chemical composition, temperature, and moisture. One of these is moisture, which plays an important role. Hence, the approximate resistivity of the soil can be determined by analysing the moisture content. Exhaust fans are quite important in areas without air conditioning since they run continuously throughout the day, sometimes even when it is not necessary. Using this project, the exhaust may be initiated and controlled as needed. As a result, the fan's lifespan is extended and the EB tariff is decreased. Finally, a generator will automatically kick on to supply power to the plant if the incoming EB supply fails or stops. Soil resistivity depends on the three parameters. They are moisture, temperature and chemical content. Exhaust fans playing a great role in the non-air conditioned area, where they are running through out the day even in unnecessary times. In this project the exhaust can be controlled and started when required.

II. WORKING OF COMPONENTS

ARDUNIO UNO

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board. Arduino UNO is



based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc.

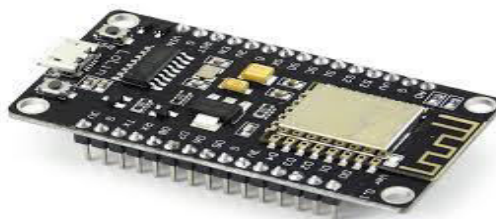


AURDUINO UNO BOARD

Arduino Uno Microcontroller Board is based on the Microchip Technology ATmega328 8-bit Microcontroller (MCU). Arduino Uno features 14 digital input/output pins (six of which can be used as PWM outputs), six analog inputs, and a 16MHz quartz crystal. Uno also includes a USB connection, a power jack, an In-Circuit Serial Programming (ICSP) header, and a reset button. This Arduino MCU board contains everything the user needs to support the MCU

NODE MCU

The Node MCU (*Node MicroController Unit*) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.



NODE MCU ESP328P MODULE

But, Similar to Node MCU, the Arduino hardware is a microcontroller board with a USB connector, LED lights, and standard data pins. It also defines standard interfaces to interact with sensors or other boards. But unlike Node MCU, the Arduino board can have different types of CPU chips (typically an ARM or Intel x86 chip) with memory chips, and a variety of programming environments.

ZMPT101B VOLTAGE SENSOR

The ZMPT101B AC Single Phase voltage sensor module is based on a high precision ZMPT101B voltage Transformer. ZMPT101B AC Voltage Sensor is the best for the purpose of the DIY project, where we need to measure the accurate AC voltage with a voltage transformer. This is an ideal choice to measure the AC voltage using Arduino/ESP8266/Raspberry Pi like an open source platform.

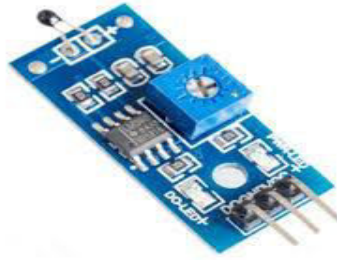


VOLTAGE SENSOR MODULE



LM393 TEMPERATURE SENSOR

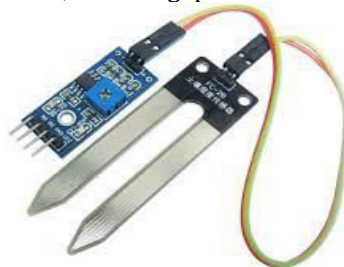
The LM393 has two internally inbuilt operational amplifiers which are internally compensated with frequency. These ICs are specially designed for performing their different tasks using a single power supply. It can also execute its functions properly with a split power supply. The supply of current-drain does not rely on the amount of the power supply. One of the most important features of this IC is, it includes ground in its common-mode input voltage. The applications of this IC mainly include various fields in real life, and also industrial, ADC (analog to digital converters), electrical systems powered by the battery, time-delay generators limit comparators, etc. This article discusses an overview of the LM393 IC and its working.



TEMPERATURE SENSOR MODULE

EE518 RESISTIVE SOIL MOISTURE SENSOR

Soil moisture sensors measure the water content in the soil and can be used to estimate the amount of stored water in the soil horizon. Soil moisture sensors do not measure water in the soil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way. For a soil sensor to work, no matter the type, it must make contact with the soil. The highest accuracy will be obtained when the soil sensor is surrounded by the soil, with no gaps between the probe and the soil.



RESISTIVE SOIL MOISTURE SENSOR MODULE

Monitoring soil moisture will not only benefit environmental researchers but farmers, golf course superintendents, archeologists, and regulators. Soil moisture sensors play an important role in helping to protect water resources and understand our ever-changing climate.

GSM SIM 900 MODULE

GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard developed by the European Telecommunications Standards Institute. It was created to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones and is now the default global standard for mobile communications – with over 90% market share, operating in over 219 countries and territories. A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here. These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computers. A GSM modem can be a dedicated modem device with a serial, USB, or Bluetooth connection, or it can be a mobile phone that provides GSM.



GSM MODULE

12 V DC MOTOR



DC MOTOR

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. Its a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field.

EXHAUST FAN



EXHAUST FAN

Exhaust fans are also known as cooling fans, they are an ideal solution for application that requires high efficiency and silent operation. The cooling fans work by sucking the cold air at the bottom vent, and there by realizing hot air from the top vent as the heat rises upward

III. METHODOLOGY

GSM (Global System for Mobile communications) is a digital cellular technology used for transmitting mobile voice and data services. The GSM/GPRS-compatible Quad-band device can provide data transfer speeds of up to 9.7 Kbits per second, allowing the transmission of basic SMS. It can also be used for various applications such as surfing the Internet, calling, and sending and receiving text. It mainly works through a set of predefined instructions called AT Commands, where AT stands for Attention.

The AT commands for GSM-GPRS support is as follows:

- **AT+CMTI:** SMS has been received.
- **AT+CREG:** Network registration indication.
- **AT+CMGD:** Delete SMS message
- **AT+CMGS:** To send SMS message.



- **AT+CMSS:** To Send Message from Storage.
- **AT+CMGW:** Command writes an SMS to the memory.
- **AT+CPMS:** Command allows the message storage area to be selected (for reading, writing, etc.).
- **AT+CMGR:** Read SMS Message

Arduino UNO: It is a ATmega328 microcontroller board having 20 digital input/output pins, 16MHz resonator, a power jack a USB connection for dumping the code etc. It has 32KB of flash memory for code storing purpose. The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language.

Temperature sensor: A temperature sensor is a device used to measure and identify the temperature of an object. It can also be used to control various processes such as lighting.

Resistive Soil Moisture Sensor: An infrared sensor emits a beam of electromagnetic radiation or a field of electromagnetic radiation, and it looks for changes in its field or return signal.

Voltage sensor: Smoke detectors are devices that sense smoke and activate an alarm. They use radioactive materials to ionize the air and prevent its escape.

Node MCU: A light sensor is a device that uses the light energy from visible sources to generate an electrical signal. It's commonly referred to as a photoelectric device.

Relay driver module: When running a high load, a relay is required to give the proper voltage and current. In this circuit, a transistor with a resistance of -30 is enough to make a relay driver. A good example is a Relay that is used to protect sensitive components of an electronic device.

: The module is a single-chip LCD driver controller that is designed to work seamlessly with microcontrollers. It features a low power consumption and is capable of delivering a graphic display with 8448-pixel resolution.

We are using 4 sensors IR, LDR, Temperature and Humidity Sensor and Smoke sensor. These are the basic electronic components which convert physical quantities measurements into electrical signals. In the Arduino UNO board, the digital and analog pins act as a power supply source, when used as output and when used as input, they read the signals from the components connected to them that is sensors. It acts as a compatible device for the GSM module to deliver the phone and data communication. The customized program/code is loaded into Arduino Flash memory where the actual process begins. The Sim 900A GSM module uses AT commands to pass on the information to the user, thereby giving scope to resolve the issue. The sensors used are compatible with Arduino, IR sensor which has a range varying from 2 to 30cm can detect the obstacle at that range and sends the information to the microcontroller if there is any unauthorized presence inside the plant. It then activates the GSM module and sends the alert message "A motion has been detected" to the provided mobile number. Also, LCD display displays the alert message to enhance the communication.

Similarly, when there is improper lighting condition or darkness found in the room, LDR sensor notices it and the GSM alerts the user by sending an SMS alert "**Improper lighting condition found**". Also, if there is any smoke in the room and if it exceeds the threshold ppm, smoke sensor will activate the microcontroller to alert the user using GSM module by sending a "**Smoke Alert**" message to the user. High temperature and humidity conditions are noticed and corresponding SMS alerts are being sent using a DHT 11 sensor such as "**High temperature is detected**". Whenever such a disturbance happens in the industry the system will turn off the load to protect it from damage using a relay driver circuit.



IV. BLOCK DIAGRAM WORKFLOW

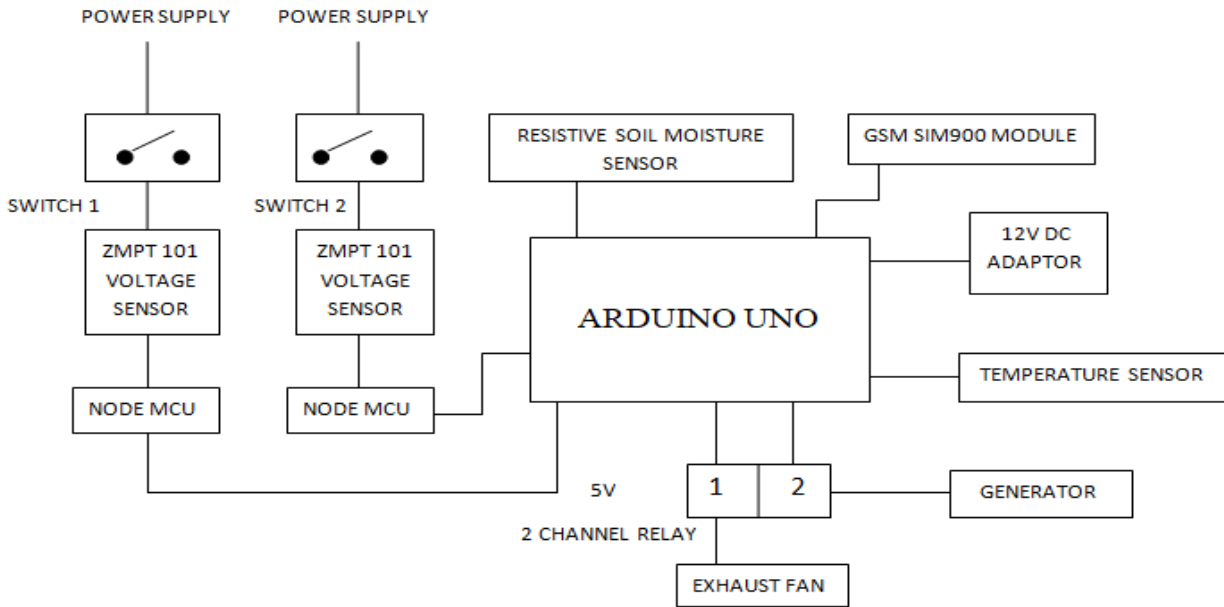


Figure 1: Block diagram

- Gas leakage or fire breakout or improper lighting or any intrusion into the industry occurs.
- Sensors integrated to the system detect the issues and informs the microcontroller if they exceed the threshold level.
- Microcontroller based Arduino sends the alert message to the user using a GSM Modem with real time data.
- Displays the message on the LCD display and activates the buzzer/alarm to alert the surroundings.
- Turning off the load as soon as the hazard is detected to protect it from damage using a relay driver circuit
- The system is fully controlled by the microcontroller and the microcontrollers will continuously monitors the sensors, detector and GSM modem. If the voltage level of sensor input pins goes to zero then it will send the AT + CMGS = "USER MOBILE NUMBER" to GSM modem through serial port.
- The GSM modems will response with the character ">". After receiving ">" Character microcontroller again send the type of security problem SMS + CTRL Z to GSM Modem. GSM modem will send the type of problem to user.
- For example, any moment detected in security area at the time microcontroller pin number 39 goes to logical zero. Microcontroller sensed the change and immediately send AT + CMGS = "+888888888888" to GSM modem, GSM modem give ">" character to microcontroller.



VI. RESULTS AND DISCUSSION

The developed GSM based Industrial fault detection system works efficiently by activating sensors once required and gives good response to the microcontroller-based Arduino which is interfaced with GSM SIM 900A module that sends SMS alerts when it detects any hazardous activity in the industry. The time taken by the system to deliver the SMS is dependent on the coverage area or range of the specified mobile network. If the mobile is in the range of the system, then the SMS is delivered within few seconds. The SMS messages are customized in the code that displays the incident type thereby necessary action can be taken by the owner.

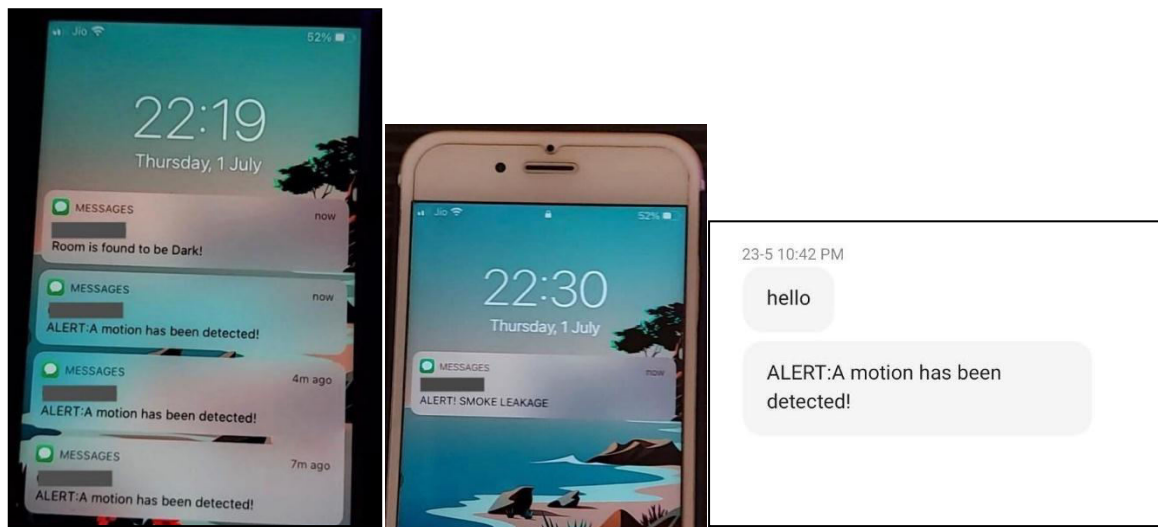


Figure 3: Results obtained

VI. CONCLUSION

The emergence of the internet and internet technologies of modern times undoubtedly made a big progress in all human activities. Technological development, as the most important factor and an important prerequisite of general development presupposes the application of new technologies. Therefore the necessary rapid and immediate change in the exiting situation is needed. Simultaneous changes are possible only on the bias of unique development strategy in which an important place should take the establishment of innovations of a smart industry, which should reduce the workforce and increase the efficiency.

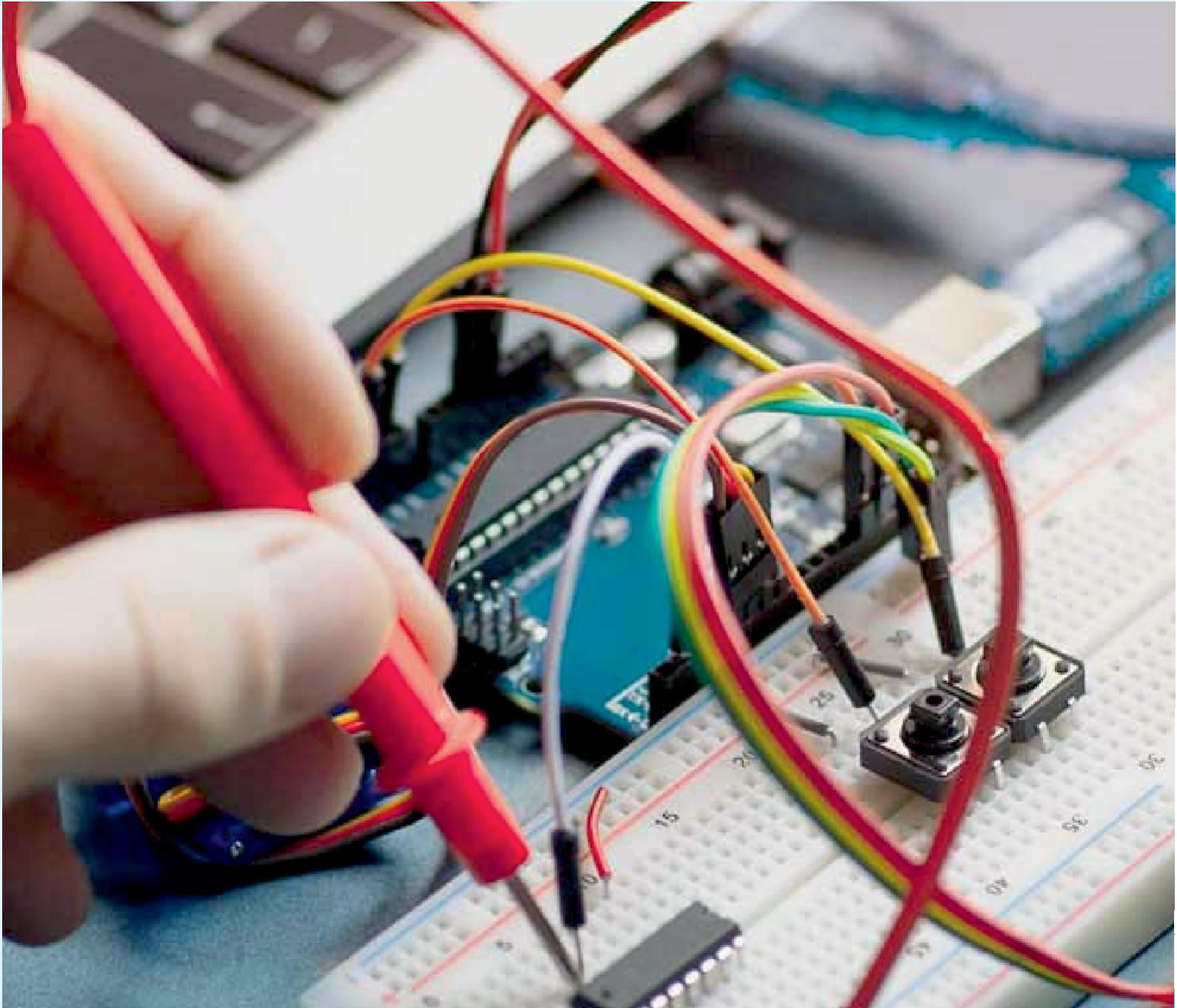
From this project we can easily sense the abnormal condition or malfunctioning inside the industry & safety measures can be conducted automatically by the system once you guide it. Real time information is sent to the operator or owner using GSM. The GSM network used enables the owner to control the plant even from large distance. The microcontroller used helps in interfacing many input/output devices at a time. The time taken by the system to deliver the SMS is dependent on the coverage area or range of the specified mobile network. If themobile is in the range of the system, then the SMS is delivered within few seconds.

REFERENCES

- [1] "Android Interface Based GSM Home Security System" IEEE Publication. By Rupam Kumar Sharma.
- [2] <https://ieeexplore.ieee.org/document/7894657> - IEEE Publication
- [3] Intelligent security system for residential and industrial automation | IEEE Conference Publication | IEEE Xplore
- [4] IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE).
- [5] Gsm based industrial security system | TROI publication.
- [6] GSM BASED INDUSTRIAL FAULT DETECTION SYSTEM - INTERNATIONAL RESEARCH JOURNAL OF MODERNIZATIONIN ENGINEERING TECHNOLOGY AND SCIENCE VOLUME: 3, ISSUE : 11/10/2021- PULI KEERTHIJA, NAYAKA HEMA, PALAWAR VAISHNAVI, Dr .M. SHYAM SUNDER



- [7] MINIATURE CIRCUIT BREAKER (MCB) STATUS MONITORING SYSTEM - INTERNAL JOURNAL FOR SCIENTIFIC RESEARCH & DEVELOPMENT VOL.3, ISSUE 02, 2022 -ANIRUDDHA NARKHEDE, SHANTANU KULKARNI, S.S. SHINGARE
- [8] SMART FACTORY IN INDUSREY TECHNOLOGIES - SYSTEM RESEARCH AND BEHAVIORAL SCIENCE 37(4), 607-617, 2021 - ZHAN SHI, YONGING XIE ,WEI XUE, YONG CHEN, LIULIU FU, XIAOBO XU
- [9] IoT BASED SMART HUMIDITY AND TEMPERATURE MONITORING SYSTEM Additional by using WIFI Modules - IJARIE - ISSN(O) -2395 – 4396, VOL 3 ISSUSE 06 2022 AKASH DEVADE,VAIBHAV MARE ,SHUBHAM SHINDE , ABHISHEK JORI, VISHAKHA
- [10] SMART MONITORY SYSTEM FOR INDUSTRY AUTOMATION (IoT BASED) - INTERNAL RESEARCH JOURNAL OF ENGINEERING AND TECHNOLOGY ,VOL 09 2022 -NIKITA GOSAI, SAKSHI BABAR BHAGWAN KATALE ,Prof P.M. KULKARNI



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