MICROCONTROLLER BASED SUBSTATION MONITIRING AND CONTROL VIA IOT

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ABSTRACT-- As the distribution network has gotten more complicated, substation automation has become a must for every utility business looking to enhance efficiency and electricity quality. The proposed project, which is an IOT-based substation control system, would assist utility companies by ensuring that local-substation defects are quickly identified and notified to the appropriate departments using IOT, reducing the duration of intensity incursion. SMS messages will be sent out containing the measured parameters. The microcontroller will work inconjunction with sensors installed at a nearby substation to complete a task as directed.. Electrical characteristics such as current and voltage will be compared to their rated value on a regular basis to safeguard the distribution and power transformer from overload, short circuit faults, overvoltages, and surges. Under such circumstances, the entire device is shut down, with transfers detecting it and the electrical switch being killed promptly. To show this, SMS alerts may also be created. The use of GSM makes the substation intelligent in the sense that it can send and receive signals and information. This saves time and money at the substation by lowering labour costs. The sub-observing station's and functioning effectiveness will undoubtedly improve in this method.

KEYWORDS: Substation, SMS Messages, Internet of Things, Relay, Monitoring.

INTRODUCTION:

The distance between the generators and the load mightbe hundreds of miles, resulting in a massive quantity ofpower exchange over vast distances as a result of poor quality electric power. Issues with power quality were not regularly observed throughout the early stages of development. The alert has been triggered owing to the increased demand for electricity on the customer side, which has elevated the quality of power provided to theuser side. During the transit of general power, a significant quantity of energy is wasted, resulting in a drop in the nature of the intensity received at the substation. To required to create a A monitoring system that can recognize, analyze, and analyse existing electrical line restrictions automatically. Because of the lack of automation surveillance and the provider's limited deceivability over the grid, control blackouts and power outages continue to occur today. WSN will provide the provider with the required view by gathering data from the grid's many subsystems. A sensor node will determine whether to tell the sink about this information immediately or to slightly delay this notification. Operation PB COOP. Sense data evaluation: we define three priority levels (0, 1, and 2) The process of choosing on a correspondence method is as follows: need 0-no further action is necessary, need 2-esteem is flushed downthe toilet since it is regarded as earnest, and a message should be sent.

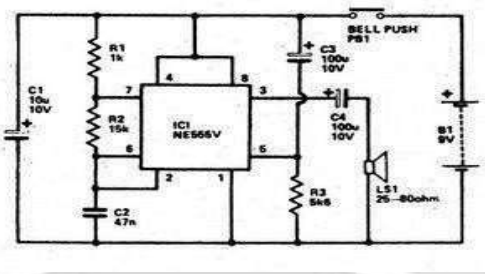
LITERATURE REVIEW:

Lighting the streets due to high consumption of electricity. Cars, on the other extreme, pass at a slow pace during some periods of time, and sections of both the road are not used by automobiles after a certain duration of time. We offer a methodology in this paper that detects a vehicle from a specified range and immediately turns

on the light till the vehicle crosses that radius. Technically, this method may save a huge amount of electricity while also prolonging the lamp's life.

Furthermore addition, the energy required for lightning is derived from solar energy throughout the day. As a result, the power consumption is renewable.

A ESP-based device is also included in design, which sends messages to the substation in the incidence of a street problem.



PROPOSED METHOD

The purpose behind this undertaking is to secure the unknown electrical parameters like Voltage, Current and Frequency and send these ongoing qualities over IOT based checking and control with the temperature at the power station. This venture is additionally intended to ensure the electrical hardware by working an Electromagnetic Relay. This Relay gets enacted at whatever point the electrical parameters surpass the predefined esteems. The Relay can be utilized to run a Circuit Breaker to turn off the fundamental electrical supply. The client can send orders as IOT to peruse the remote electrical parameters. This system additionally canconsequently send the continuous electrical parameters intermittently (in view of time settings) as SMS. This system can be intended to send SMS alarms at whatever point the Circuit Breaker trips or at whatever point the Voltage or Current, recurrence surpasses as far as possible.

BLOCK DIAGRAM

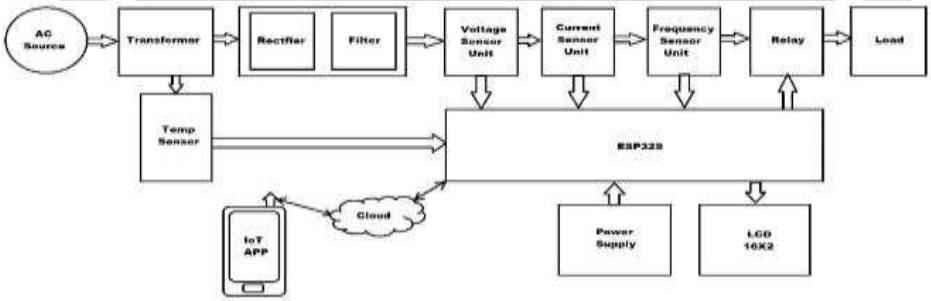


Fig 1: Block Diagram of Proposed Method

DESCRIPTION

An unexpected rise in voltage, current, or temperature in the appropriation transformer is explained in the above block. Asa result, we propose that the EB's dispersion transformer be computerised. substation. In the robotization, we think about the voltage, current, and temperature as the parameters to be observed

For the same, the transformer shows its pinnacle adaptability. From that, we design an automatization structure based on the microcontroller that operates the transformer on a continuous basis. The transformer in the substation is switched off at the main station by using IOT because of the microcontroller functioning.

VOLTAGE SENSOR

The level shifter improves the estimates in voltage sensors. There are broadly two types of voltage sensors that may be written to. Capacitive voltage sensor and resistor voltage sensor are two types of voltage sensor.

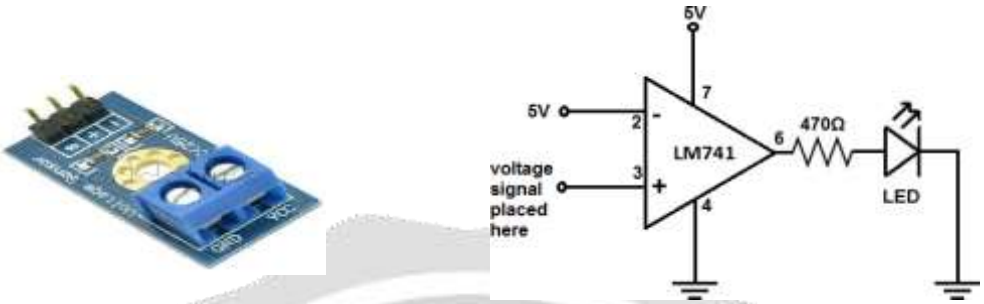


Fig: Voltage sensor

RELAY

A relay is a device that is controlled by electricity.switches Many relays employ an electromagnet to control a switch mechanically, however alternative working standards, such as strong state transfers, are also used. Transfers are utilised when accessing a circuit through a separate low-control flag is required, or when a single signal must control many circuits. The main transfers were used as boosters in protracted broadcasting circuits, reprocessing the flag receiving in from one circuit and re- transmitting it on another. Transfers were frequently used to conduct intelligent functions in phone exchanges and early PCs. A constructor is a type of transfer thatcan manage the high power necessary to drive an electric motoror other loads directly. Operation is controlled through steady relays.

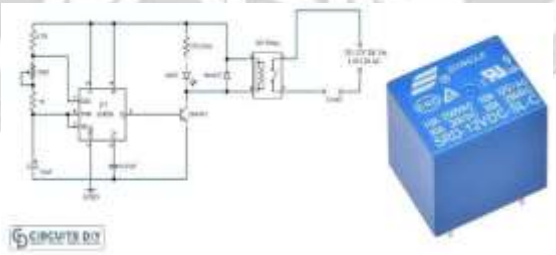


Fig: Relay Circuit

ESP32S MICROCONTROLLER

The ESP-32S is the latest version WiFi Bluetooth combo module is ultra-high performance and ultra- low-power consumption Wi-Fi and Bluetooth combo wireless platform.

This is ESP WROOM 32 MCU Module. ESP WROOM 32 is a powerful, generic WiFi-BT-BLE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming, and MP3 decoding. At the core of this module is the ESP32S chip, which is designed to be scalable and adaptive. There are 2 CPU cores that can be individually controlled or powered, and the

clock frequency is adjustable from 80 MHz to 240 MHz.

Using Bluetooth, users can connect to their phone or broadcast low energy beacons for its detection. The use of Wi-Fi enables a large physical range, as well as a direct connection to the internet via a Wi-Fi router. Perfect for wearable electronic or battery-powered applications, the ESP32 chip uses less than 5µA. ESP-32S integrates dual-core processor, 448

KByte ROM,520 KByte SRAM,16 KByte SRAM in RTC, 802.11 b/g/n/e/I Wi-Fi, Bluetooth v4.2 BR/EDR & BLE, clocks & Times, abundant peripheral Interfaces and security mechanism.

ESP-32S Wifi Bluetooth combo module provides SDK Firmware for fast on-line programming and open source toolchains based on GCC for development support. It is designed for Generic low power IoT sensor hub, loggers, video streaming for the camera, Wi-Fi & Bluetooth enabled devices, Home automation and mesh network applications, aimed at makers, hardware engineers, software engineers and solution provides.

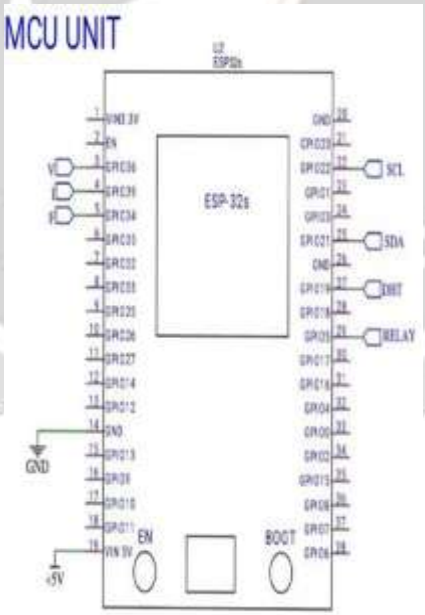


Fig : ESP32S PIN CONFIGURATION.

LCD Display

The screen is flat. LCD and laser screens operate in really different ways. Every pixel on a plasma screen is a small incandescent bulb that is switchedon and off electrically. Whento use an LCD screen.

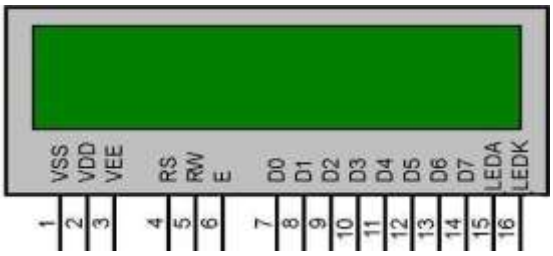


Fig: LCD SCREEN CONFIGURATION

The cells are automatically changed on and off, with absorbed light pivoting through flowing precious stones. Liquid valuable stone display is a type of display seen in automated smartwatches and many small laptops. LCDs have two transparent material portions with a flowing precious stone arrangement in the centre. An electric current was sent through the wet, causing the crystals to combine, preventing light from passing through. A liquid-crystal screen (LCD) is a horizontal screen or any other electrically modulated optically equipment that making uses of fluid crystalline' surface qualities.

CURRENT SENSOR

A sensor is a device that detects electricity current in the coil and generates a flag in relation to it. The generated flag may be a basic voltage or current, or it could be an advanced inquiry in a data security mechanism.

FREQUENCY SENSOR

This simple RF signal monitor device would be used to monitor the intensity of Radio frequencies and electromagnetic turmoil in your home, workplace, or store. It may be a useful tool for testing or laying up Radiofrequency circuits. It may also be used to detect electrical impulses within your home.

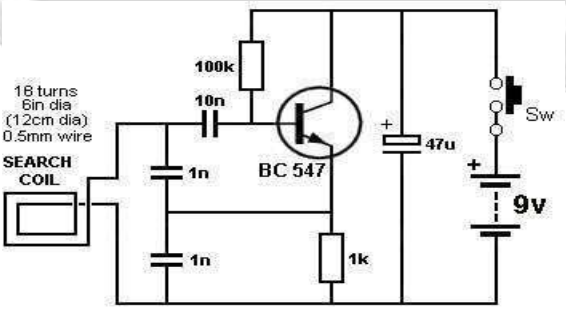


Fig:5 Frequency sensor

ANALOG TO DIGITAL CONVERTER

Transducers are frequently used to turn over information that is basic in nature, such as streams or voltages. Here, the electronic numbers are paired, i.e. '0' and '1'. The '0' represents the 'off' state, whereas the '1' represents the 'on' state. As a result, an ADC converts all simple qualities into advanced complex qualities. For examples, suppose we need to install a monitoring system in our house or office that will activate in the fire situation or overheating. Our entire warning system will be digital. However, after measuring the temperature, the temperature sensor can provide simple qualities at the yield. In this way,you may switch between the many options.

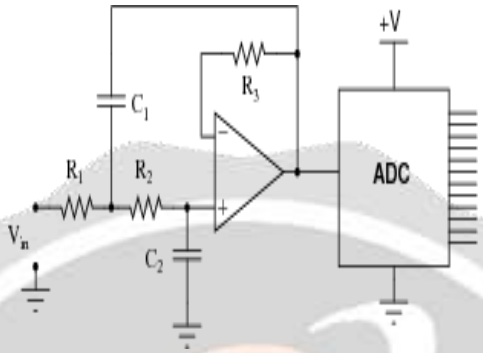
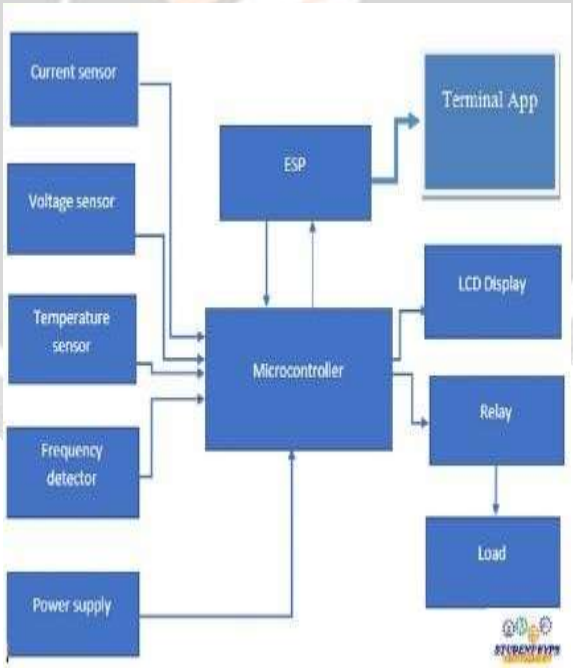


Fig. 6: Analog to digital converter

BLOCK DIAGRAM



CIRCUIT DIAGRAM

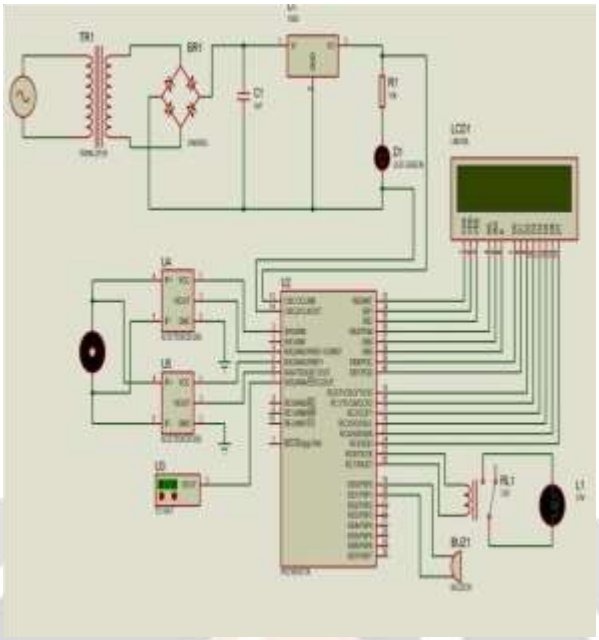


Fig. 7: Circuit Diagram for the Proposed System

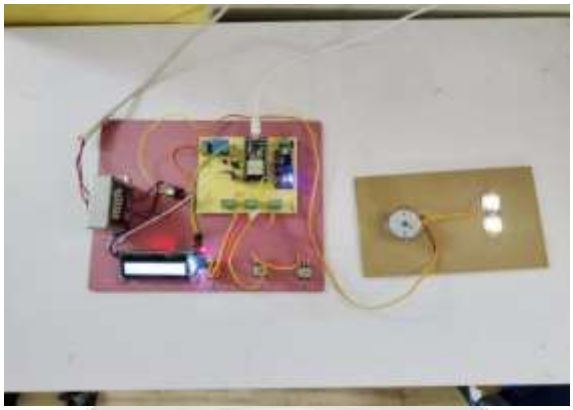
CIRCUIT DIAGRAM EXPLANATION

The microcomputer required a + 5v power supply to operate. Four unique types of loads will be linked. The substation in order to track voltage, current, frequency, and temperature. If the predetermined limit is exceeded, the relay will trip the circuit and send an IOT notification.

RESULT AND DISCUSSION

Parameters	Specification	Input	Output
Voltage sensor	Step down	(0-230)V AC	(0-5)VDC
Current sensor	Step down	(0-10)Amp	(0-2)Amp
PIC controller	Monitor & control	(0-5) V	(0-5) V
Relay	Trip	(0-12)v	(0-5)V
IOT	Control and monitoring	Monitoring	Control

PROJECT KIT



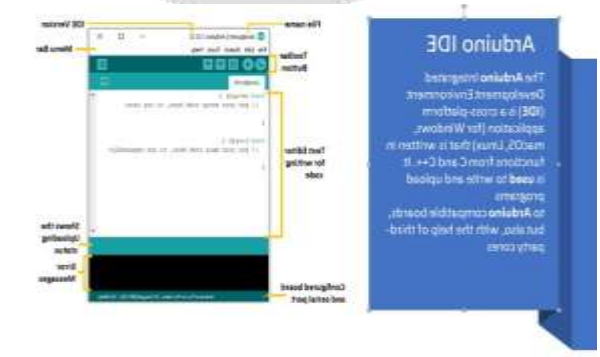
BLYNK APP

Blynk is a platform for the development of smart phone applications that works with wide range of microcontrollers.

It is used to connect MCUs Aurdino ESP-32S over a WIFI, ETHERNET or Cellular to the internet and build customer Mobile applications to remotely Monitor and control electronic equipment.

Easy for Substation Analysis and Monitoring and Control.

AURDINO IDE



The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to uploadprograms and communicate with them

ADVANTAGES

- The immediate attention can take place if a variation happens in the sub-station parameters.
- IOT based control is easy to identify the fault in any variant.
- The various parameters can be modified and analyzed continuously through a network.

APPLICATIONS

- POWER STATION
- ENERGY PRODUCTION
- DISTURBUTION AREA

CONCLUSION

We can increase the quality of power delivered and offer uninterrupted power supply after our project "Substation Monitoring and Control using Microcontroller and IOT" is complete. In particular, actual surveillance of different indicators is carried out to ensure the security of the station and its components. Furthermore, the project has been completed by applying very advanced IC's with the aid of shall become effective. The work has been successfully prepared and evaluated in this manner. The method is intended to make distant substation control simple. It refers to the multiple communication. Exchanging, The station can communicate with the service company to demonstrate how a substation is linked to a certain issue. The precise location of the station can also be ascertained by submitting the substation's

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