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UPS BATTERY MONITORING SYSTEM OVER GSM FOR HIGH AVAILABILITY SYSTEM

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Abstract:

AnUninterrupted Power Supply (UPS) is a critical component in any high availability system. However, the effectiveness of a UPS depends largely on its battery backup, which must be continuously monitored to ensure that it is working properly. In the past, this monitoring has been done manually or through local monitoring systems, but advances in IoT technology now make it possible to remotely monitor the status of UPS batteries and receive real-time alerts if any issues arise.

Finally, the system will be scalable, allowing additional sensors to be added to the network as needed. Nevertheless, physically checking the UPS battery is highly challenging since it requires more money and time. Data center operators, at the center of the digital economy, are under pressure from several directions. sustaining the highest level of availability at the most affordable level. A leading provider of battery management solutions.

IndexTerms:*Arduino, Voltage Sensor,GSMModule,GPSModule, Arduino IDE, Relay, UPS Battery.*

I.INTRODUCTION

In today's digital world, high availability systems are critical to the smooth functioning of various organizations, including data centers, hospitals, financial institutions, and many more. These systems require a continuous power supply, and to achieve that, they rely heavily on uninterrupted power supplies (UPS). A UPS provides power backup during power outages and prevents downtime, which is crucial for high availability systems. However, a UPS is only as effective as its battery backup, which must be continuously monitored to ensure its proper functioning.

In the past, UPS battery monitoring was done manually or through local

monitoring systems. However, advances in IoT technology have made it possible to monitor UPS batteries remotely, enabling real-time monitoring and alerts. The proposed project aims to develop an IoT-based monitoring system for UPS batteries, specifically for high availability systems. This system will consist of a network of sensors placed in strategic locations throughout the battery backup system. These sensors will collect data on critical performance indicators, such as voltage, current, temperature, and battery capacity. The collected data will be transmittedwirelessly to a central monitoring system accessible via the internet. The monitoring system will use data analytics and machine learning algorithms to analyze the data and detect any potential issues with the battery backup system. If any issue is detected, the system will generate real-time alerts, allowing system administrators to take prompt action and prevent downtime.

II. LITERATURE REVIEW

Here is described a different approach to the methods now in use for classifying batteries based on their chemistry. Battery testing equipment was used to age batteries with four distinct chemical compositions. The creation of a 'UPS battery management system' is discussed in this paper. This device assists in determining the status of batteries backing hours for both running and stationary modes by using an ATMEGA controller. The BMS provides the analysis of SoC (State of Charging), DoD (Depth of Discharge) State of Health (SoH), battery life, and (Battery Management System).

The battery's voltage and current are measured using the sensor and a 12 Volt sealed valve-controlled lead acid battery. This study shows how the Internet of Things (IoT) can be used to monitor an electric vehicle's battery performance. It should go without saying that an electric car's battery serves as its primary energy source. Unfortunately, the vehicle's energy supply is steadily reducing, which results in performance decline. The manufacturing of batteries is quite concerned about this. This paper uses an Arduino board to demonstrate the design of a battery voltage sensor for a UPS (uninterruptible power supply).

This research examines the specifics of BMS for stationary energy storage and electric vehicles. This study focuses on tracking the battery's level of charge, temperature, and current for solar panels with batteries attached for residential use. ESSs need a BMS algorithm that can control the status of the battery since

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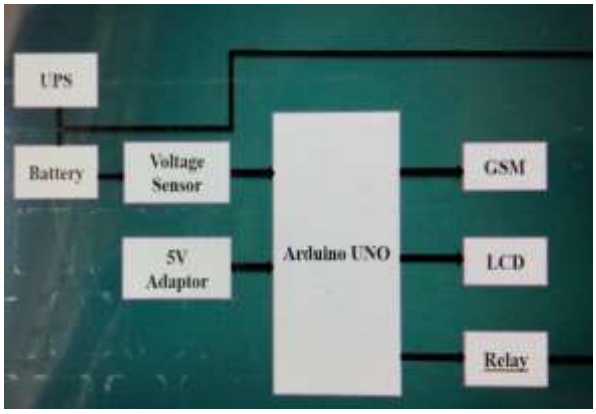
ageing raises a battery'sinternal resistance and decreases its capacity.

III.PROPOSEDSYSTEM

The proposed system will have several advantages over existing battery monitoring systems. It will be fully automated, reducing the need for manual monitoring and minimizing the risk of human error. It will be remotely accessible, enabling system administrators to monitor the status of the battery backup system from anywhere in the world

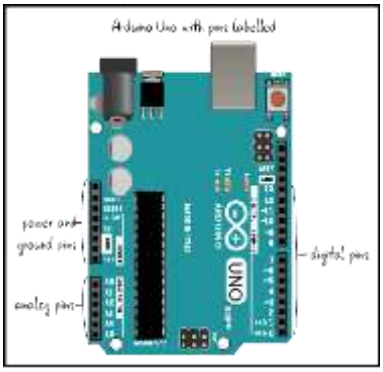
SystemArchitecture:



The acid level of the UPS battery is detected using an ultrasonic sensor. If there are any changes or unpredictabilities, such as an increase in temperature, a battery fire, or a rise in acid level, the load will be instantly shut off. The detected parameters are promptly updated in IOT and shown on the LCD panel for remote monitoring. If any the sensors value are normal so the output Of the LED is OFF.

A. ArduinoUno:

TheArduinoUnoisanopen-sourcemicrocontrollerboardbasedontheATmega328P microcontroller. It serves as thecentral processingunit,collectingdatafromvarious sensors, processing it, and transmittingittothecloudplatform.The ArduinoUnoprovidesaflexibleandeasy-to-usedevelopment environment, making it suitableforprototyping.human error. It will be remotely accessible, enabling system administrators to monitor the status of the battery backup system from anywhere in the world.



B. VoltageSensor:

A voltage sensor is a sensor that measures and records the voltage level of an object. Voltage

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sensors are capable of measuring both AC and DC voltage levels. In addition to taking voltage as an input, the sensor can also produce switches, analogue voltage signals, current signals, or aural signals. Sensors are tools with the ability to detect and respond to specific electrical or optical signals. Traditional current and voltage measuring methods have been effectively replaced by the use of current sensor and voltage sensor approaches. details on the voltage sensor. The supply of voltage may be found out about, watched over, and measured using a voltage sensor.

C. Uninterrupted Power Supply (UPS):

An (UPS) or uninterruptible power source is a type of continual power system that provides automated backup power to a load when the input power source or mains power fails. A UPS differs from a traditional auxiliary or standbygen erator in that it will provide near-instantaneous protection from input power interruptions by switching to energy stored battery packs, supercapacitors or flywheels The on-battery run-times of most UPSs are relatively short (only a few minutes) but sufficient to "buy time" for initiating a standby power source or properly shutting down the protected equipment. Almost all UPSs also contain integrated surge protection to shield the output appliances from voltage spikes.

D. GPS MODULE

The Global Positioning System (GPS)modulereceivessignalsfromsatellite stodetermine the device's geographical location,altitude, speed, and time. This information iscrucialforspatially-

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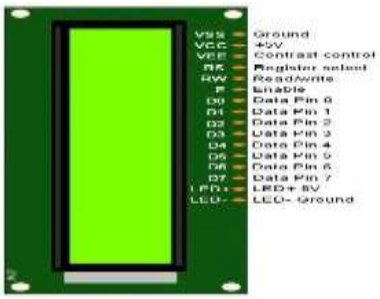
resolvedairqualitymappingandmonitoring ,enablingtheidentificationofpollutionhots pots,trackingpatterns, and correlating air quality data withspecific locations or sources of pollution. TheGPS data can also be used for route planningandoptimization,ensuringefficien tdeploymentandmonitoringintargetareas.

E.GSM Module:



TheGlobalSystemforMobileCom munication(GSM)moduleworksbyconnec tingtotheGSMnetworkthroughaSIMcard.I tenablesreal-timedatatransmissionfromthemonitorings ystemtothecloudplatform,ensuringseamle ssdataflow and accessibility. Additionally, the GSMmodule allows for remote system control andmanagement,enablingremoteconfigur ation,firmwareupdates,andmaintenanceop erations,whichcanenhancesystemreliabilit yandreduce operationalcosts.

F. 16x2 Liquid Crystal Display (LCD):

The16x2LiquidCrystalDisplay(L CD) provides a user-friendly interfacefordisplayingreal-timedatacollectedfromvarioussensors,su chaspollutantconcentrations,temperature ,humidity,andlocation information. This on-site monitoringcapability allows for immediate data analysisand interpretation, enabling rapid response anddecision-making by on-site personnel or localstakeholders.

G. Relay:

A relay Electromechanical relay principle of Electromechanical relay schematic showing a control coil, four pairs of normally open and one pair of normally closed contacts An automotive-style miniature relay with the dust cover taken off

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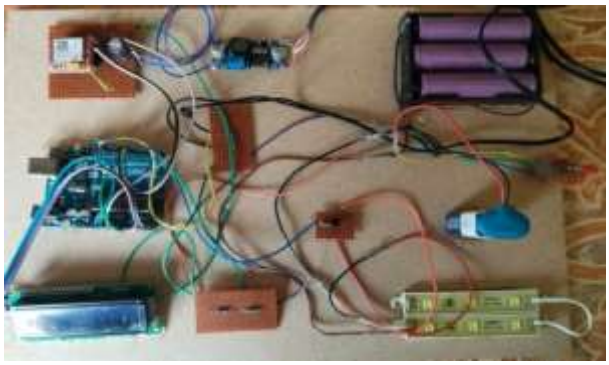
IV. SYSTEM SETUP AND OUTPUT



SystemSetup:

Sensor Integration: Connect Voltage sensor toArduinoUnousingappropriate interfaces.

PowerManagement: Utilizethebuckconverter to regulate voltage levels for stablesensoroperation.

Data Acquisition: Arduino Uno reads sensordataperiodicallyandprocessesitfortransmission.

Communication: Integrate a GSM module tosenddatatoacentralserverordesignated mobile phones via SMS.

LocationTracking: IncorporateaGSMmoduletoacquirelocationdataforeachsensor reading.

Display Interface: Connect LCD to ArduinoUnotovisualizereal-timeenvironmentalparameterslocally.

Functionality:

DataCollection: Sensorscontinuouslymonitor ups parameters such as COconcentration, harmful gases, temperature, andhumidity.

Data Processing: Arduino Uno processes theacquired data, including sensor calibration andunitconversion.

DataTransmission: UtilizingtheGSMmodule, the system sends the processed dataalong with location information to designatedrecipientsviaSMS.

Real-timeMonitoring: TheLCDdisplayshows current battery readingsforlocal monitoringandawareness.

Remote Access: Users can receive real-timebattery data ontheirmobiledevices,enablingremotemonitoringandtimelyinterventions.

Data Analysis: Collected data can be

furtheranalyzedfortrendidentification,hotspotmapping,andpolicyformulationtoaddresses ups batteryeffectively.

V.RESULTS:

VI. CONCLUSION

In conclusion, implementing an GSM-based UPS battery monitoring system for high availability systems can bring several benefits. By continuously monitoring the UPS battery status and sending real-time alerts, this system can help prevent unexpected downtime and minimize the risk of data loss or damage to critical systems. The use of IoT technology allows for remote monitoring and management, making it easier for IT administrators toaccess critical information and take necessary actions. This can save time and reduce the need for on-site maintenance, which can be especially important in large-scale data centers or other mission-critical environments.

VI. REFERENCES

M. Karuppasamypandian, V. Agnes Idhaya Selvi, Paramathma, and M.

Krishna.2021International Conference on Advancing Computing and Innovative Technologies in Engineering, "Development of Web Server Based Battery Management System for UPS" (ICACITE). IEEE, (2021).

(https://www.sciencedirect.com/science/article/pii/S235264832100057X)

- Selvabharathi, D., & Meganathan, N. Utilizing a Feed-Forward Neural Network to Predict Lead-Acid Battery Health. Journal of Circuits, Systems and Computers, 31, 5 (2022).

(https://www.sciencedirect.com/science/article/pii/S0160412021005225)

- K Balachander, G Suresh Kumaar, M Mathankumar, A Manjunathan, S Chinnapparaj, "Optimization in design of hybrid electric power network using HOMER", Materials Today: Proceedings, 45 (2021). 7 E3S Web of Conferences 399, 04007 (2023) **(https://doi.org/10.1051/e3sconf/202339904007 ICONNECT-2023)**
- Kannadhasan Suriyan, Nagarajan Ramalingam, Kanagaraj Venus Amy, Sathish Sivaraman, Kiruthiga Balasubramaniyan, Manjunathan Alagarsamy, Bulletin of Electrical Engineering and Informatics, 11, 2 (2022) **(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5825064/)**