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Research Paper

Performance monitoring of UPS battery using IoT

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Abstract

The proposed proposal basically concentrate on energy efficient and cost effective model construct an automatic UPS monitoring and controlling system , with the context of PDA's to machine level and machine level to PDA's.RF is the essential information based communication system now a days i.e. Bluetooth/ZigBee/Wi-Fi . IoT based UPS provides the balancing tradeoff between monitoring and controlling the system remotely in order to increase the energy efficiency and production rate. Proposed system automatically monitor the 4 parameters ,i.e current ,voltage, temperature, power which runs on each UPS. During the drain out or worn-out if any of the pa-rameters like voltage andcurrent decreases from the ideal conditions then this will be monitored automatically and the values will be displayed on android app application and and uploaded to the cloud(IoT).The breakdown conditions of UPS will be notified to the chief engineer,supervisor and control room through SMS and IoT.

Keywords: *PDA; IOT; UPS and Accesses Point.*

1. Introduction

The UPS trade off is very essential for some parameter calcula-tions i.e., charging of battery, in terms of the tempera-ture,voltage,,line frequency, power. To observe the UPS we use Real time unit within UPS. The UPS is used to supply power to unstable applications with security. It offers supply voltage to sensitive loads. The output will be the free sin wave without any disturbances in the power with correct amplitude and frequency. The quality of the power will high compare to other devices.The UPS supplies the power which is available and the backup power is supplied when the power failure occurs and it is supplied until the charge of the battery goes to null position. It will indicate the remaining power and the time of supply are well noted in the sys-tem. The backup power for the industrial UPS will be more than the UPS used for the house hold appliances ie. for one or two computers[4]. Basically the industrial UPS will be above 400v and it has to supply power to the database systems.
Based on an Internet of Things (IoT) platform and cloud technology, UPS increases the usage of UPS systems, optimizes management, and helps companies achieve the lowest possible operating cost for their businesses critical power systems.UPS is part of a complete service offer and will be available with various services and agreements and will be provided 24x7. In the past people are used to communicate within them only but at the present stage the people are speaking with the machines only. Some UPS have microprocessors on board to know the present state of the power supply. UPS will be providing the sinusoidal signal as the supply voltage and if it gets fails it will not provide any signal. Coming years all the devices will be having the sensors and mainly that will connect to the IoT. At present many companies are showing interest on providing the security to the smart phones and also other gadgets that will be connected to the internet. [8].
By connecting UPS to the IOT, the UPS can be monitored, managed and controlled from anywhere in the world. The network manger will be taking the priority software from the UPS manufactures and management. The IOT provides the infor-mation about the UPS and the stored capacity, usage capacity. UPS are installed with a battery connected and the back-up power provided to the loads. The parameters UPS such as running out of charge, high temperature that damage the cells, discharging of the battery, voltage that causes failure of the UPS can be monitored. The UPS can be monitored by connecting the lan that is connected to the web browser. Number of the cells can be connected to the Ups. We should not let any UPS to monitor itself. Using a small monitoring device will help us to make carefully the work. Over-charging of the battery capacity can be monitored carefully it may get fail any time. DPS telecom will help us more in monitoring of the UPS [9].

2. Literature review

The development of embedded technology using the internet will help us in the implementing the managing of UPS. Monitoring and controlling of UPS is done using the Magatec communication protocol by implementing the web server, hardware and software of the system. Some simplification has been changed in the TCP/IP protocol stack to complete ups accesses. The Ethernet will be playing the crucial role while connecting the embedded web
server. By using the protocol the information about the parameters of UPS are extracted. Device server wishes to convert the user instructions into the instructions that UPS can understand by using the Magatec protocol. The URL demand from the client is sent to the LAN via .internet. It reaches the Ethernet interface of the web server without any distortions. The web server acknowledge the URL request after the response of the remote client scan calls for the request of the UPS monitoring [10].
Online UPS Endeavour AC voltage regulation that works with the controllable battery charger has been proposed. The battery can be of type LA. The battery can be continuously charged and the battery pinned discharge is well known with the help of relay through which the PIC microcontrol-ler is connected. When the UPS gets

damaged or the voltage has been decreased, the AC voltage will be equipped straight to the load by turning off the main switch. The technique which is used for the battery here is constant current charging technique. The battery at over charge and when the battery is in the discharge mode can be known by the relay a by monitoring voltages. The backup power supply will be given the power is lost. Here the digital charger which is designed is controlled through the micro-controller software [11]. The monitoring and the controlling of the UPS can also be implemented digitally. These can be implemented by designing hardware and a software with a friendly graphical user interface. The system can let on many complex algorithms raise the accuracy and capability of the UPS. The soft-ware is used to monitor the parameters and operation modes of ups and also the strategies of the UPS at different modes can be determined. it is very necessary to check every time when the load is connected to UPS weather the UPS can handle it or not. The load may be of any type that may range v to kv. The max power rating is 1.5kvA [12].
The UPS battery monitoring system can be done using the cloud computing. The battery data and the strate-gies of the UPS can be accessed by implementing the application of cloud computing. This also can be done by using the Hadoop technology to establish a battery monitoring prototype system. To monitor the data in the huge amount we can take the cloud as the data base to store the monitored data for the applications. Here the hadoop will have divided into two parts which are helpful in the software are distributed file system and the distributed compu-ting map reduce.HDFS acts as the master/slave and the map re-duce are used to calculate the large amount of data. Here it will not only store the real time monitored data but also it stores device running data. Here it will come under sever based and it will be in the application layer. The data can be shown in the webpage on any other websites which stores the data [13].
The UPS has the ability to convert and control the power supply. It can convert AC to DC and it is designed mostly for the small loads. This model will help the person to know the upcoming faults through the SMS. In this system we use step down and the rectifier circuit. The step down will help the voltage to maintain 12v and the rectifier will be rectifying all the circuit. This will works on the switching principle. Here GSM900 is used as the GSM module to send the message. The UPS can be monitored remotely and it is very useful to detect the faults in UPS. Easy to reduce the labour and the performance will be more than the other systems [22].

3. Need of proposed system

- Here in this proposed system we can not only monitor but also we can control the UPS from the Internet or the data base.
- Each and every UPS will be given to a particular device and by using the internet we can monitor the UPS pa-rameters and also the loads which are connected to it also will be displayed in the data base and we can con-trol the loads using the internet. We can stop the load which is consuming more power and the load which isnot in use.
- The chief engineer can get a message alert when any UPS got failure and can get the details of particular UPS or load.
- The software reset is used which allows it to be reset by software running on the computer without any physical assistance.

4. Proposed hardware requirement

The UPS based on the microcontroller with 10 bit ADC con-verter in built in it. Here the amplitude and frequency and the UPS signal distortion is measured .The battery level and the signal level is also measured [12].

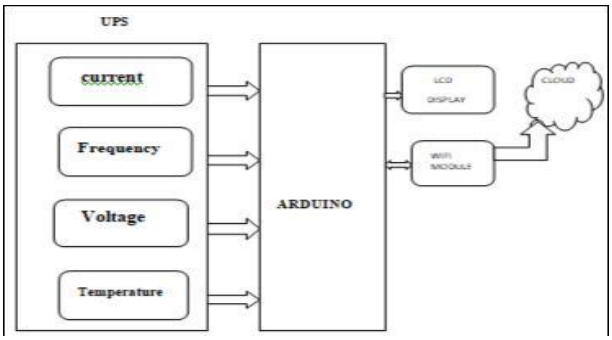

Fig. 1: Proposed Hardware Model.

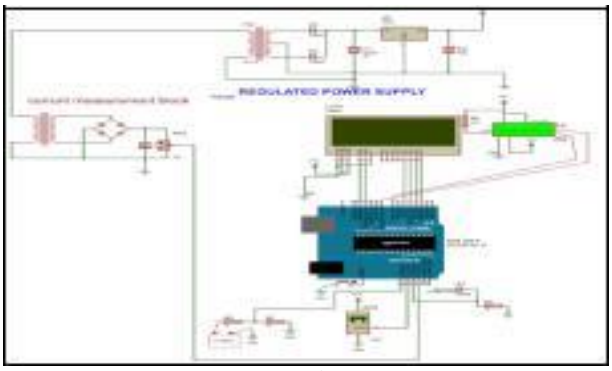

Fig. 2: Schematic View of the Proposed Method.

5. Implementation

The implementation of the UPS monitoring is very important because the power supply is the main problem in india. So in many industries or schools or companies everyone should need the backup otherwise it will lead to huge data loss. So to get that backup every industry working with a power they need UPS. The UPS will be immediately come to active when the power supply is off and leads smooth functioning of systems ,industries and or-ganization will not degraded if they have UPS connected to load continuously irrespective change in power line and power off conditions. The productivity of the industry will not get any dam-age if they have the UPS connected to theloads. The loads will be running continuously without off when they are connected to the UPS. The UPS will be automatically come to on within no time.
In this system, the proposed model resembles the continuously monitoring of UPS. Here the the required DC supply is obtained by using a rectifier,7805 regulator,a capacitive filter which converts the AC signal to Below to this power section there is a current measuring block which comparises of a current transducer ,a bridge rectifier and a capacitive filter. Whenever the load i.e the bulb is applied then this section operates and gives the voltage which is proportional to the generated one converts the obtained signal and gives us the current measurement.
Here the measurement of the temperature is obtained by using a sensor called thermistor .if the temperature sensor is not used. For Ex when we used the battery at high temperature the battery gets opened or busted so for the indication of temperature, the sensor is used. Here the reset logic is used when the operation of the entire circuit is not executed properly. When the reset button is pressed the circuit start functioning from the beginning.
The ESP8266 which is nothing but a Wi-Fi module, it is low cost and it is used for uploading the data of voltage, line frequency and other parameters in the cloud site (Thing speak).We can monitor this information by using web browser from anywhere in the world.

6. Results

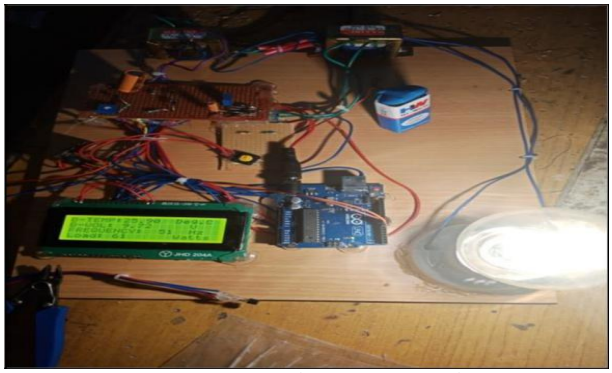

Fig. 3: Shows the Implementation of the Monitoring of the UPS Under the Load Conditions.

Fig. 4: Shows the Maximum and Minimum Values of the Temperatures.

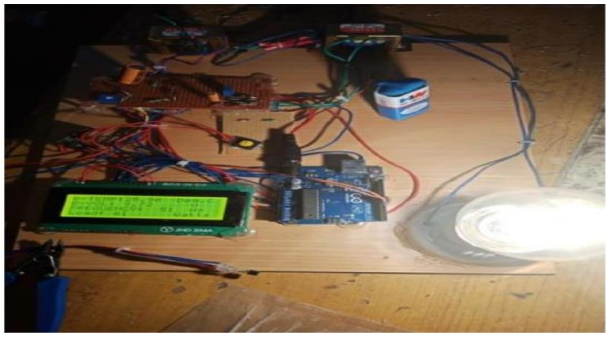

Fig. 5: Shows That System under No Load Conditions.

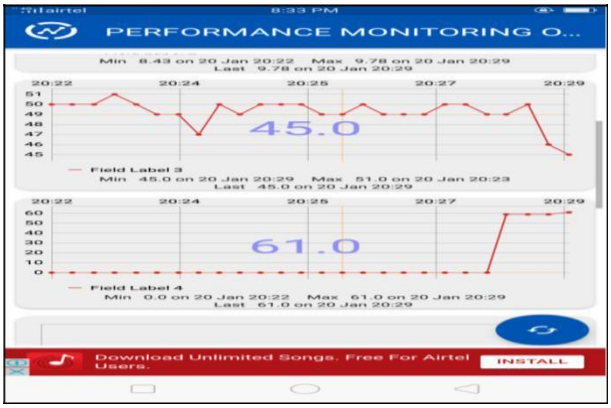

Fig. 6: Shows that the Peak Reaches to the Maximum at 61.0 Volts whenever the Load Is Applied and Found Stable at 45.0 Volts.

Fig. 7: Parameter Monitoring of Ups Remotely with IoT.

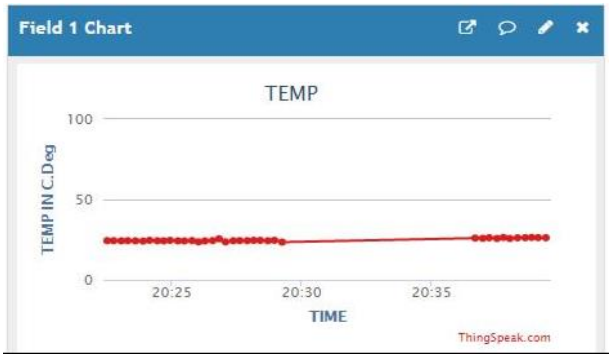

Fig. 8: Shows the Temperature of the UPS Battery Under the Load Conditions.

X-axis represents the time stamps and Y-axis represents the input current.

This graph allows the user to monitor the performance in user friendly way.

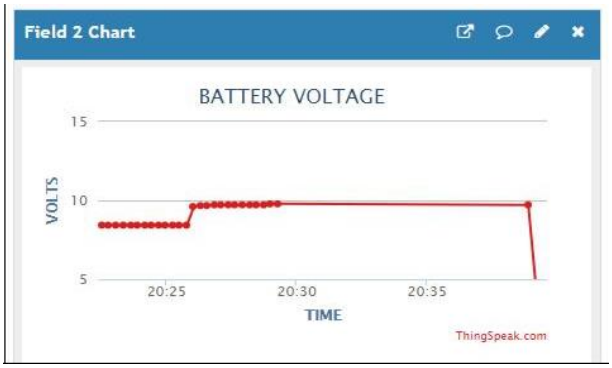

Fig. 9: Represents the Voltage Consumed by the UPS Battery where Y Axis Represents the Voltage Consumed by the Load and the X Axis Represents the Time Stamps. This Graph Facilitates the User to Monitor the Performance in User Friendly Way.

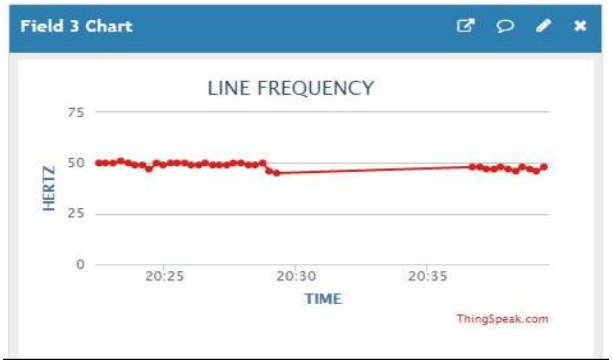

Fig. 10: Represents the Line Frequency Consumed by the UPS Battery .X Axis Represents the Time Stamps and Y Axis Represents the Line Frequency. The Graph Will Allow the User to Monitor the Performance In User Friendly Way.

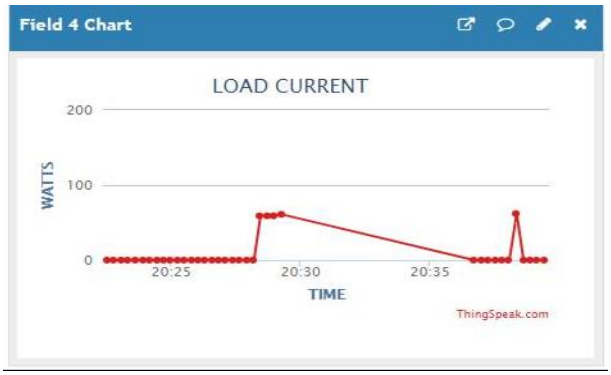

Fig. 11: Represents the Line Frequency Consumed by the UPS Battery .X Axis Represents the Time Stamps and Y Axis Represents the Load Current. The Graph Will Allow the User to Monitor the Performance in User Friendly Way.

7. Conclusions

The developed system monitors the power consumed by the load and UPS. Whenever the UPS is running on overload as well as under-load, it generates a notification to the mobile number regis-ter with supervisor, chief engineer and maintenance persons .At the same time can be controlled from the internet of things. The implemented system is low cost, efficient and can be affordable by all the scales of industry. The developed system provides the pa-rameters without any delay. This system can be modified and can be enhanced with slight modifications.

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