International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 02 | Feb-2018 www.irjet.net p-ISSN: 2395-0072

IoT Based MultiUtility Auto Cut-Off Power Charger

R.Shankar[1], S.Blessy[2], M.Selva Roja[3]

[1]Associate Professor, Department of Electronics and Communication Engineering
[2,3]U. G Students, Department of Electronics and Communication Engineering
JEPPIAAR SRR Engineering College, Padur-Chennai 603103,Tamil Nadu-India

---

Abstract - *Increase in the production of various electronic gadgets day by day, increases the demand of power chargers. The issue with present day chargers is that they charge the devices even after battery of the device is fully charged. This leads to degradation of battery life of any device. Also, it dissipates much power which is a loss in the system. To overcome the above issues, a novel auto cut-off power charger is proposed in this work. The proposed smart electronic device, which has sensors, software programmed controllers and network ports which enable to collect connected device's power level and the collected information is used to track the power level of the device. Moreover, the device can be cut off from the charger thereby avoids overcharging of the battery and improves the performance of the device.*

Key Words: **Power chargers, Degradation of battery, Auto cut-off, Sensors, Programmed controllers, Track the power level.**

1. INTRODUCTION

In this era, many applications are simply performed by various electronic appliances. Thus, innumerous electronic appliances are emerging day by day. These appliances use electronic devices as an integral part which depends purely on power. Thus, now-a-days, charging of such devices becomes a challenge. The battery of the device is one of the factors, which decides the efficiency of the device. Overcharging of battery may degrade the life and performance of the device. To overcome the adverse effects due to overcharging, an auto cut-off power charger is proposed in this work.

The proposed IoT Based multi utility auto cut off power charger is designed by introducing a circuit to detect the current and voltage level with IoT support, which operates with the threshold value beyond which it allows to turn off the power charger from anywhere. It enhances the life of the battery used in any real time electronic gadgets. It also focuses on energy conservation. This approach when implemented in industries in real time appliances maintains the equipment's performance and enhances its life time.

2. INTELLIGENT AUTOMATION SYSTEM

Various automation system such as devices that monitors battery level based on estimation of temperature obtained from battery using Kalman filter's, a state of charge estimation[1]. In the development of automatic cut-off PV charge controller, voltage level alone is measured[2, 3]. Multi utility concept is fetched from solar panel based multi mobile charger[3, 4].

IoT offers advance connectivity of devices and systems which is beyond our reach for communications and various applications[5-10]. Intelligent home automation system using IoT and smart devices with different protocols has emerged drastically in smart homes [11-15].

The voltage level estimation of battery using Kalman filter may vary as it is based on temperature that may change due to different parameters. Though solar panel mobile charger is efficient, it is not suitable for all appliances. Moreover, in smart homes IoT has attained its peak, but it is not fully extended to industrial appliances.

To overcome the above issues, IoT based multi utility auto cut-off power charger is proposed, that follows estimation of battery based on voltage and current levels; even at different environmental conditions; including industrial appliances which can be accessed from anywhere.

3. PROPOSED NOVEL POWER CHARGER

The proposed IoT based multi utility auto cut-off power charger the parameters such as voltage, current and power are evaluated continuously. The battery level of the charged device is monitored and controlled externally with the help of a relay. Once it reaches the threshold value it automatically detaches from the mains. The added advantage is that it can be accessed from anywhere through IoT. It can also be controlled manually by a user at any charged level of the battery.Fig-1represents the block diagram of IoT Based Multi Utility Auto Cut-Off Power Charger.

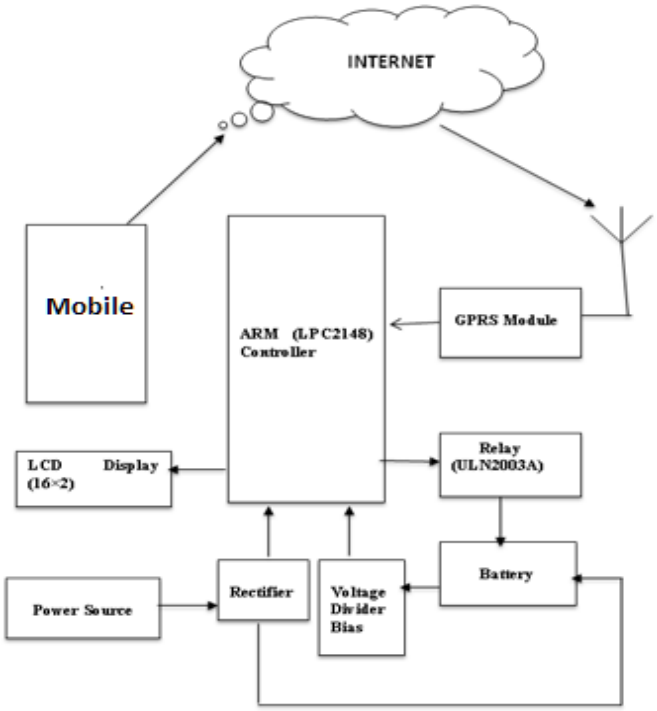

Fig-1. System block diagram

Fig -2 represents the ARMLPC2148 Controller. ARM LPC-2148 is a family of 32-bit micro controller. It has 32 KB to 512 KB on-chip memory. The controller provides low power consumption and it is easy for loading and decoding. It has 8 KB to 40 KB Random

Fig-2:ARM LPC2148 Controller

Access Memory (RAM). It is preferred more since it provides 20 years of retention with 1 lakh instructions for write/erase cycles.The controller has inbuilt UART with handshake protocol and a 10-bit A/D converter.

Fig-3: GPRS

Fig-3 Represents the Global Packet Radio Service (GPRS). The tracking of the electronic device is done by Global System for Mobile communication (GSM).Global Packet Radio Service(GPRS) is the extension of GSM with an added feature of high data transmission rate.

It is a wireless modem which uses Hayes compatible AT(Attention) commands for communicating with the server.

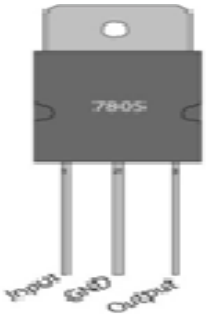

Fig-4: Voltage Regulator

Fig-4 Represents the Voltage Regulator.7812 is a voltage regulator integrated circuit.7812 provides +12V regulated power supply. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value.

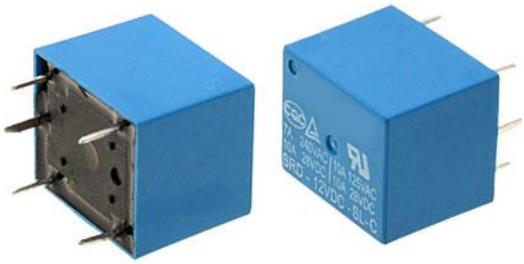

Fig-5: Relay

Fig-5Represents the ULN2003A relay**.** The relay used here is for electrical switching. It is operated by the principle of electromagnetism. It provides a collector current of about 500 mA. Relays can be classified based on the number of output circuits being connected. For example, Protective relays are used for multiple circuits and ULN2003A for single output circuit.

4. IMPLEMENTATION AND EVALUATION

Fig-6Represents the integrated hardware of the proposed work. When the power supply is switched ON, the step-down transformer converts AC to DC current. The transformed current is regulated by a +12V voltage regulator to maintain a constant value.

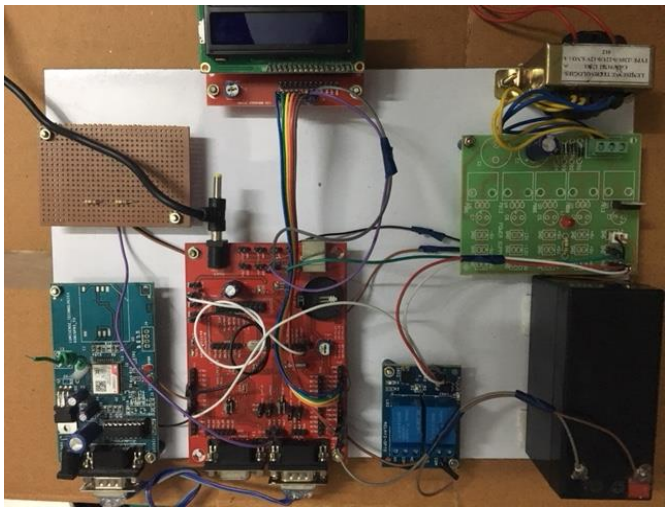

Fig-6: Integrated Hardware

Meanwhile the battery starts charging and monitored by the ARM-LPC 2148 microcontroller. The relay which is placed between controller andbattery act as an electromechanical switch. By applying the voltage divider biasing rule the voltage level of the batteryis being calculated and updated to the server via IoT.If the voltage is found below the predefined threshold value the relay closes, allowing the battery to charge. If it falls above the threshold value the relay opens, which detaches the power supply from the battery.

The LCD display is used to exhibit the current, voltage, power and present status of the battery.

Fig-7: Server Webpage

Fig -7 Shows the server webpage.Since, IoT is enabled, the GPRS module took the responsibility of tracking the electronic device being charged to connect it to the webpage of the server.

5. CONCLUSION

Various charging methods, vast growth in automation and the recent development in IoT was analyzed.With these huge advancements as a key factor, a novel multi utility power charger with auto cut off system is proposed, developed and implemented is presented in this paper. This, IoT based multi utility auto cut-off power charger continuously monitors voltage, current and power levels of battery and detaches the charging circuit automatically from the mains with the help of a relay, after the threshold voltage is reached. This results in high power consumption and enhances the battery life compared to the other charging methods.

REFERENCES

[1] Kuang –Ting Lee and Min-JhenDai, "Temperaturecompensated model for li-on batteries with extended kalman filter state-of-charge estimation for an implantable charger",DOI 10.1109/TIE.2017.2721880,IEEE.

[2] ManojKumar.and Deepak Lanna-" Design and development of cost effective automatic cut off PV charge controller with indicator", IOSR-JEEE, VOL-10, PP18-22.

[3] Kim and B.H.Cho,"State –Of-Charge Estimation and State –Of –Health Prediction Of a Lithium Ion degraded battery based on an EKF combined with a per unit system IEEE ,Vol 60 ,pp.4249-4260,2011.

[4] Miss. Swathi, M. Karemore and Prof. Amit Welekar" Implementation of solar panel based multi mobile charger with auto cut off power", IJRITCCJan-2016.

[5] Anita Kulkarni, T.RaviTeja-"Automated System for Air Pollution Detection and Control in Vehicles" IJAREEIE Vol 3, Issue 9, September 2014.

[6] R. Chandana, R.Gowtham, V. Hariharan, M.Kanimozhi. Dr.L.JubairAhmed-"Solar Based Automatic Curtain by using Microcontroller" IJRASET Volume 4, Issue 3, March 2016.

[7] C. Gowthami, C. Santhoh, A. Pavankumar, A. Karthick, K. R. Ramya-"Design and Implementation of Automatic Street Light Controller System using Light Dependent Resistor (LDR)" IJEET Volume 35, No.10May2016.

[8] J.A. Stankovic,"Research directions for the Internet of Things", IEEE Internet Things J., Vol. no. 1, pp.3-9, Feb.2014.

[9] TaesicKim,Member ,Amit Adhikaree , Student Member,IEEE, Daewook Kang, Senior Member,IEEE Myoung Kim ,Member ,and JuwonBaek,Senior Member IEEE – A New Hybrid Filter –Based Online Condition Monitoring For Lithium Ion Batteries IEEE-2017.

[10] Pooja N. Pawar and Shruti Ramachandran-" A survey on Internet of Things based home automation system", IJIRCCE,vol.4, issue 1, Jan 2016".

[11] Shanzhi Chen, Senior member, IEEE, Hui Xu, Dake Liu, Senior member, IEEE, Bo Hu, and Hucheng Wang- "A vision of IOT: Applications, Challenges, and Opportunities with China Perspective IEEE INTERNET OF THINGS JOURNAL, VOL 1, NO.4 AUGUST 2014.

[12] Andrea Zanella, senior member IEEE, Nicola Bui, Angello Castellani, Lorenzo Vangelista, Senior member IEEE, and Michele Zorzi, Fellow, IEEE- "Internet of things for smart cities", IEEE Internet of Things Journal, vol. 1, No.1, February 2014.

[13] K.Yang and Z.Zhang, "Summarize on IOT and explanation into technical system framework",Proc.IEEESymp.Robot.Appl.ISRA,2012,pp.653-656.

[14] Nikhil Kakade, Prof. (Dr.) S.D. Lokhande–" IOT based Intelligent home using smart devices", IJIRCCE Vol 4, Issue 6, June 2016.

[15] Yan Li, Zhiduo Sun, Liang Han, And Ning Mei-" Fuzzy Comprehensive Evaluation Method for Energy Management Systems Based on an Internet of Things" IEEE Access vol 5, October 25,2017.

BIOGRAPHIES

Dr. R. Shankar is currently working as Associate Professor in the Department of Electronics and Communication Engineering at JEPPIAAR SRR Engineering College affiliated to ANNA University, Chennai, India. He has published several papers in International Journals and International Conferences. He has presented papers in IEEE Conferences. His research interests include, computer networks, wireless communication, interworking networks.

S.Blessy doing Bachelor of Engineering in the Department of Electronics and Communication Engineering at JEPPIAAR SRR Engineering College affiliated to ANNA University, Chennai, India.

M.SelvaRoja doing Bachelor of Engineering in the Department of Electronics and Communication Engineering at JEPPIAAR SRR Engineering College affiliated to ANNA University, Chennai, India