

# IoT Based Power Consumption and Monitoring System

R.Aravinthan<sup>1</sup>, Alwin.Augustin<sup>2</sup>, P.Divagaran<sup>3</sup>, S.Saravanan<sup>4</sup>, P.Manikandan<sup>5</sup>  
<sup>1,2,3</sup> U.G.Scholar, <sup>4</sup>Professor, <sup>5</sup>Assistant Professor, Department of Electrical and Electronics Engineering,  
Muthayammal Engineering College (Autonomous), Rasipuram, Tamilnadu, India.

**Abstract -** Life today is getting easier and simpler with the advancement of automation technology. Manual systems are getting replaced by automatic systems. With the rapid increase in Internet users, it has become part of life. One of its kinds is IoT, latest and emerging technology. Things like consumer goods, industrial goods, etc., can be networked to share information and complete the task remotely. Basic home functions and features can be controlled using IoT from anywhere in the world. It is meant to save human and electrical energy. Now energy management is a major issue of whole world. Due to our mistakes, lots of energy is lost. We always forgot to switch off light and fan that consumes electricity. So our proposed system is aimed to minimize that electricity loss caused by our carelessness. In this system directly monitors and control through their mobile phone using IoT (Internet of Things). The Arduino controller will control the load depending on the input given by the user. The home load such as fan, light and motor will be controlled with the help of IoT website. The command for the system is given by IoT website

## I. INTRODUCTION

Though electricity is very essential in day to day life, the proper utilization of it must be done. We can properly consume the electricity as well as reduce the electricity consumption. The vulnerability about the supply of energy can tell the working of whole economy, especially in creating financial aspects. It is the necessity to manage consumption of electricity due to limited availability of resources. Despite many efforts, Energy crisis is the present day problem and it is getting worse day by day. To overcome this situation people are finding various energy efficient resources. Among them, power is the main concern which needs to be monitored and controlled. With the rise in power consumption in every part of the world there is a subsequent rise in power theft and over usage of power.

This is a serious problem which is being faced by the power utilities. A model is designed which aims to control and monitor power consumption of industries or the in our homes. The designed model monitors the power consumption of the end users and it will turn off the application whenever it is not necessary. The device sends the power consumption data to the supplier's server using Internet of Things (IoT) technology through an Internet gateway WI-FI. With the help of internet accessibility, communication will be possible between end-user and the load. The load can be monitored and controlled by the consumer even when the consumer is unable to turn off because they are away

So the aim of this paper is to recognize and eliminate the misuse of electricity. Internet of things has helped many organizational systems to improve efficiency, increase the speed of processes, minimize error and prevent theft by coding and tracking the objects. Computing and communications has its future in the technological transformation brought by the IOT. Power consumption can be reduced to a great extent if we can monitor our daily power usage and switch off appliances which are unnecessary consuming electricity. This paper focuses on developing a monitoring and controlling system using the concept of Internet of Things.

The Internet of Things integrates everyday "things" with the internet. Computer Engineers have been adding sensors and processors to everyday objects since the 90s. However, progress was initially slow because the chips were big and bulky. Low power computer chips called RFID tags were first used to track expensive equipment. As computing devices shrank in size, these chips also became smaller, faster, and smarter over time. The cost of integrating computing power into small objects has now dropped considerably. For example, you can add connectivity with Alexa voice services capabilities to MCUs with less than 1MB embedded RAM, such as for light switches. A whole industry has sprung up with a focus on filling our homes, businesses, and offices with IoT devices. These smart objects can automatically transmit data to and from the Internet. All these "invisible computing devices" and the technology associated with them are collectively referred to as the Internet of Things.

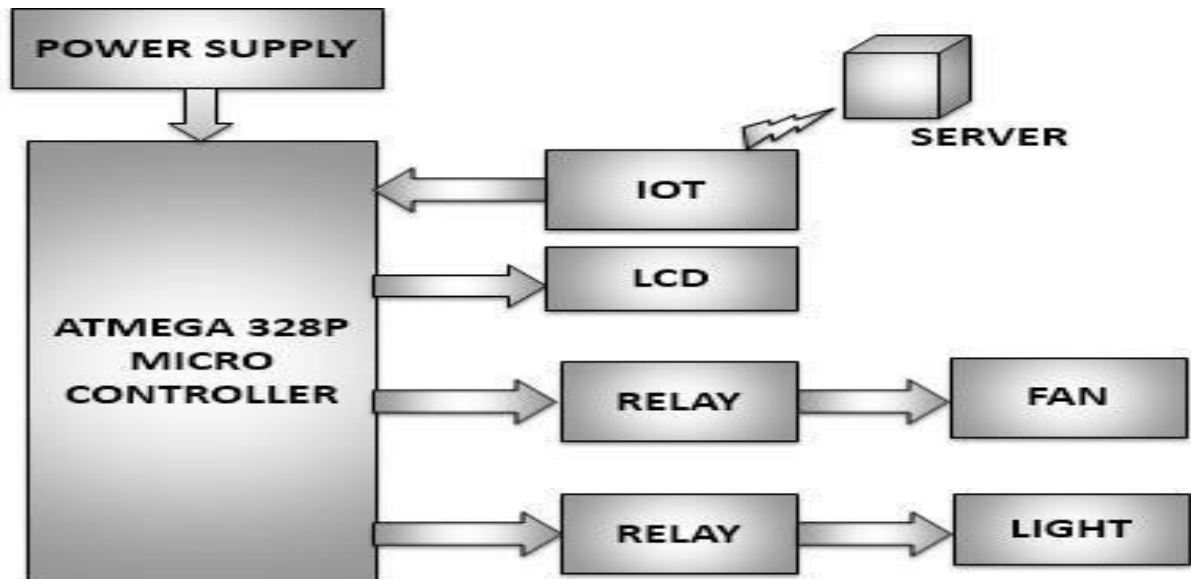
The concept of Home Automation aims to bring the control of operating your everyday home electrical appliances to the tip of your finger, thus giving user affordable lighting solutions, better energy conservation with optimum use of energy. Apart from just lighting solutions, the concept also further extends to have an overall control over your home security as well as build a centralised home entertainment system and much more. The Internet of Things (or commonly referred to as IoT) based Home Automation system, as the name suggests aims to control all the devices of your smart home through internet protocols or cloud based computing. The IoT based Home Automation system offer a lot of flexibility over the wired systems as it comes with various advantages like ease-of-use, ease-of-installation, avoid complexity of running through wires or loose electrical connections, easy fault detection and triggering and above and all it even offers easy mobility.

## II. EXISTING SYSTEM

In existing system the device can controlled manually with the man power. If there is wastage of energy in the form of running devices in the industry, it results in huge loss of power and thereby contributing to the economical fall. When the machines go abnormal condition, it indicated to the user via buzzer. Mainly, the automatic detection of cautious environment in the industry is quite less in the existing system. Some of the disadvantages of existing systems are Power wastages are more, Man power is needed, Tendency for accidents to occur. The main disadvantage in the existing system is the manpower accidental conditions through which various load losses are evolved. The regular switching characteristics of the loads are further mishandled due to human error. The main disadvantages of the system is that it will only cover the shortest distance and the power loss will be comparatively high

## III. PROPOSED SYSTEM

In this system, owner directly monitors and control through their mobile phone using IoT (Internet of Things). The Arduino controller will control the load depending on the input given by the user. The AC home load such as fan, light and motor will be controlled with the help of IoT website. The command for the system is given by IoT website. The Arduino controller will control the load depending on the input given by the user.



This system consists of loads like fan and light. This load is interfaced with the Arduino through relay. Based on the command from the IoT website the load can be controlled. The condition about the loads is displayed on the LCD. The measured sensor details are displayed on the LCD and monitored through IoT. In this, the power supply is given to the ATMEGA328P Microcontroller through a step-down transformer. In this, we are using a 16\*2 LCD display and the IoT module, and we are connecting the relay with the electronic and electrical applications to facilitate the turn-off of the devices automatically.

A step-down transformer is used to convert the 230 V Alternating Current to 12V Alternating Current, and then the converted 12V AC is given to the rectifier to convert the AC voltage to the DC voltage. After that, it is given to the voltage regulator to split the voltage as per the requirement of the Relay, Arduino board, and LCD display as

12V and 5V. With the help of the of the IoT module and through the installed application on our mobile phone we can directly monitor and control all electronic and electrical applications on workspaces or industries. In this device there are five main parts Arduino, Wi-Fi module, Relay drivers, android application and step down transformer. Firstly we provide power to the step down transformer, it step down the input voltage and given to the arduino with VIN pin.

The Wi-Fi module is also connected with arduino to Rx and Tx pin that provides the information to the microcontroller. Microcontroller reads the information and send to the relay drivers which work as switch. In Arduino we upload the program as per requirement then it performs some mathematical and logical operation to control the relay drivers.

#### IV.RESULTS AND DISCUSSION

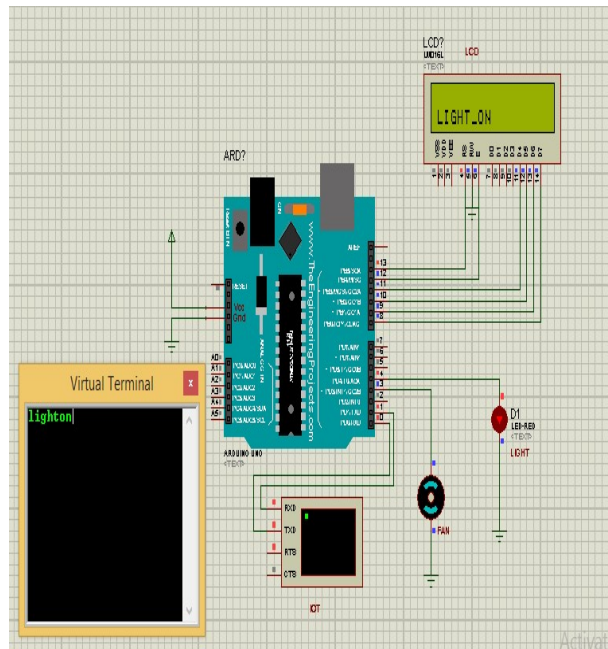


Fig.1.Simulation Result

The hardware part is shown in above fig 4(c) On and off switches to control load are provided in the android app and it will also be displayed on the LCD display.

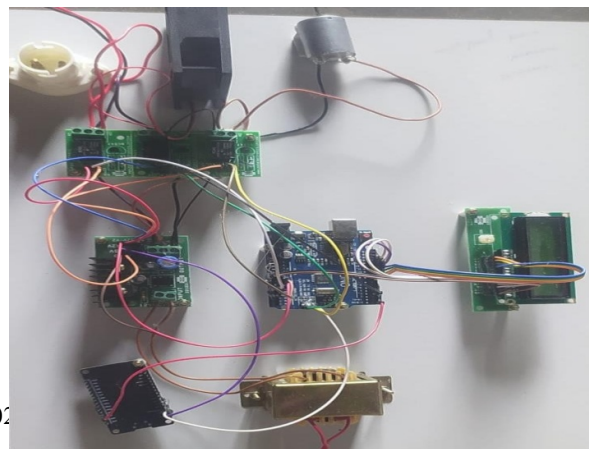


Fig.2. Hardware Setup

## V.CONCLUSION

In this paper, the home automation is implemented using IoT. A smart home integrates various electrical appliances in the home and automates them with no or minimum user intervention. The smart home keeps track of different environment variables present and guides the appliances to work according to the needs of the user. In this the electrical appliances are controlled based on the command from the IoT. From the energy is consumed. We achieved the development of Smart Home by using the Internet of Things technologies. From the experiment, it was found that we can manage to make low cost, flexible and energy efficient smart home for the better and greener future.

## REFERENCES

- [1] Shruti G. Suryawanshi, Suresh A. Annadate, "Raspberry Pi based Interactive Smart Home Automation System through E-mail using Sensors" International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 2, February 2016.
- [2] Mukesh Kumar, Sanjeev Sharma, and Mansav Joshi, "Design of Real Time Data Acquisition with Multi Node Embedded Systems," IJCA., vol. 42, no. 11, pp. 6–12, 2012.
- [3] R. A. Ramlal, M. H. Leong and R. S. S. Singh, "Bluetooth Remote Home Automation System Using Android Application", International Journal of Engineering And Science, Volume-2, Issue 01, Pages: 149-153, 2013, ISSN: 2319 – 1813, ISBN: 2319 – 1805.
- [4] K. R. Chowdhury, M. Di Felice, "Search: a routing protocol for mobile cognitive radio ad hoc networks," Computer Communication Journal, vol. 32, no. 18, pp.1983-1997, Dec.20Md.
- [5] Nasimuzzaman Chowdhury, Md. Shiblee Noman, Srijon Sarker, "Access Control of Door and Home Security by Raspberry Pi through Internet", International Journal of Scientific & Engineering Research, Volume 4, Issue 11, November 2013, ISSN: 2229-5518.
- [6] Al-Ali A. R. and Al-Rousan M., "Java-based home automation system", IEEE Transactions on Consumer Electronics, vol. 50, no. 2, pp. 498-504, 2004, Q.
- [7] Wang, H. Zheng, "Route and spectrum selection in dynamic spectrum networks," in Proc. IEEE CCNC 2006, pp. 625-629, Feb. 2006.
- [8] Bruhathireddy, Dr. G. N. Kodandaramaiah, M. Lakshminath "Design and Implementation of Home Automation system using Raspberry Pi", International Journal of Science, Technology & Management, www.ijstm.com, Volume No. 03, Issue No. 12, December 2014, ISSN: 2394-1537.
- [9] V. Dhinesh, T. Premkumar, S. Saravanan and G. Vijayakumar, "Online Grid Integrated Photovoltaic System with New Level Inverter System" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.1544-1547, 2018
- [10] J. Vinoth, T. Muthukumar, M. Muruganandam and S. Saravanan, "Efficiency Improvement of Partially Shaded PV System, International Journal of Innovative Research in Science, Engineering and Technology, Vol.4, Special issue 6, pp.1502-1510, 2015
- [11] M. B. Malayandi, Dr. S. Saravanan, Dr. M. Muruganandam, "A Single Phase Bridgeless Boost Converter for Power Factor Correction on Three State Switching Cells", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1560-1566, May 2015.
- [12] A. Sasipriya, T. Malathi, and S. Saravanan, "Analysis of Peak to Average Power Ratio Reduction Techniques in SFBC OFDM System" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Vol. 7, No.5, 2013.
- [13] P. Ranjitha, V. Dhinesh, M. Muruganandam, S. Saravanan, "Implementation of Soft Switching with Cascaded Transformers to drive the PMDC Motor", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1411-1418, May 2015.
- [14] C. Sowmya, N. Mohanandhini, S. Saravanan and M. Ranjitha, "Inverter Power Control Based On DC-Link Voltage Regulation for IPMSM Drives using ANN" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 11, pp.1442-1448, 2018.
- [15] N. Yuvaraj, B. Deepan, M. Muruganandam, S. Saravanan, "STATCOM Based of Adaptive Control Technique to Enhance Voltage Stability on Power Grid", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1454-1461, May 2015.
- [16] P. Manikandan, S. Karthick, S. Saravanan and T. Divya, "Role of Solar Powered Automatic Traffic Light Controller for Energy Conservation" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.989-992, 2018.
- [17] R. Sathesh Kumar, D. Kanimozhi, S. Saravanan, "An Efficient Control Scheme for Wind Farm Using Back to Back Converter," International Journal of Engineering Research & Technology (IJERT), Vol. 2, No.9, pp.3282-3289, 2013.
- [18] K. Prakashraj, G. Vijayakumar, S. Saravanan and S. Saranraj, "IoT Based Energy Monitoring and Management System for Smart Home Using Renewable Energy Resources," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1790-1797, 2020.
- [19] J. Mohammed siddi, A. Senthil kumar, S. Saravanan, M. Swathisriranjani, "Hybrid Renewable Energy Sources for Power Quality Improvement with Intelligent Controller," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1782-1789, 2020.
- [20] S. Raveendar, P. M. Manikandan, S. Saravanan, V. Dhinesh, M. Swathisriranjani, "Flyback Converter Based BLDC Motor Drives for Power Device Applications," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
- [21] K. Manikanth, P. Manikandan, V. Dhinesh, Dr. N. Mohanandhini, Dr. S. Saravanan, "Optimal Scheduling of Solar Wind Bio-Mass Systems and Evaluating the Demand Response Impacts on Effective Load Carrying Capability," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
- [22] T. R. Vignesh, M. Swathisriranjani, R. Sundar, S. Saravanan, T. Thenmozhi, "Controller for Charging Electric Vehicles Using Solar Energy", Journal of Engineering Research and Application, vol.10, Issue.01, pp.49-53, 2020.
- [23] V. Dhinesh, Dr. G. Vijayakumar, Dr. S. Saravanan, "A Photovoltaic Modeling module with different Converters for Grid Operations", International Journal of Innovative Research in Technology, vol.6, Issue 8, pp.89-95, 2020.
- [24] Dhinesh, R. Raja, S. Karthick, Dr. S. Saravanan, "A Dual Stage Flyback Converter using VC Method", International Research Journal of Engineering and Technology, Vol.7, Issue 1, pp.1057-1062, 2020.
- [25] G. Poovarasam, S. Susikumar, S. Naveen, N. Mohanandhini, S. Saravanan, "Study of Poultry Fodder Passing Through Trolley in Feeder Box," International Journal of Engineering Technology Research & Management, vol.4, Issue.1, pp.76-83, 2020.
- [26] C. Sowmya, N. Mohanandhini, S. Saravanan, and A. Senthil kumar, "Using artificial intelligence inverter power control which is based

- on DC link voltage regulation for IPMSM drives with electrolytic capacitor,” AIP Conference Proceedings 2207, 050001 (2020); <https://doi.org/10.1063/5.0000390>, Published Online: 28 February 2020.
- [27] M.Revathi, S.Saravanan, R.Raja, P.Manikandan,” A Multiport System for A Battery Storage System Based on Modified Converter with MANFIS Algorithm,” International Journal of Engineering Technology Research & Management, vol.4, issue 2, pp.217-222, 2020.
- [28] D Boopathi, S Saravanan, Kaliannan Jagatheesan, B Anand, “Performance estimation of frequency regulation for a micro-grid power system using PSO-PID controller”, International Journal of Applied Evolutionary Computation (IJAE), Vol.12, Issue.4, pp.36-49, 2021.
- [29] V Deepika, S Saravanan, N Mohananthini, G Dineshkumar, S Saranraj, M Swathisriranjan, “Design and Implementation of Battery Management System for Electric Vehicle Charging Station”, Annals of the Romanian Society for Cell Biology, Vol.25, Issue.6, 17769-17774, 2021.
- [30] A Senthilkumar, S Saravanan, N Mohananthini, M Pushparaj, “Investigation on Mitigation of Power Quality Problems in Utility and Customer side Using Unified Power Quality Conditioner”, Journal of Electrical Systems, Vol.18, Issue.4, pp.434-445, 2022.
- [31] V Kumarakrishnan, G Vijayakumar, D Boopathi, K Jagatheesan, S Saravanan, B Anand,” Frequency regulation of interconnected power generating system using ant colony optimization technique tuned PID controller”, Control and Measurement Applications for Smart Grid: Select Proceedings of SGESC 2021, pp.129-141.
- [32] C Nagarajan, B Tharani, S Saravanan, R Prakash,” Performance estimation and control analysis of AC-DC/DC-DC hybrid multi-port intelligent controllers based power flow optimizing using STEM strategy and RPFC technique”, International Journal of Robotics and Control Systems”, Vol.2, Issue.1, pp.124-139, 2022.
- [33] G Vijayakumar, M Sujith, S Saravanan, Dipesh B Pardeshi, MA Inayathullaa," An optimized MPPT method for PV system with fast convergence under rapidly changing of irradiation”, 2022 International Virtual Conference on Power Engineering Computing and Control: Developments in Electric Vehicles and Energy Sector for Sustainable Future (PECCON), pp.1-4.
- [34] C Nagarajan, K Umadevi, S Saravanan, M Muruganandam, “Performance Analysis of PSO DFFP Based DC-DC Converter with Non Isolated CI using PV Panel”, International Journal of Robotics and Control Systems’ Vol.2, Issue.2, pp.408-423, 2022.
- [35] VM Geetha, S Saravanan, M Swathisriranjani, CS Sathesh, S Saranraj, “Partial Power Processing Based Bidirectional Converter for Electric Vehicle Fast Charging Stations”, Journal of Physics: Conference Series, Vol.2325, Issue.1, pp.012028, 2022.
- [36] M Santhosh Kumar, G Dineshkumar, S Saravanan, M Swathisriranjani, M Selvakumari, “Converter Design and Control of Grid Connected Hybrid Renewable Energy System Using Neuro Fuzzy Logic Model”, 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA), pp.1-6, 2022.
- [37] C Gnanavel, A Johny Renoald, S Saravanan, K Vanchinathan, P Sathishkhanna, “An Experimental Investigation of Fuzzy-Based Voltage-Lift Multilevel Inverter Using Solar Photovoltaic Application”, Smart Grids and Green Energy Systems, pp.59-74, 2022.
- [38] C Nagarajan, K Umadevi, S Saravanan, M Muruganandam, “Performance investigation of ANFIS and PSO DFFP based boost converter with NICI using solar panel”, International Journal of Engineering, Science and Technology, Vol.14, Issue.2, pp.11-21,2022.
- [39] K Priyanka, N Mohananthini, S Saravanan, S Saranraj, R Manikandan, “Renewable operated electrical vehicle battery charging based on fuzzy logic control system”, AIP Conference Proceedings, Vol.2452, Issue.1, pp.030007, 2022.