e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 13, Issue 4, April 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.317

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE)

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 4, April 2024||

| DOI:10.15662/IJAREEIE.2024.1304026 |

IOT Based Wireless EV Charging Station

Dr.Hemalatha[1], Praveen Kumar.S[2], Sethu Mathavan.J[3], Kathir.M[4], Vanadurai.K[5]

Assistant Professor, Department of EEE, Francis Xavier Engineering College, Tirunelveli, India[1]

UG Students, Department of EEE, Francis Xavier Engineering College, Tirunelveli, India[2,3,4,5]

ABSTRACT: As an alternate form in the road transportation system, electric vehicle (EV) can help reduce the fossil-fuel consumption. However, the usage of EVs is constrained by the limited capacity of battery. Wireless Power Transfer (WPT) can increase the driving range of EVs by charging EVs in motion when they drive through a wireless charging lane embedded in a road. The amount of power that can be supplied by a charging lane at a time is limited. A problem here is when a large number of EVs pass a charging lane, how to efficiently distribute the power among different penetrations levels of EVs? However, there has been no previous research devoted to tackling this challenge. To handle this challenge, we propose a system to balance the State of Charge (called BSoC) among the EVs. It consists of three components: i) fog-based power distribution architecture, ii) power scheduling model, and iii) efficient vehicle-to-fog communication protocol. The fog computing center collects information from EVs and schedules the power distribution. We use fog closer to vehicles rather than cloud in order to reduce the communication latency. The power scheduling model schedules the power allocated to each EV. In order to avoid network congestion between EVs and the fog, we let vehicles choose their own communication channel to communicate with local controllers.

KEYWORDS: IOT, ELECTRIC VEHICLE, RASPBERRY PI, ARDUINO UNO BOARD, WIFI MODULE, ANDRIOD APP, COMMUNICATION CABLE

I.INTRODUCTION

Electric vehicle Many engineers of our country is facing the problem of power. For this reason many of engineers work hardly on wireless power transmission. The most effective method of wireless transmission is electromagnetic transmission. This method is very efficient in the aspect of cost & handling capacity Wireless transmission is under developing technology since 1980`s due to lack of technology& financial support

Nikola Tesla demonstrated a "transmission of electrical energy without wires" that depends upon electrical conductivity as early as 1891.Tesla demonstrates wireless transmitted by ‘electrostatic induction’ during 1891 lecture at Columbia College. The two metal sheets are connected to Tesla coil oscillator which applies high Voltage radio frequency alternating current. An oscillating electric field between the sheets.

Today, electricity plays a vital role in our modern day life. As we are using many numbers of appliances using electricity, it is quite difficult to live without electricity. Traditionally wires or cables are used to carry the electrical power from one place to another. However, Wireless Power Transmission (WPT) has emerged as the technology in the recent days, where the electrical power is transmitted from one place to another without the use of wires. The main theme behind WPT is to get rid of the risky usage of the wires at the same time to eliminate the difficulty in organizing the power cords. For an example, the portable electronic devices including mobile phones, tablets, laptops, household robots, drones and etc normally relies upon the battery power. Due to the rapid development and tremendous applications, these portable devices are becoming part of our day to day activities.

In addition to that, there is always an increasing demand of smart gadgets to say good bye to wires, making capable of charging without being plugged in. Hence, there is a necessity for finding a new technology to be free of from the clumsy cables or the chargers [1]-[3]. Hence, the researchers at MIT coined the term WiTricity as the part of their project work, where WiTricity is nothing but the Wireless Electricity offering the transmission of electrical power to a remote place without using wires. Basically, WiTricity eliminates the need for having a different charger for each device we use. This is the fundamental advantage we can get it from this technology. It is enough to identify a location where we can put the portable devices which is getting automatically charged. WiTricity ensures that the power hungry devices can charge by their own without the need for plugging in into to power cords using the chargers. Apart from safety (as there is no need of cables), WiTricity provides more convenient in the sense that there is no need for manual

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 4, April 2024||

| DOI:10.15662/IJAREEIE.2024.1304026 |

recharging or changing the batteries and seems to be more reliable as the devices will never run out of the battery power. Moreover, WiTricity can make the environment as more ecofriendly as it reduces the use of disposable batteries.

Even though WiTricity provides automatic wireless charging, mainly requires short distances to charge. Hence, WiTricity is still under development where lots of research works are going on to improve its potential applications to even charge the larger vehicles or equipment and also being operated over a longer distances. Hence, this work aims to propose a novel method of using WiTricity to charge the mobile phones without the use of wired chargers. The significance of this work is to make an efficient power transfer of low voltage over a shorter distance. The proposed work promises that the mobile users can carry their phones anywhere even if the place is devoid of charging facilities Transportation plays a major role in day to day life. According to [1], approximately 70% of the United Kingdom (UK) households own a minimum of one vehicle. In 2016, the UK alone had more than 30 millions cars registered and driven on the roads. The vehicle licensing statistics shows that in 2016, around 3.3 millions cars

II. PROPOSED METHOD AND DESCRIPTION

Proposing an IoT-based wireless EV charging station involves integrating various technologies to create a smart and efficient charging infrastructure for electric vehicles. Here's a general outline of the proposed method:

Hardware Components:
Charging Pad: This is where the EV parks for charging. It includes the wireless charging coils embedded in the ground.
IoT Sensors: These sensors monitor various parameters such as vehicle presence, battery level, temperature, etc.

Wireless Charging Technology:
Inductive Charging: Utilizes electromagnetic fields to transfer energy between the charging pad and the EV without physical connection.
Resonant Inductive Coupling: Enhances efficiency and extends the charging range compared to traditional inductive charging.

IoT Integration:
Battery Monitoring: IoT sensors monitor the battery status of the EV, transmitting data such as state of charge, voltage, and temperature.

Data Analytics and Optimization:
Data Collection: Collect and analyze data from IoT sensors to gain insights into charging patterns, energy usage, and system performance.
Optimization Algorithms: Develop algorithms to optimize charging schedules based on factors such as grid load, energy prices, and user preferences.

Installation and Maintenance:
Consider factors such as location, infrastructure requirements, and environmental impact during installation.
Regular maintenance and inspection to ensure optimal performance and safety of the charging station.

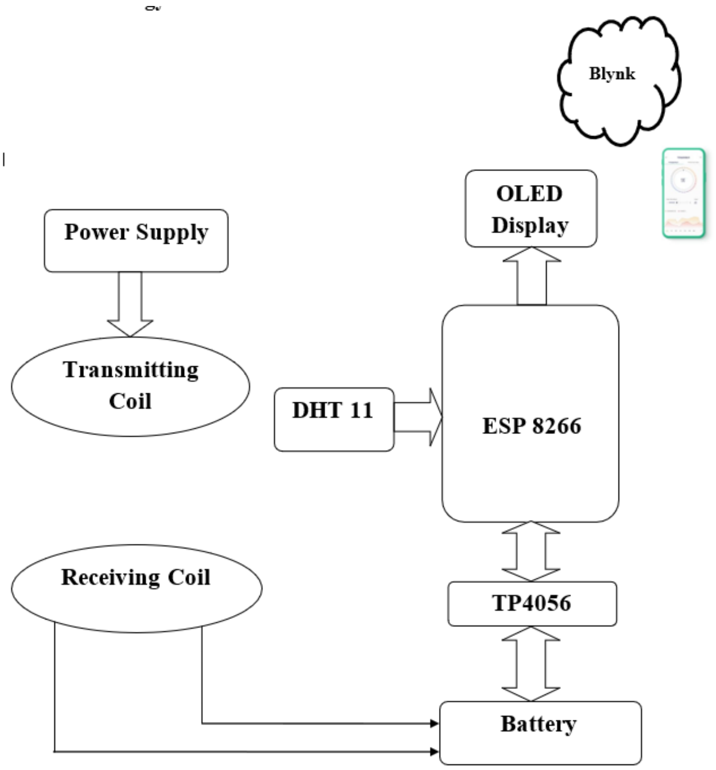
Testing and Deployment:
Conduct thorough testing and validation of the system under various operating conditions.
Deploy the charging stations in strategic locations such as public parking lots, highways, and urban areas to maximize accessibility and convenience for EV owners.

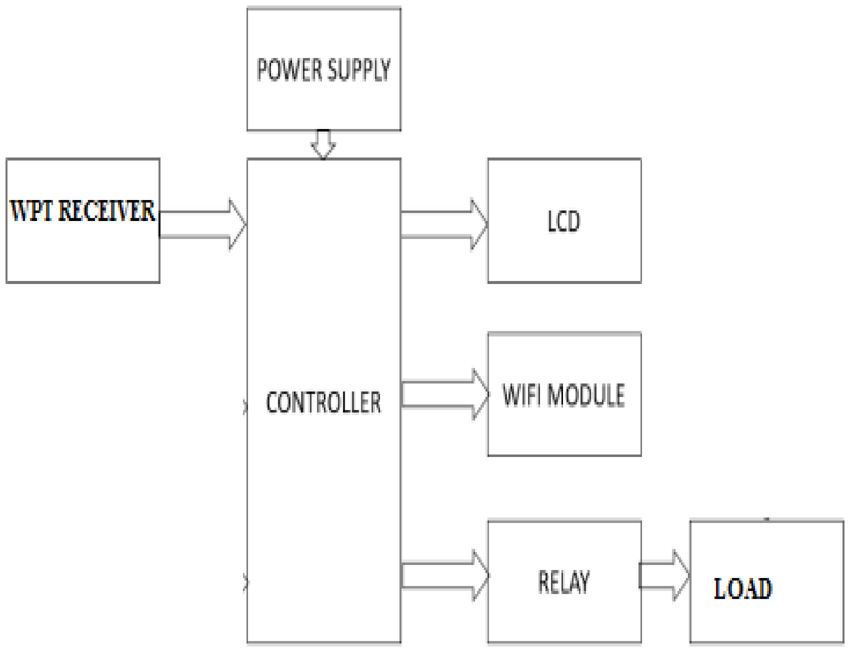
| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 4, April 2024||

| DOI:10.15662/IJAREEIE.2024.1304026 |

III. BLOCK DIAGRAM AND CONNECTION DIAGRAM





| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 4, April 2024||

| DOI:10.15662/IJAREEIE.2024.1304026 |

In this project, we are going to develop a system using IoT based technology and renewable energy source i.e. solar energy. Whole system will be operated on 12 V supply using battery. Battery will be charged by solar panel. We will be using Node MCU microcontroller for interfacing Voltage sensor and to monitor voltage level. Voltage sensor gives analog output to Node MCU. This controller converts Analog signal into digital form and provides it to LCD and Node MCU. Percentage of battery will be displayed on LCD 16X2. For wireless power transfer, we are using transmitter and receiver coil. The distance between these two coils is less than 5 mm so we get the voltage 5 volt. The transmitter coil requires 9 volt DC supply and at the end of receiver coil, we get the 5 volt supply. We can have customized control from Android App to ON and OFF the relay for charging the battery with time. If the Relay is OFF then it will turn OFF the transmitter coil supply 9 Volt. If the relay is ON then it will turn ON the wireless transmitter coil supply 9 Volt. So it will save the battery power with the help of Android application and also will increase the battery life because timer function is available in Android application. It provides fully customized and dynamic setting to ON and OFF the relay for EV and mobile charger on time as per battery charging requirement.

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

IC voltage regulators Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watt

Diode: A diode is a semiconductor device that essentially acts as a one-way switch for current. It allows current to flow easily in one direction, but severely restricts current from flowing in the opposite direction. A diode is an electronic component with two terminals, the anode and the cathode, that conducts electricity in one direction. Diodes have low resistance in one direction and high resistance in the other.

Inductor: An inductor is a passive electrical component that stores energy in a magnetic field when electric current passes through it. Inductive charging is a technology that allows an electric vehicle (EV) to be charged without physical connections Inductive Power Transfer (IPT) is one of the fastest evolving technologies in the development of Electric Vehicles (EVs).

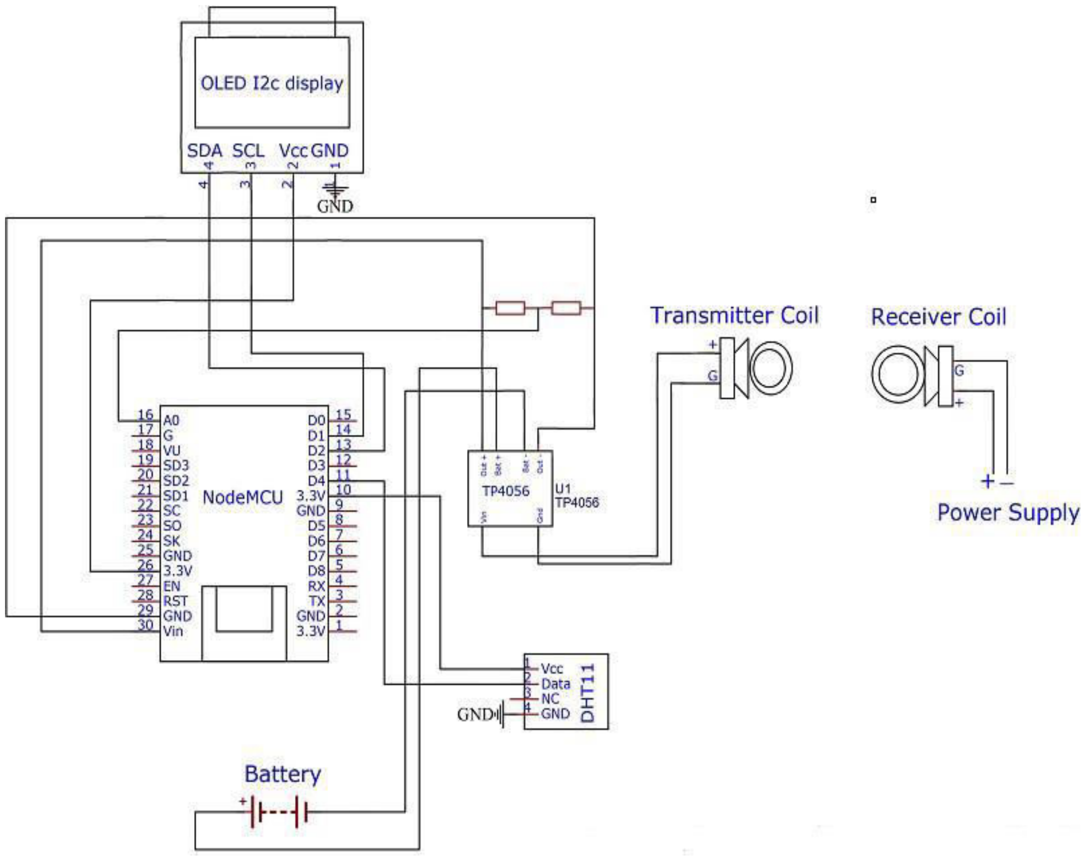
Capacitor: A capacitor is a device that is used for storing electrical energy in an electric field CDE's custom-engineered DC Link capacitors are designed specifically for Level 3 EV charging applications. The high-power demands of Level 3 charging require robust DC link capacitors, having exceptional life and reliability over a broad range of operating conditions ultracapacitors

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 4, April 2024||

| DOI:10.15662/IJAREEIE.2024.1304026 |

IV. SCHEMATIC DIAGRAM



V.CONCLUSION

As for safety, there's really nothing to worry about. The average wireless charging system creates a field no more dangerous than radio waves, and waves are not strong enough to have any effect on human body. Wireless battery charging has many advantages in terms of convenience because users simply need to place the device requiring power onto a mat or other surface to allow the wireless charging to take place. We believe that our contribution in this work will successfully benefit society in terms of convenience, reduced wear of plugs and sockets, and application in medical environments. Reduced efficiency is one of the key challenges in wireless battery charging system due to resistive losses on the coil, stray coupling and etc.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 4, April 2024||

| DOI:10.15662/IJAREEIE.2024.1304026 |

VI. RESULTS AND DISCUSSION

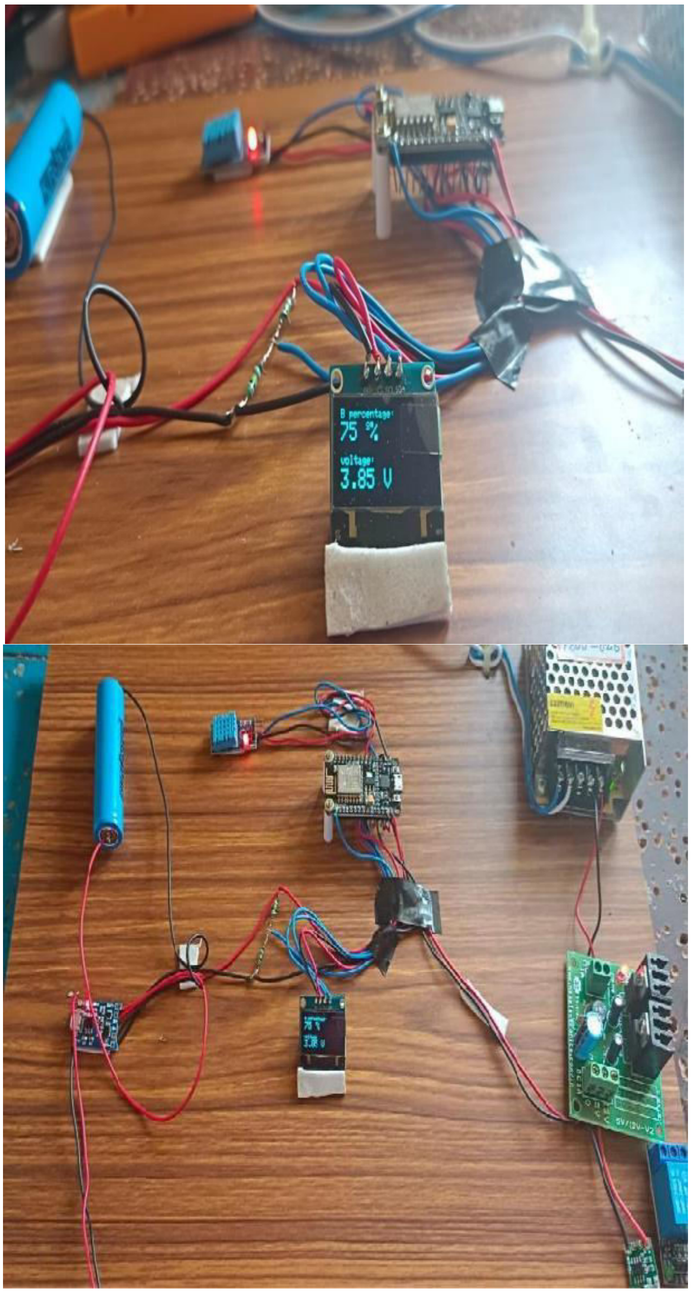


FIG -RESULT OF THE PROJECT

The Results and Discussion section of a paper on an innovative technology to charge electric vehicles wirelessly through inductive coupling. In this prototype, when we gave an input voltage of 12V DC we were able to get an output voltage of 5V with 2 A at a distance of 20mm. The prototype we made is of lower efficiency because the power input given to the prototype is used for meeting the constant loss as well as magnetic leakage. But we are sure that as the power rating of the prototype increases the overall efficiency of the system also gets improved as better, since the power required for the constant loss and the magnetic leakage will almost remain the same.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 4, April 2024||

| DOI:10.15662/IJAREEIE.2024.1304026 |

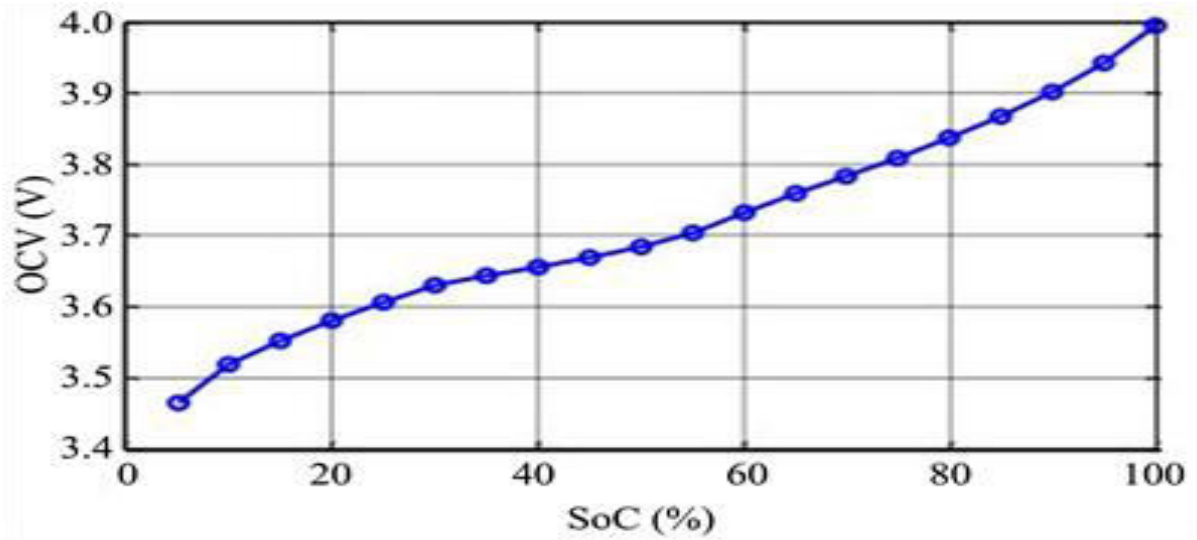
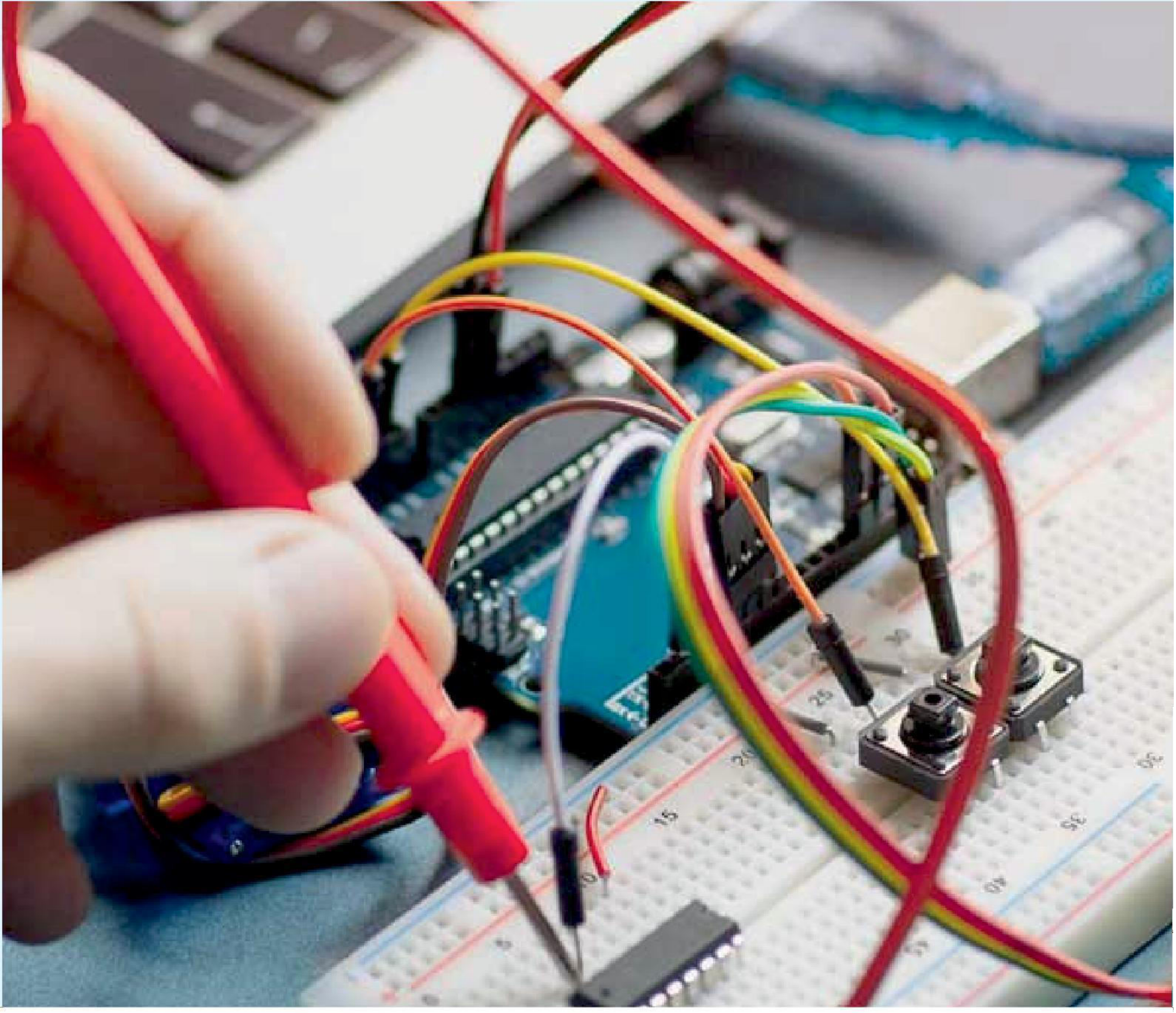


FIG - IOT BASED EV CHARGING STATION (GRAPH)

REFERENCES

[1] L. Cheng, Y. Chang, Q. Wu, W. Lin and C. Singh, "Evaluating charging service reliability for plug-in EVs from the distribution network aspect," IEEE Transactions on Sustainable Energy. IEEE, vol. 5, pp.1287-1296, 2014.
[2] N. Xu and Y .Chung, "Reliability evaluation of distribution systems including vehicle-to-home and vehicle-to-grid," IEEE Transactions on Power Systems. IEEE, vol. 31, pp.759-768, 2016.
[3] A. Alahyari, M. Fotuhi-Firuzabad and M. Rastegar, "Incorporating customer reliability cost in PEV charge scheduling schemes considering vehicle-to-home capability," IEEE Transactions on Vehicular Technology. IEEE, vol.64, pp. 2783- 2791, 2015.
[4] S. Habib, M. Kamran and U. Rashid, "Impact analysis of vehicle-to-grid technology and charging strategies of electric vehicles on distribution networks--a review," Journal of Power Sources. Elsevier, vol. 277, pp.205- 214, 2015.
[5] M. Ansari, A. Al. Awami, E. Sortomme and M. Abido, "Coordinated bidding of ancillary services for vehicleto-grid using fuzzy optimization," IEEE Transactions on Smart Grid. IEEE, vol. 6, pp. 261-270, 2015.
[6] L. Hua, J. Wang and C. Zhou, "Adaptive electric vehicle charging coordination on distribution network," IEEE Transactions on Smart Grid. IEEE, vol.5, pp. 2666- 2675, 2014.
[7] C. Antúnez, J.F. Franco, M.J. Rider and R. Romero., "A new methodology for the optimal charging coordination of electric vehicles considering vehicle-togrid technology," IEEE Transactions on Sustainable Energy. IEEE, vol.7, pp. 596-607, 2016.
[8] N. Xu and Y .Chung, "Well-being analysis of generating systems considering electric vehicle charging," IEEE Transactions on Power Systems. IEEE, vol.29, pp. 2311-2320, 2014.
[9] W. Su and M. Chow, "Performance evaluation of a PHEV parking station using particle swarm optimization," Power and Energy Society General Meeting, 2011 IEEE., pp. 1-6, 2011. [10] V. Aravinthan and W. Jewell, "Controlled electric vehicle charging for mitigating impacts on distribution assets," IEEE Transactions on Smart Grid. IEEE, vol.6, pp. 999-1009, 2015.
[11] D. Dallinger, D. Krampe and M. Wietschel, "Vehicleto-grid regulation reserves based on a dynamic simulation of mobility behavior," IEEE Transactions on Smart Grid. IEEE, vol.2, pp. 302-313, 2011. [12] C. Corchero, M. Cruz-Zambrano, H. Miguel and F. Heredia, "Optimal energy management for a residential microgrid including a vehicle-to-grid system," IEEE Transactions on Smart Grid. IEEE, vol.5, pp. 2163- 2172, 201



International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

9940 572 462 6381 907 438 ijareeie@gmail.com

Scan to save the contact details

www.ijareeie.com