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IoT BASED ELECTRIC VEHICLE BY EMPLOYING V2G AND G2V TECHNOLOGY

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Abstract: Electric vehicles are environmentally friendly because it uses electricity to charge their batteries instead of using fossil fuels like petrol or diesel. They have low running cost as they have less moving parts. In EV's there is zero tailpipe emission. Registration fees and road tax on purchasing electric vehicle are lesser than petrol or diesel vehicles. It has more charging convenience as we can charge from home. It has no noise pollution. V2G (Vehicle to Grid) and G2V (Grid to Vehicle) aid the bidirectional power flow between EV and Grid/source. In this Project we implemented Level 2 Charging, precisely charging the vehicle at 1-phase 230 volts of AC power.

V2G technology allows charging the EVs as well it supplies power to the grid/source as per the requisite. The EVs will become the vital reserve for the grid, and also supports the grid by enhancing its stability and flexibility. G2V technology allows EVs to draw power from grid by using Level2 Charging, which means we can charge the EVs from source/House. This V2G and G2V technology improves the battery performance and reduce the short-range problems like the life of the battery will be maintained and Uninterrupted power supply will be provided to house/Grid as per requirement. We can control Vehicle through Wi-Fi.IR Sensor is used for emergency breaking.

IndexTerms **– Electric Vehicle, Vehicle to Grid, Grid to Vehicle, Emergency Braking**

I. INTRODUCTION

Electric vehicles (EV's) are a kind of automobile that are driven through electric motors rather than internal combustion engines (ICEs) that run on fossil energies. EV's are becoming more popular due to the potential to reduce the harmful gases like greenhouse gas and it decrease air pollution. EVs are rechargeable batteries to generate essential power to the vehicle.
EVs comes in two different forms, they are:

- All-electric vehicles (AEVs), which is also known as battery electric vehicles (BEVs)
- plug-in hybrid electric vehicles (PHEVs), which is also known as extended-range electric vehicles.

AEVs has only batteries it does not contain ICEs, where PHEVs are the combination of battery and ICEs.

The main components of Electric Vehicle are battery which provides electricity to the vehicle, electric motor which drives the wheels of the vehicle and power electronics which control the electricity flow between the battery and the motor. EVs are also having the regenerative braking which allows the vehicle to recuperate the energy during deceleration and braking. The battery is recharged through an external power source.

Charging of the EV is done at home or public charging stations. Charging at home which required standard electrical outlet. Increasing the EVs the charging station at public is increased and being arranged in many of the countries. EVs charging time is completely depends on the type of chargers used, capacity of the battery and power output at the charging station.

EVs bargains several advantages, includes the running cost electric vehicle uses electricity to charge their batteries rather of using fossil fuels, the maintenance cost of EVs is low due the EVs has less moving parts when we compared with combustion vehicle, zero emission of gases from electrical vehicle we can reduce the environmental impact of charging your vehicle further by choosing renewable energy options for home electricity, EVs don't have gear system so they are easy to drive and EVs have no noise pollution.

Still, there some challenges accompanying with the electric vehicle, such as limited driving range compared to traditional vehicle, the availability of public charging stations, taking long time for the charging and the discharging of batteries when we are not using the vehicle for some time.

In this project we mainly focused on the battery performance, when we are not using the vehicle for some time, we can connect vehicle battery to the grid and we can utilize the battery power and also when we have the peak demand of the load we can connect the battery to the load and we can utilize the battery power.

II.G2V:

G2V refers "Grid to Vehicle", in the vehicle's battery is getting charged through the grid. In the charging we have 3 type of charging level-1 charging ,level-2 charging and level-3 charging. In level-1 charging the vehicle is getting charged at 110V AC which slowly charge the vehicle. In level-2 charging the vehicle is charged at 230V AC which the commonly used voltage. In level-3 charging the vehicle is charged above 400V DC which is fast charging.

In the protype we used level-2 charging, we can charge our vehicle by using the single-phase supply from our houses, the reason behind the using for level-2 charging is 10% more efficiency than level1 charging.

The battery we used is 12V DC but we have used level2 charging that means we are able to give the 230V AC supply but the battery will not accept the AC supply .So, by using the Step down transformer the 230V AC is converted to 12V AV again we have the supply as AC but the battery need DC by using the Regulated Power Supply (RPS) we converted 12VAC-(512)V DC. The vehicle is charged by using to methods, Wireless charging, and Wired charging. The wireless charging is charged at 5V DC and by wire charging the vehicle is charged at 12VDC.

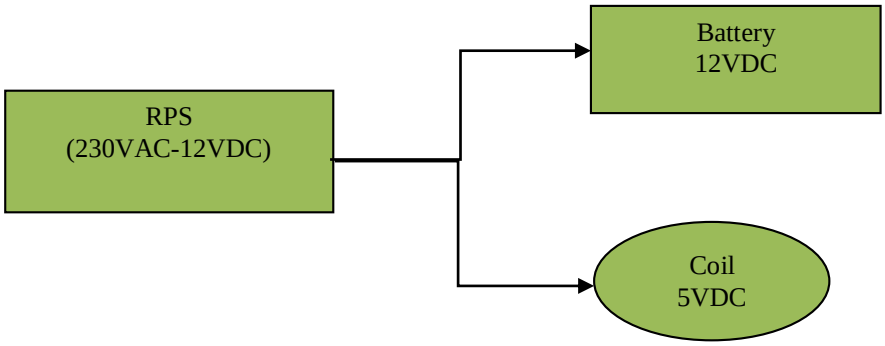


Fig1: Block Diagram of G2V

III.V2G

V2G stands for vehicle-to-Grid, which states to a technology that allows electrical vehicle (EVs)to not only lure power from the grid to charge their batteries, but also to lead power back to the grid when essential. V2G systems naturally implicate bi-directional communication among the EV and the power grid, allowing for the transfer of electricity in both directions.

The basic perception behind V2G is that electric vehicles can be concert as mobile energy storage units, capable of storing surplus electricity from the grid during times of low demand, and the grid during times of high demand or when grid necessitates additional power. This can help to balance the grid, manage peak loads and optimize the use of renewable energy sources.

In V2G the electrical vehicle battery is connected to the load through inverter. The battery is 12V DC, but the load is of AC so, connecting through inverter which converts the 12V DC230VAC. The output from the inverter we can connect to load. Hence, we can say that V2G is a bi-directional charging.

Fig2: Block Diagram of V2G

IV BLOCK DIAGRAM

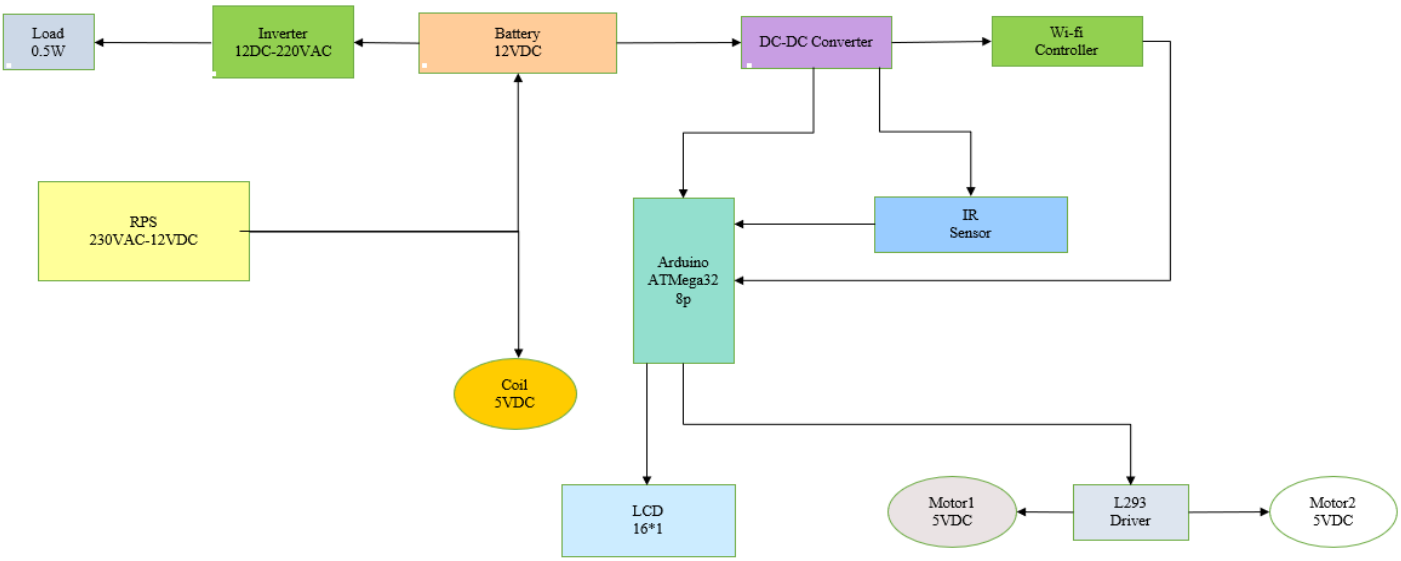


Fig 3: Overall Block Diagram of V2G And G2V Hardware

V HARDWARE COMPONENTS

S.NO	NAME OF THE COMPONENT	SPECIFICATION	QUANTITY
1	TRANSFORMER (STEP DOWN)	(230V-12V) AC	1
2	RPS	12VAC-12VDC	1
3	INVERTER	12VDC-230VAC	1
4	10PCS WIRELESS CHARGING	5VDC	2
5	BATTERY	12VDC	1
6	ARDUINO UNO	AT MEGA 328P	1
6	DC-DC CONVERTER	6-60V	1
7	L293 DRIVER	-	1
8	DC MOTORS	5V DC	2
9	LCD	16*2	1
10	BREADBOARD	-	1
11	COIL	5VDC	2
12	BULB	0.5W	1
13	WI-FI CONTROLLER	-	1

Table 1**:** Hardware components of the Prototype.

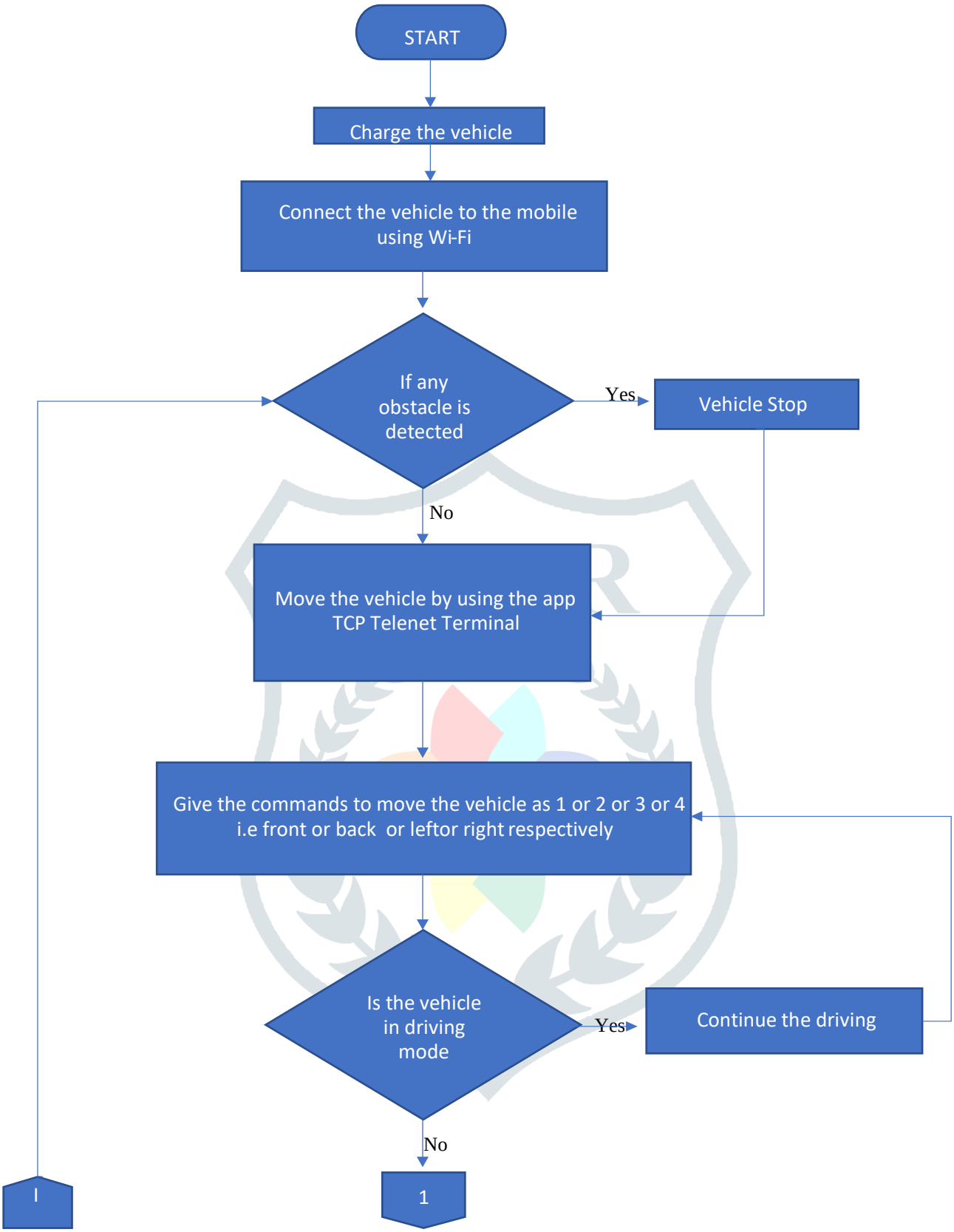
VI MECHANISM:

Step1: Plugging the vehicle to the grid through wired or wireless.
Step2: After the battery is charged, by using the Wi-Fi controller connect vehicle to mobile.
Step3: After connecting the vehicle to the mobile, by using the app "**TCP Telnet Terminal**" operate the vehicle by passing the commands as follows:

- **1 Refers to move Forward**
- **2 Refers to move Back**
- **3 Refers to move Left**
- **4 Refers to move Right**
- **5 Refers to move Stop**

Step4: When we pass the above command's, the vehicle will act accordingly to the command and we are able to see the command in the LCD which is provided in the vehicle.
Step5: If any object is detected in front of vehicle, then the vehicle will stop and in LCD it displays as "OBJECT IS DETECTED".
Step6: After using the vehicle if we have peak demand of load or if we won't use the vehicle for some period then connect the vehicle battery to the grid.

VII FLOW CHART


START
Charge the vehicle
Connect the vehicle to the mobile using Wi-Fi
If any obstacle is detected
Yes
Vehicle Stop
No
Move the vehicle by using the app TCP Telenet Terminal
Give the commands to move the vehicle as 1 or 2 or 3 or 4 i.e front or back or leftor right respectively
Is the vehicle in driving mode
Yes
Continue the driving
No
1
I

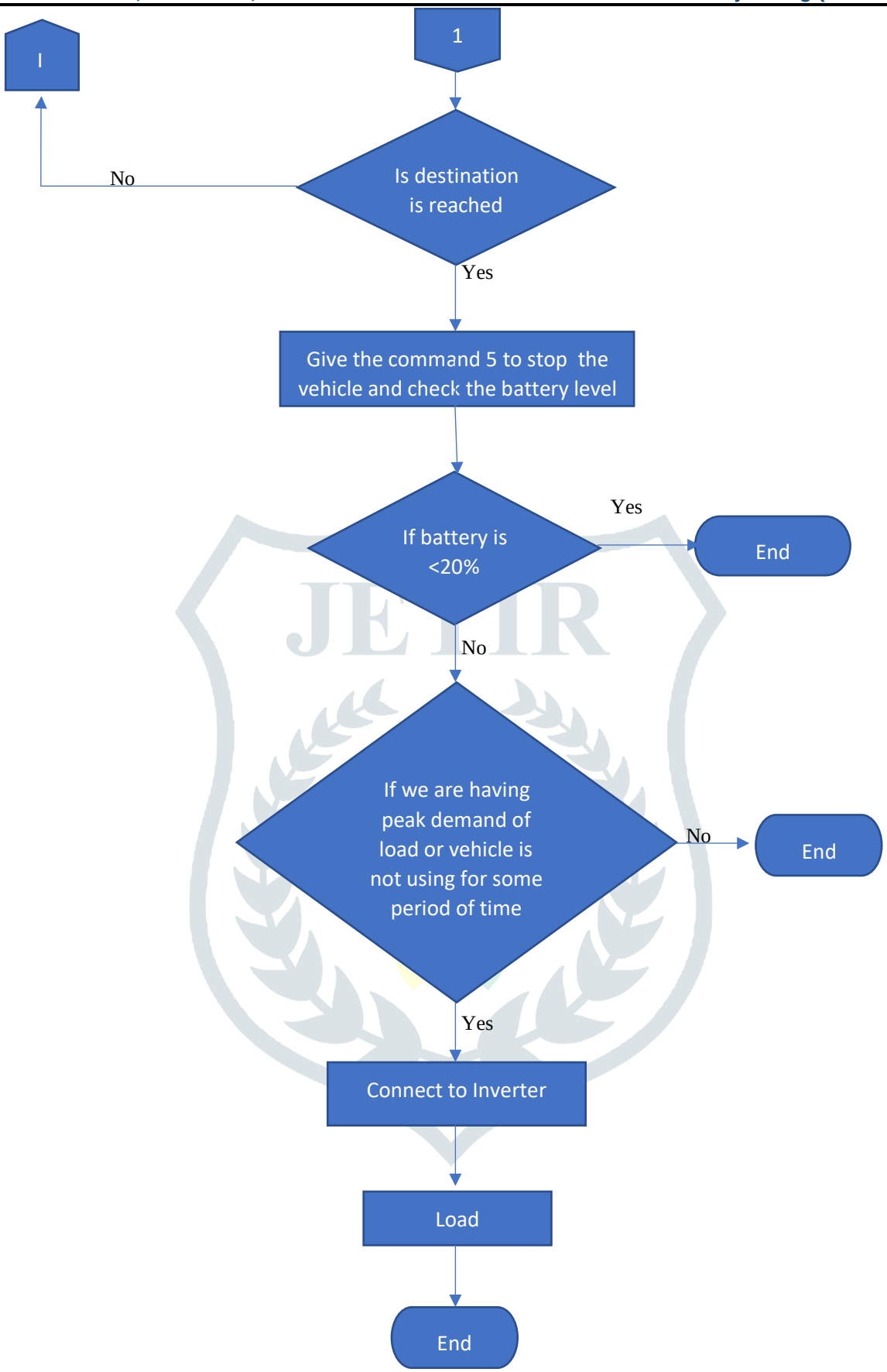


Fig 4: Overall Flow chart

VIII RESULT

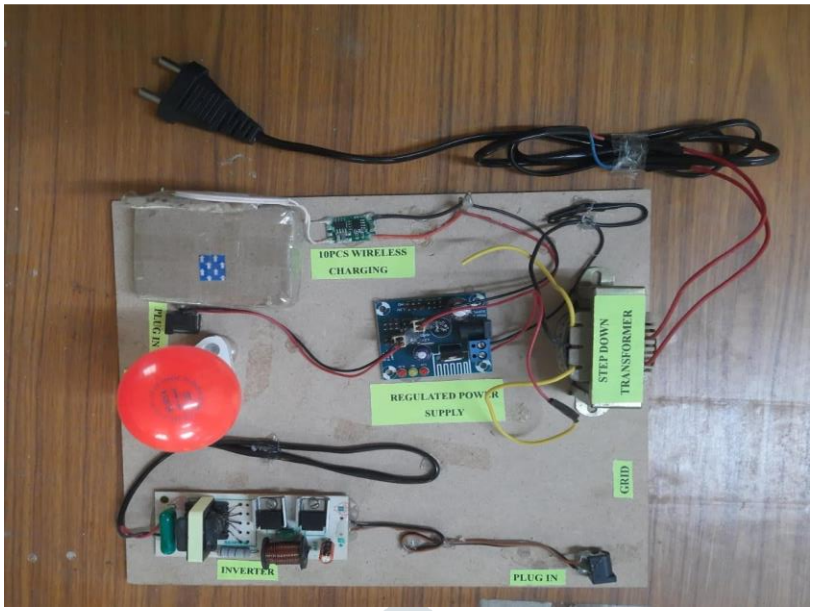


Fig 5: Hardware block of Grid

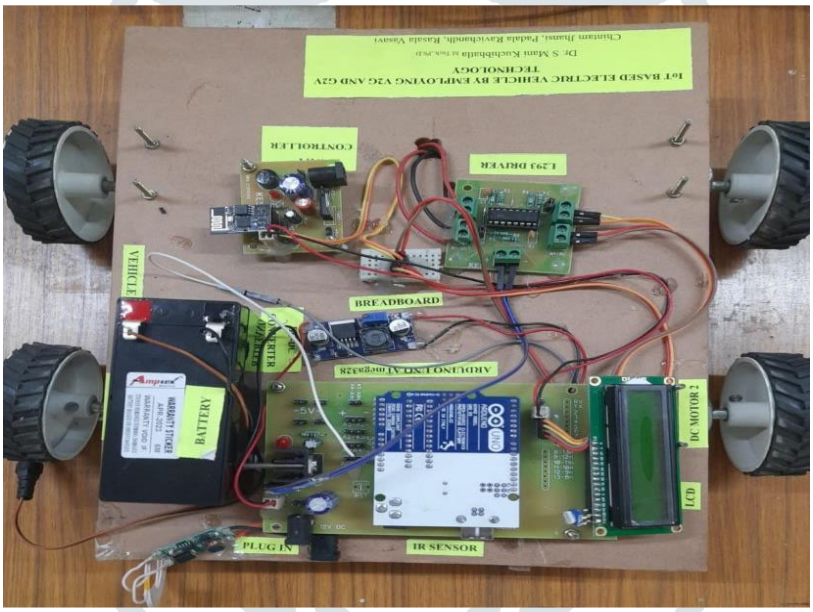


Fig 6: Hardware Block of Vehicle

In the above Figures 5 & 6 showing the Hardware Blocks of Grid And Vehicle Respectively.

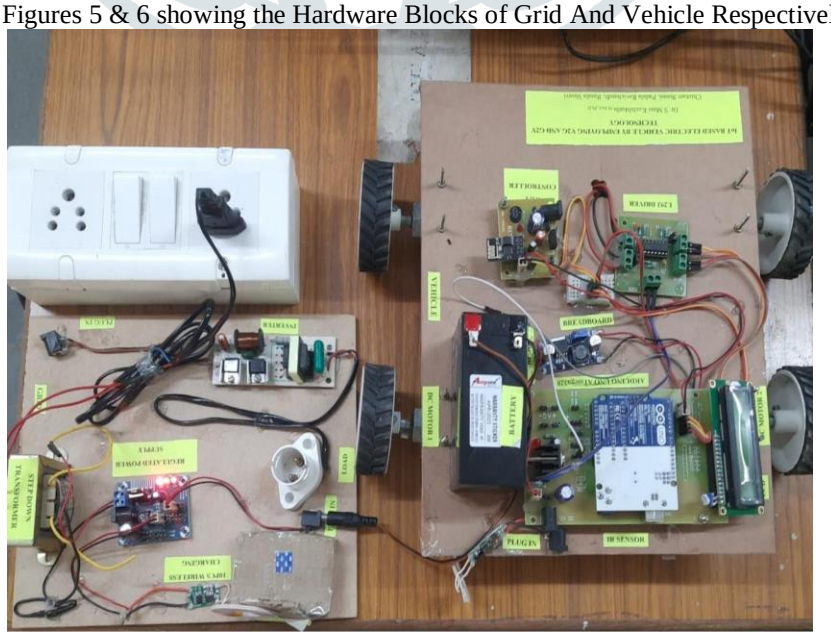


Fig 7: Hardware Block of G2V During Wired Charging.

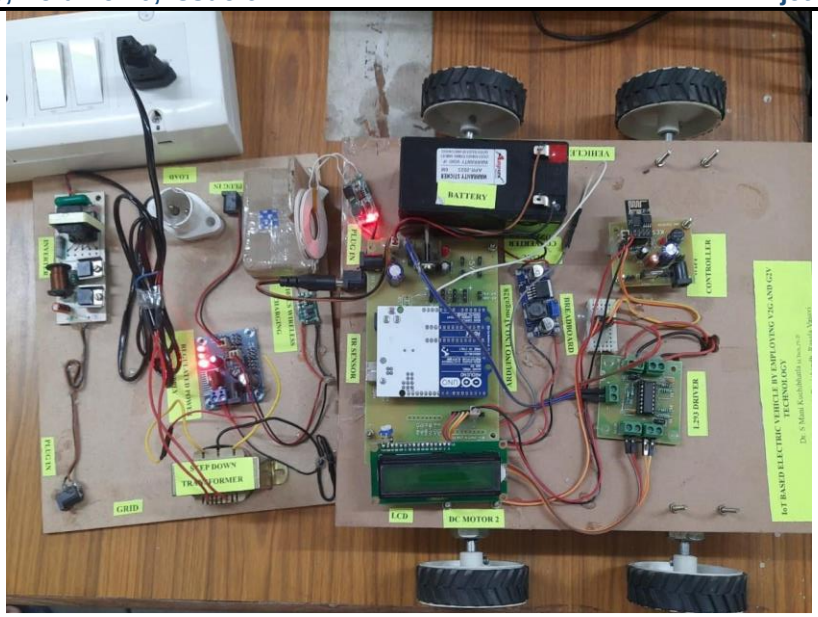


Fig 8: Hardware Block of G2V During Wireless Charging.

In Above Figures 6 & 7 Showing The Hardware Blocks Of G2V During Wired And Wireless Charging.

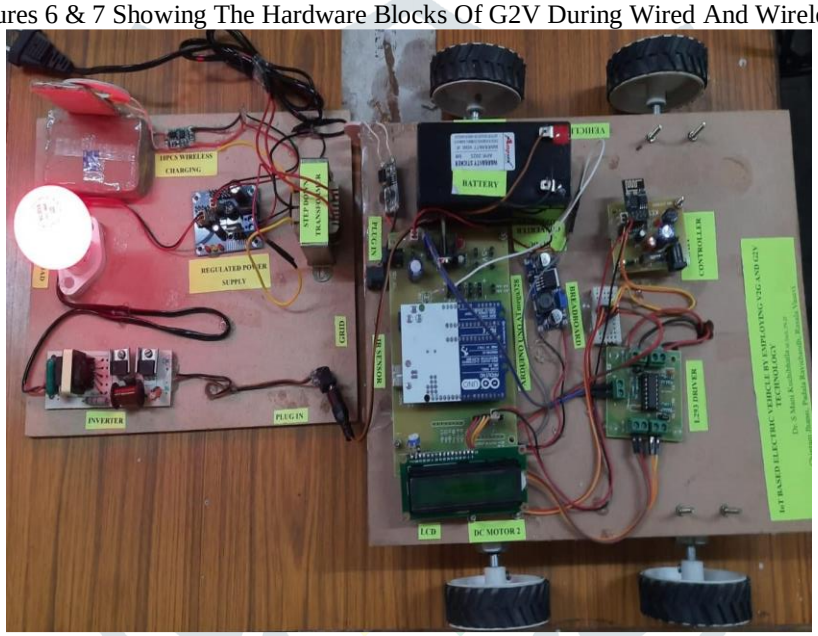


Fig 9: Hardware Block Of V2G

In Fig 9 showing the Hardware Block of Vehicle to Grid.

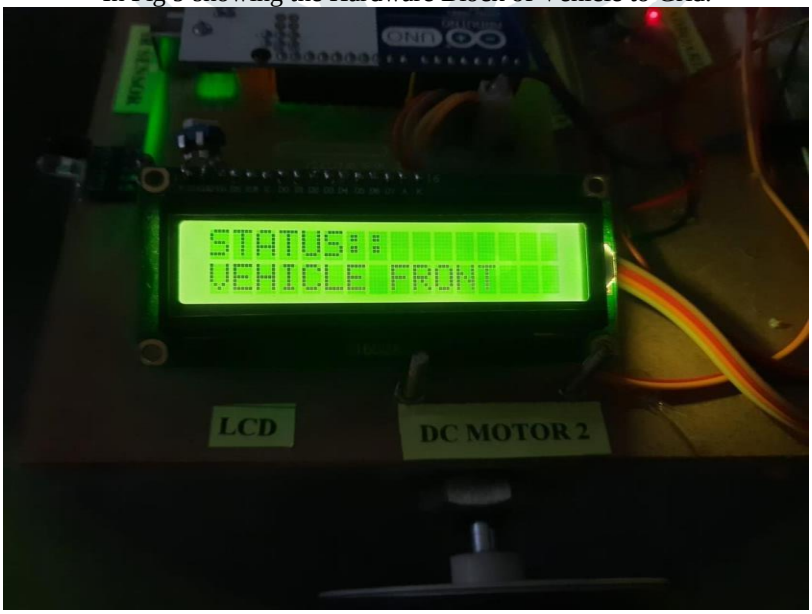


Fig 10: LCD Display Showing Vehicle Status Moving Front

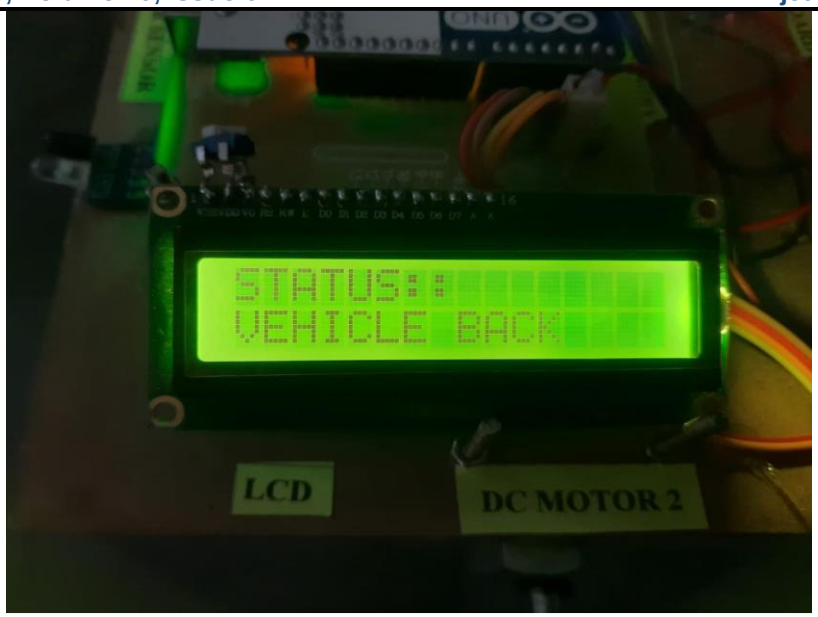


Fig 11**:** LCD Display Showing Vehicle Status Moving Back.

In above figures 10 & 11 LCD Display showing Vehicle status Moving Front and Back respectively.

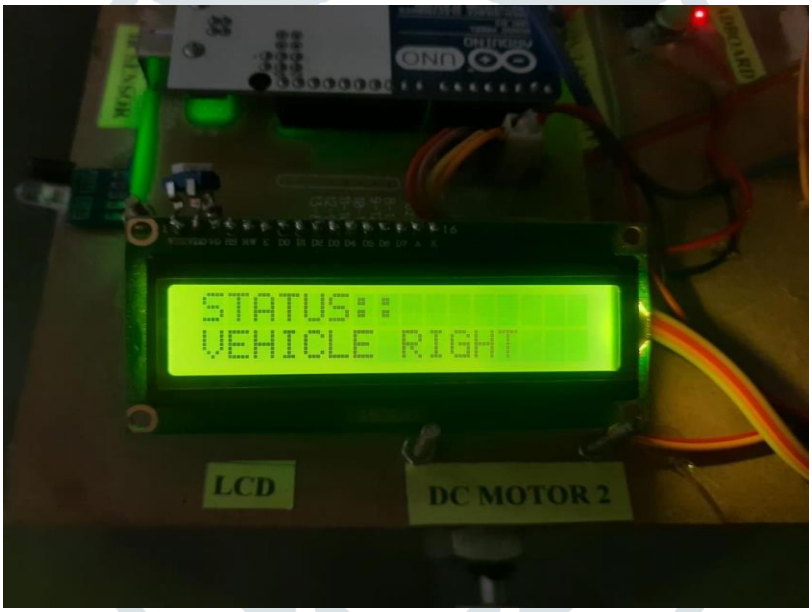


Fig 12: LCD Display Showing Vehicle Status Moving Right

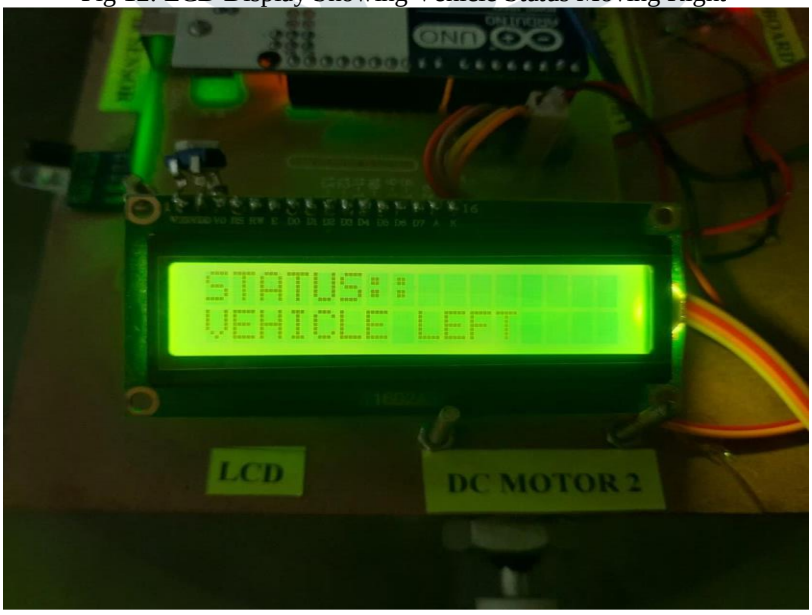


Fig 13: LCD Display Showing Vehicle Status Moving Left

In above figures 12 & 13 LCD Display showing Vehicle status Moving Right and Left respectively.

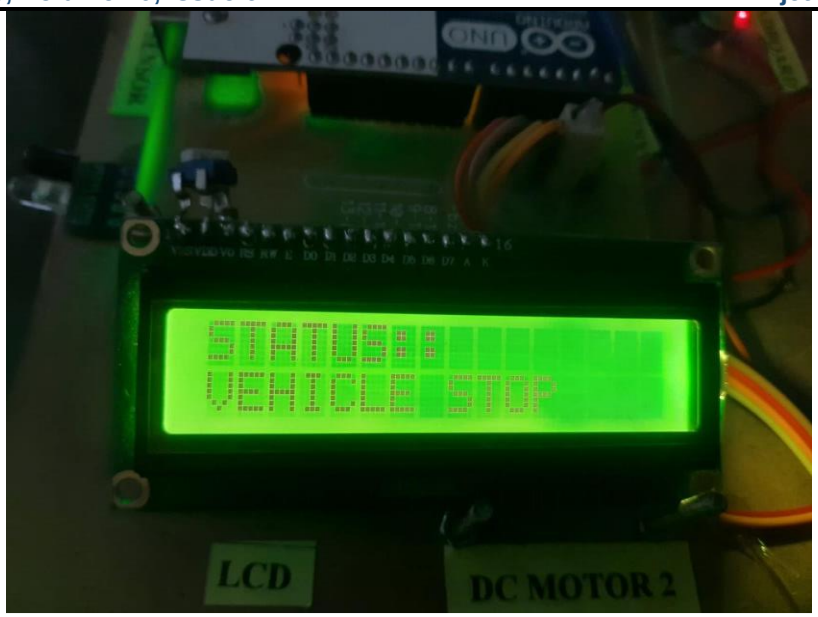


Fig 14: LCD Display Showing Vehicle Status Stop

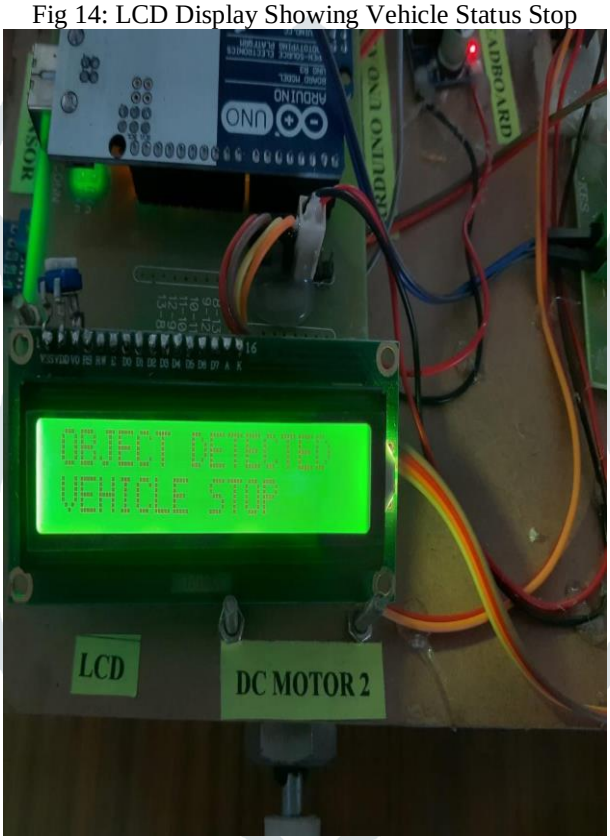


Fig 15: LCD Display Showing Vehicle Status Object Detected Vehicle Stop.

In Above Figures 14 & 15 LCD Display Showing Vehicle Status Stop And Object Detected Vehicle Stop Respectively.

IX CONCLUSION

Vehicle-to-Grid (V2G) and Grid-to-Vehicle (G2V) technologies that utilize a single-phase AC supply offer promising opportunities for integrating electric vehicles (EVs) with the electricity grid. V2G technology allowing EVs to not only consume electricity from the grid but also to return excess electricity back to the grid when they are not in use or if the demand of the load is peak. To run the vehicle we have used Arduino Uno code.

In future we can connect the solar panel to the vehicle and we can use the power generated from the solar. We can connect the renewable energy generated by the vehicles solar panel to the grid.

X REFERENCES

[1]. C. Shumei, L. Xiaofei, T. Dewen, Z. Qianfan, and S. Liwei, "The construction and simulation of v2g system in micro-grid," in Proceedings of the International Conference on Electrical Machines and Systems, ICEMS 2011, 2011, pp. 1–4.

[2]. S. Han, S. Han, and K. Sezaki, "Development of an optimal vehicle-to Grid aggregator for frequency regulation," IEEE Trans. Smart Grid, vol. 1, no. 1, pp. 65–72,2010.

[3].M. Tolbert, "Single-phase on-board bidirectional PEV charger for V2G reactive power operation," IEEE Trans. Smart Grid, vol. 6, no., pp. 767–775, 2015.

[4]. A. Arancibia and k. Strunz, "Modeling of an electric vehicle charging station for fast dc charging," in proceedings of the IEEE International Electric Vehicle Conference (IEVC), 2012, pp. 1-6.

[5] K. M. Tan, V. K. Ramachandaramurthy, and J. Y. Yong, "Bidirectional battery charger for electric vehicle," in 2014 IEEE Innovative Smart Grid Technologies - Asia, ISGT ASIA 2014, 2014, pp 4. 406–411.
[6] J. Gallardo-Lozano, M. I. Milanes -Montero et al., "Electric vehicle battery charger for smart grids", Electr. Power Syst. Res., vol. 90, pp. 18-29, Sep. 2012.
[7] D. B. Richardson, "Electric vehicles and the electric grid: A review of modeling approaches Impacts and renewable energy integration", Renew. and Sustain. Energy Rev., vol. 19, pp. 247-254, Mar. 2013.
[8] Z. Wang and S. Wang, "Grid power peak shaving and valley filling using vehicle-to- grid systems", IEEE Trans. Pow. Delivery, vol. 28, no. 3, pp. 1822-1829, Jul. 2013.
[9] Justin D. K. Bishop, Colin J. Axon et al., "Evaluating the impact of V2G services on the degradation of batteries in PHEV and EV", Appl. Energy, vol. 111, no. 2013, pp. 206-218.
[10] Y. Lee, A. Khaligh et al., "Advanced integrated bidirectional AC/DC and DC/DC converter for plug-in hybrid electric vehicles", IEEE Trans. on Vehicular Tech., vol. 58, no. 8, pp. 3970-3980, Oct. 2009