



# International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

*(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)*



**Impact Factor: 8.524**

**Volume 14, Issue 1, January 2025**

# Artificial Reinforcement Learning Method based EV-Charging with Effective Integrated Energy Management

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**ABSTRACT:** EV technology is one of the most important electronic generation processes globally. It is almost environmentally friendly renewable energy resources. Through installed photovoltaic (PV) systems, a lot of technologies were developed in this field era. Energy loss happens in photovoltaic systems, so these progressions have an effect on the competent system. The PV system modules have failures that affect overall system reliability, so they cause energy loss and fire hazards. EV methods are used to reduce the damage at the PV module, which helps to protect the PV systems. The visual and thermal method based data set is used for the detection of the fault. It is one of the best contact-less and non-destructive methods. The graph based semi-supervised learning algorithm is applied to detect the fault in the image for classification purposes, and this experiment has been analyzed through evaluation metrics.

**KEYWORDS:** photovoltaic (PV) system, ev-charging, graph based semi supervised algorithm.

## I. INTRODUCTION

Owing to the rapid increase in pollution levels, there is a need to explore new ways to power our homes, vehicles, and businesses. This need has increased dramatically over the recent years owing to the fear of fossil fuels running out and its resultant social and environmental effects. The depletion of crude oil reserves has occurred at a rapid rate due to the increase in fuel consumption by our automobile industry. The focus has now fallen on electric vehicles owing to their reduced emission levels. A major limitation of electric vehicles is that, it is an extra load on the electric grid and since many countries face an energy deficit, it is not currently feasible to use electric vehicles. Pure electric vehicles, though are not fully free of emissions. If the batteries are charged using energy generated from fossil fuels, polluting gases are still formed at the power plant.

Hence they can only reduce and decentralize the pollution and cannot eradicate it completely. An alternative source of power that is being developed is the use of solar power to run automobiles. A hybrid vehicle makes use of two or more distinct power sources to power it. Hybrid Electric Vehicles (HEVs) combine both solar and electrical energy. The hybrid electric vehicle is driven by an AC universal type electric motor, whose performance is governed by a motor controller (variable voltage accelerator), which further gets its power from a battery, that can be charged through a battery charger.[6] Also solar charging assist has been incorporated, which charges the battery to its safe limit and then disconnects itself in-order to prevent overcharging.

This provides an additional layer of safety and security to the vehicle. In a conventional braking system, kinetic energy is lost as heat energy in air stream while braking via mechanical friction brakes. Thus, a lot of energy is wasted every time we apply the brakes. Regenerative braking is a process wherein this kinetic energy is stored in a short term storage system such as battery and utilized later for accelerating the vehicle.[2] Conventional electric vehicles have a single charge range significantly lower than the motor car, making it unpopular with the masses.

However, by the use of technology such as solar powering of hybrids and regenerative braking, the limitations of conventional electric vehicle can be diminished to an extent where its practical use is a current possibility and not a

future prospect.[4]HEVs thus successfully combine the conventional ICE driven mechanical drive train with a motor propelled electric drive train. A hybrid electric vehicle produces less emissions from its ICE than a comparably sized conventional car. An HEV's gasoline engine is usually smaller than its comparably sized conventional counterpart and if not used to directly drive the car, it can be geared to run at maximum efficiency, further improving on fuel economy. The vehicle is powered by a Solar panel of 120W, OCV 18.6V. A 12V, 80Ah battery was used for the vehicle. MPPT module was implemented on a printed circuit board, to maximize the power output from PV panel. An MPPT charge controller of 20A, 12V rating is used. The electric motor drive consists of a universal motor rated for 750W, 1500rpm. Voltage controlled acceleration is provided for controlling the acceleration of the electric drive train. A DC generator which gives an output of 12V, 30A is used for regenerative braking. The HEV is started on electric motor drive. When the battery voltage falls below 10.5V (ie: the battery is discharged), the HEV switches to IC engine drive. Once the HEV is running, in order to avoid damage to the starting system, a relay circuit is used to turn off the starter motor. Regenerative braking is achieved by means of DC generator attached to the wheel of the HEV.

## II. LITERATURE WORK

Xiujuan, et al [1] The advantage of electric vehicles is that the cell plate has a very low transformation efficiency (i.e). Because of the strong mobility of the working environment in the Solar Car, the max-point tracking algorithm varies by 14% on a regular basis in the interest of further transformation. The ideal technique of traceability is to record the constant voltages, disturbances, and observations, as well as the conductance at the time. Simultaneously, the most popular highest power point tracking approach is the same. The method for improving conductivity with the greatest precision is the best of all. It allows for the tracking of massive amounts of power. It keeps track of the maximum power point. It is obvious that the output voltage in the area where the constant current source works is different when changing the work voltage, the tolerance is low and the sensitivity at constant voltage is obvious in order to improve the tracking method, so that maximum power point tracking is accurate when temperature, light intensity and output power are definite.

Rattankumar, V, and N. P. Gopinath[2] No future fossil fuel exists since we conceived of the effective utilisation of non-conventional energy. We eliminate several of the disadvantages of conventional vehicles, such as reduced coupling losses, field losses, smooth speed handling, and fuel expense. The key components utilized in the creation of a solar car are photovoltaic modules, solar tubular battery, BLDC, ackerman steering, mechanical construction, and MCB. Ackerman steering, a mechanical design, and a small circuit breaker are among the solar car's equipment. The Solar Car developed at a speed of 30 Km/h presently needs a single charge of around 18 hours and has been proven to be effective at 100 Km per charging. More work is being done to improve the vehicle, which is now powered by a BLDC with a standard engine. It also proposes the use of highefficiency solar panels that are small in size. Different vehicle flaws are being investigated, and steps are being taken to eliminate them in the hope that a commercially successful model of solar car will be developed in the future.

Alnunu, Nasser, et al.[3] The environment is promoting research and development in the field of renewable energy sources as people become more conscious of the importance of sustainable energy sources. The development of field and experience in the renewable energy sector has been recognised and promoted by oil and gas companies. Shell is one of these car races that gained prominence in the mid 1980s. Race events such as the World Solar Challenge, Shell Eco-Marathon, and North American Solar Challenge are well-established and draw university student teams from all over the world. Every year the shell eco-marathon race is held in three continents: America, Europe and Asia. The participation of both prototypes and urban concept cars is in two categories. In each category there are several energy-based subcategories. The participant in the Prototype must complete eight rounds of 25.485 km, with a period of up to 51 minutes. The best outcome is preserved so each team is limited to four official efforts. The path is reasonable for safety and technical testing. The structure and design of Solar Cars has some generic principles. The design usually consists of two major phases, mechanical and electrical. Solar car races can improve both the technical and the soft skills of the engineering student. The experience of first participation of university students in the Shell EcoMarathon race has opened the doors for further regular attendance. Over only a few months, the team managed to design, utilize and test a solar car. This car met all the tests for technical and safety inspections and participated in the race together with hundreds of participants from around the world. Shell EcoMarathon Asia 2012 will take place after this, and the team wants to be in the list of top 10 in its category. Work on designing generation 2 of the car has been under way.

### III. METHODS

In normal operating mode, the vehicle is designed to run on the electric motor drive. The electric drive consists of a 12V, 80Ah battery and an inverter circuit. The motor used is a universal type AC motor. The battery output is supplied to the inverter, which supplies AC output that can be used to power the electric motor drive. In order to vary the motor acceleration, the inverter output is regulated by a voltage varying circuit. When the battery voltage reaches below 10.5V, automatic switchover to IC engine takes place. The inverter circuit has a battery level indicator, which monitors the battery voltage level.

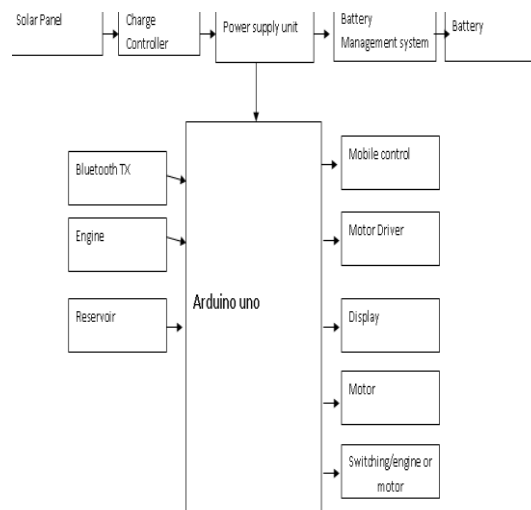


Fig 1: Block Diagram

The voltage level indicator output is given to a 3 pole relay. The relay is used to switch the ignition coil, when the pre-requisite condition is met. The negative terminal of the ignition coil is given through an electronic circuit consisting of a comparator. The HEV changes over to the IC engine drive with the help of a relay circuit. Once the HEV starts running, voltage builds up in the dynamo coil. When this voltage goes above a set reference voltage, the output of the comparator circuit goes high. The electronic switch opens which in turn releases the starter motor and prevents damage to it. In a conventional braking system, kinetic energy is lost as heat energy in airstream while braking via mechanical friction brakes. Thus, a lot of energy is wasted every time we apply the brakes. Regenerative braking is achieved by the use of a high current dc generator which is attached to the wheel of the HEV. The braking is carried out in two levels.

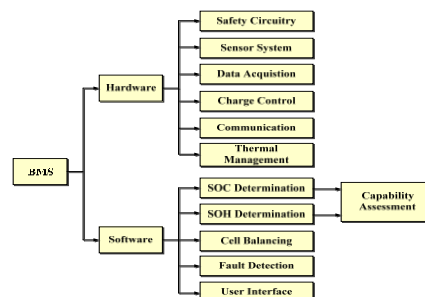


Fig 2: Proposed Work

When we pressurize the brake pedal to the first level, it activates a switch connected to a relay terminal. The common terminal of the relay is connected to the battery and the NC terminal is connected to the DC generator. On applying the brakes, the battery and DC generator gets connected. When this connection occurs, the DC generator gets loaded which results in a braking action. If this braking action is found to be insufficient to arrest the motion of the vehicle, the

second level of braking can be used. Here, the conventional mechanical brakes are applied. In order to prevent the reverse flow of current a protective diode is connected. Solar charging assist is provided for the battery. The solar panel is connected to the battery through a charge controller unit. When PV output is less than load demand, the battery feeds the load. When PV output is same as the load demand, the battery gets charged. It is critical to prevent overcharging and deep discharging of batteries to preserve its life. This is achieved by the MPPT charge controller unit.

#### **IV. RESULT ANALYSIS**

The most commonly adapted hybrid vehicle has sources of a solar power assisted with electric motor and an I.C. engine. In a HSV, the I.C. engine cooperates with an electric motor which has optimal usage of the engine. Especially driving in city traffic involves frequent starts and stops of the vehicle and during idling, the engine consumes more fuel without producing useful work thus it leads to higher fuel consumption, less efficiency and unnecessary emission from the exhaust. The HSV solves those problem and also no exhaust emission from the vehicle. The parallel power train runs on both, combustion engine and electric motor. The primary drive of the vehicle from solar powered and secondary drive by the combustion. These vehicles gain maximum efficiency in city during heavy traffic conditions without producing any emissions which supports to the green environment.

The challenges for existing AT that support children with ambulatory disabilities center around two themes: control and design. Control challenges of crutches and walkers include maintaining balance and coordinating movement. Design challenges of crutches and walkers include body support, poor performance on uneven terrain, and device mass.

Investigated about the drives used in electric and hybrid electrical vehicles. He stated that the two main types of drives are AC and DC, of which the most widely used, are 3phase Induction motors, Switched reluctance motors, and Brushless DC motors. in her paper of intelligent usage of IC engines in hybrid vehicles stated that focuses on different approaches presented in literature on the usage of information about traffic and weather conditions for the optimal energy management of hybrid electric vehicles. Ivan have given us information on the possibilities hybridizing the currently used Fuel engines with renewable sources of energy. This paper also focusses on the main problems related to the development of these vehicles, with specific attention on photovoltaic panels. have investigated about construction of hybrid vehicles and efficiency of their use in transport, to reduce environmental pollution in urban areas, compared to vehicles with engine investigated about the Toyota Hybrid System (THS) is used in Toyota Prius and compared the two major types of hybrids with the split power hybrids.

#### **V. CONCLUSION**

In this work solar powered hybrid vehicle has been successfully fabricated built in with internal combustion engine. Generally, the electric hybrid vehicles are disadvantageous during long distance travels also required periodic plug in of their batteries. These kinds of problems have been solved using hybrid solar vehicle which gives a car, self-charging potential from the solar panels. Several conditions were set forward at this meeting for developing countries such as India to reduce carbon monoxide emissions, which have a significant influence on road transport and improvement. The use of renewable energy, such as solar, in transport must be considered in order to reduce carbon monoxide emissions without delaying development. This is the research article on solar electric vehicles that was published in the study.

#### **REFERENCES**

- [1] S.Ponlatha, P.Umashankar, P.Balashanmuga Vadivu, D.Chitra, " AN IoT based efficient energy management in smart grid using SMACA technique", Wiley- International Transaction on Electrical Energy System, Vol.31,No.125, pp.1-22, Dec 2021.
- [2] Mohammad Kebriaei, Abolfazl Halvaei Niasar "Hybrid Electric Vehicles: An Overview", International Conference on Connected Vehicles And Expo, October 2015.
- [3] Sushuruth Sadagopan, Sudeep Banerji, Priyanka Vedula, Mohammad Shabin, C.Bharatiraja, "A Solar Power System for Electric Vehicles with Maximum Power Point Tracking for Novel Energy Sharing", Texas Instruments India Educators' Conference, September 2014.
- [4] Caiying Shen, Peng Shan and Tao Gao, "A Comprehensive Overview of Hybrid Electric Vehicles", International Journal of Vehicular Technology, Vol.4,No.2, October 2011.

- [5] J. Speirs, M. Contestabile, Y. Houari, and R. Gross, "The future of lithium availability for electric vehicle batteries", *Renewable & Sustainable Energy Reviews*, vol. 35, pp. 183-193, July 2014.
- [6] C. Nayanataral, P. Shanmugapriyal, G. Gurusivakumar, B.Thiruvenkadam, "Design & development of series hybrid electric vehicle". ICCPEIC, April 2014.
- [7] Sciarretta and L. Guzzella, "Control of hybrid electric vehicles", *IEEE Control Systems Magazine*, vol. 27, no. 2, pp. 60-70, June 2007.
- [8] Zhang Guirong, "Research of the regenerative braking and energy recovery system for electric vehicle", *World Automation Congress (WAC)*, 24-28 June, 2012.
- [9] Ahmed, Shehab, Ahmed Hosne Zenan, and Mosaddequr Rahman. "A two-seater light-weight solar powered clean car: Preliminary design and economic analysis." *Developments in Renewable Energy Technology (ICDRET)*, 2014 3rd International Conference on the. IEEE, 2014.
- [10] Ashrafee, Farin, Sayidul Morsalin, and Asif Rezwani. "Design and fabrication of a solar powered toy car." *Electrical Engineering and Information & Communication Technology (ICEEICT)*, 2014 International Conference on. IEEE, 2014.
- [11] Habib, S.; Kamran, M.; Rashid, U. Impact analysis of vehicle-to-grid technology and charging strategies of electric vehicles on distribution networks—A review. *J. Power Sources* 2015, 277, 205–214. [CrossRef]
- [12] Liu, L.; Kong, F.; Liu, X.; Peng, Y.; Wang, Q. A review on electric vehicles interacting with renewable energy in smart grid. *Renew. Sustain. Energy Rev.* 2015, 51, 648–661. [CrossRef]
- [13] Hawkins, T.R.; Gausen, O.M.; Strømman, A.H. Environmental impacts of hybrid and electric vehicles—A review. *Int. J. Life Cycle Assess.* 2012, 17, 997–1014. [CrossRef]
- [14] Vasant, P.; Marmolejo, J.A.; Litvinchev, I.; Aguilar, R.R. Nature-inspired meta-heuristics approaches for charging plug-in hybrid electric vehicle. *Wirel. Netw.* 2019, 26, 4753–4766. [CrossRef]
- [15] Shuai, W.; Maillé, P.; Pelov, A. Charging electric vehicles in the smart city: A survey of economydriven approaches. *IEEE Trans. Intell. Transp. Syst.* 2016, 17, 2089–2106. [CrossRef]



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