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EV CHARGING WITH SOLAR ALONG WITH DROWSINESS DETECTION

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Abstract
Electric Vehicle is a hybrid vehicle that allows the user to choose the mode of its energy. The batteries in the electrically operated system can be charged by either Solar panels or a wall charge plug-in. The Photo Voltaic (PV) panels must be installed on the electric vehicle without affecting the rider's comfort ability. The concept of solar energy is that a high torque motor will be put on the vehicle, which will be generated by solar energy. The power that had been absorbed by the various sources can be used directly by the motor if the power matches the power requirement. If not, the motor will use the power from a battery. When the vehicle was not in use during the day, the solar panels will charge the battery. The design consists of a "drowsiness detector" which is the component in which the eyeglass can be placed while the vehicle is at rest. The eyeglass is compulsory for a vehicle while riding to prevent the rider from "drowsiness". The eyeglass has a physical sensor and an eye blink sensor which is connected to the Arduino board using a UART Protocol as a wireless link that communicates between the board and the sensor. If the rider is sleeping, then the buzzer will be activated to alert the driver and the ignition would turn OFF preventing the rider from the accident.

Keywords: Solar Panel, Electric Vehicle, Eye-blink sensor, Drowsiness.

1. Introduction

The continuous increase in fossil fuel prices along with the increased concerns about pollution produced by fuel vehicles encourages the current vehicle market to find new alternatives to reduce the use of gasoline. Electric vehicles are the alternative to current vehicles to reduce fuel usage and to reduce pollution. Although current manufactured electric/hybrid vehicles are being marketed to reduce the fossil fuel usage several technologies that can utilize power electronics to charge the battery from different energy sources. The integration of solar photovoltaic's into the electric vehicle becomes widely used and highly recommended by ecological experts due to climate change concerns and the continuous growth of EVs. Based on this trend, the work focused on the design of EVs using solar panels. The PV panels convert the solar energy into electricity and convert it into electricity. This electricity is used to charge the battery which is used to run the electric vehicle. The electric vehicle will also run in the absence of solar as it will use the power from the battery. When the vehicle is not in use the solar panel is used to charge the battery at rest and this supply is used to run the vehicle at night time.

With respect to the charging of vehicles, human safety is also important. As sleep is a fundamental need of humans many accidents are happening in our day-to-day life due to lack of rest. Due to inadequate

rest, the driver will try to sleep while driving and it is the main sign of drowsiness. The current study also includes a drowsiness detector to prevent accidents. Accidents happening due to lack of sleep or tiredness i.e., drowsiness will be prevented using an eye blink sensor. The driver has to wear the eyeglass which consists of an eye blink sensor throughout the driving and eye blink for a couple of seconds to detect drowsiness. Any random change in eye-blink will leads to a reduction in the speed of the vehicle. The outcome is that the buzzer will be activated if the driver falls asleep. The wheel is slowed or stopped depending on this condition. This is how the driver can be alerted and saved during drowsiness.

2. Related Work

The existing system consists of charging electric vehicles using solar panels at the electric vehicle solar station. The charging of EV is done by connecting the solar panels. So we can charge the vehicle only at rest but not in motion. This charges the battery and the power from the battery is used during the driving. Accident Detection, alcohol detection, and vehicle protection using Intelligent Wireless Safety Helmet are developed. Also, this system provides theft protection as a helmet which is necessary to start the vehicle which is also essential along with a key to start the bike. It consists of a smart system between the helmet and the vehicle. The helmet unit checks that the rider is wearing a helmet or not and not under the influence of alcohol throughout the riding. It communicates with the vehicle to turn OFF the ignition system of the bike if the above condition is not met. If the accident is happened then the vehicle unit checks and intimates the accident through geometric coordinates via Short Message Service. By using these geometric coordinates, the location of the injured rider can be tracked using Global Positioning System (GPS) tracking application. Also, this system alerts the rider of the accident.

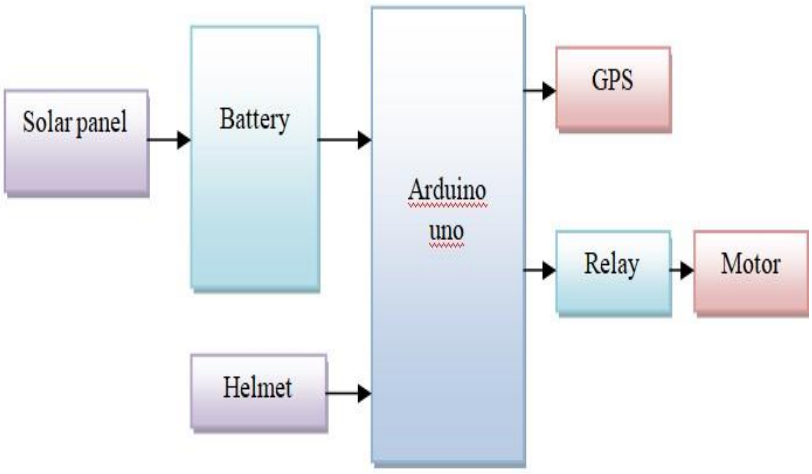

Fig1. Block diagram of Existing System

3. Proposed System

The present work deals with the design of PV Electric vehicles. It makes use of hybrid energy through solar panels to charge a battery of the Electric Vehicle. In this proposed system, we are going to use the Brush-less D.C. motor for the smooth running of the vehicle and for reducing the heat and friction losses. Analysis of environmental conditions was done. This analysis and result were used for the further development of solar Electric vehicles. For example, the use of a plug charge system was made in case of the absence of solar energy. In ideal cases, all solar energy available would be collected by the S2S but in a city environment, this is not always possible because of the shadow of buildings. In those cases, the vehicle will charge through a wall charge plug-in. The ignition will automatically turn off if the eyeglass is not worn or if the rider is sleeping and the buzzer will be activated to alert the driver this will make sure that the rider is safe.

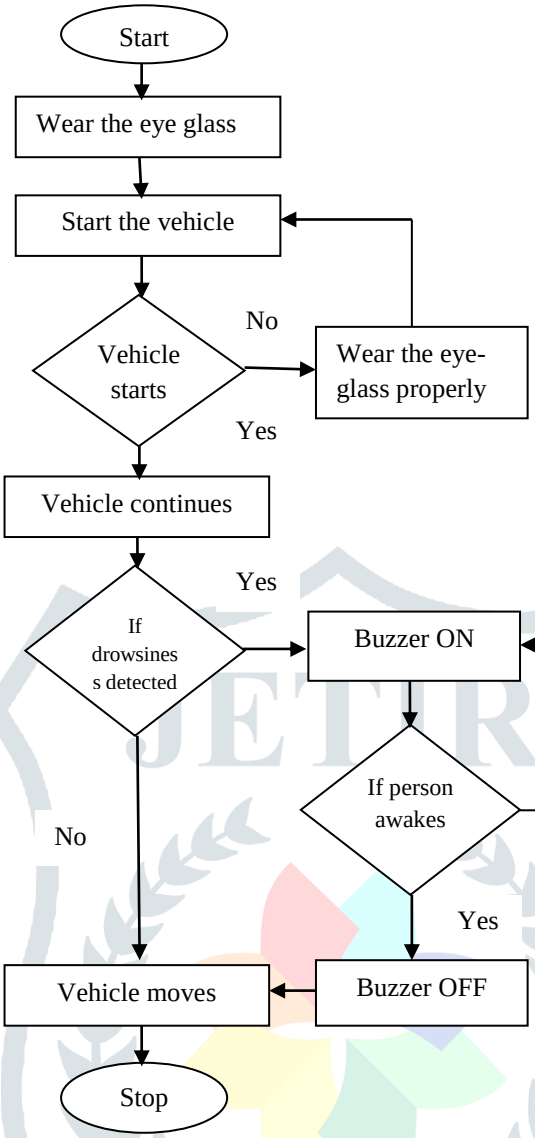

Fig2. Flow Chart

Algorithm:

Step 1: Start
Step 2: Wear the eyeglass by the driver
Step 3: Start the vehicle
Step 4: If the vehicle does not starts then check the eye-glass and wear it properly
Step 5: Start Driving
Step 6: If the drowsiness is detected then the buzzer will be activated.
Step 7: If the person awakes then the buzzer will stop and the vehicle moves.
Step 8: If the person does not awake the buzzer continues till the person awake
Step 9: The process continues from step 5 till the vehicle reaches the destination
Step 10: Stop

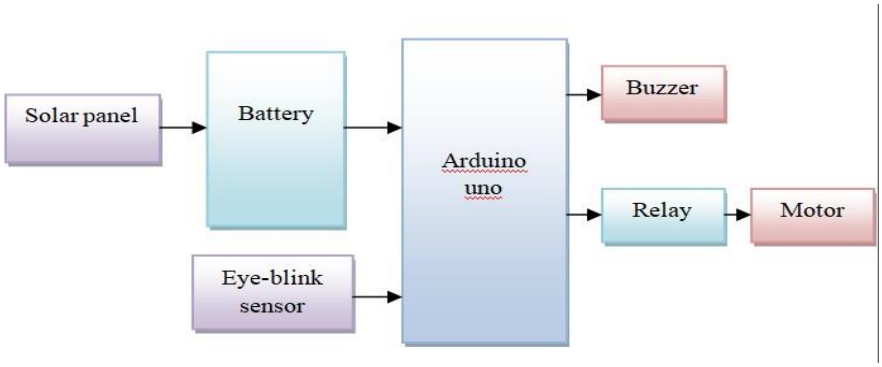

Fig3. Block diagram of Proposed System

4. Hardware Components Utilized

The proposed system consists of the following components:

A. Arduino UNO

Fig4. Arduino UNO

Arduino is a small board used for programming with the help of a USB plug to connect to the computer and has a number of connection sockets that are used to wire up to external electronics such as sensors, motors, buzzers, relays, laser diodes, loudspeakers, microphones, etc., They have either be powered through the USB connection from the computer or a 9V battery. They will be controlled using the computer or programmed by the computer and then disconnected and allowed to work independently. It is operated at a voltage of 5V.

B. Solar Panel

The solar panel is the term used for a photovoltaic (PV) module. A PV module is a group of photovoltaic cells that are mounted on a frame for installation. The solar panels use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. Most of the PV modules use wafer-based single or multi-crystalline silicon cells or thin-film cells. The structural member of every module can be either the top layer of the panel or the back layer. Every Cell must be protected from mechanical damage and moisture. Many modules are rigid but some of them are semi-flexible ones based on thin-film cells. The cells are connected electrically in series and then in parallel. In series one to another for the desired voltage and parallel to increase amperage. The wattage i.e., power of the photo-voltaic module is the mathematical product of the voltage (V) and the amperage i.e., current of the module. The manufacture specifications of the solar panels are obtained under standard conditions which are not the real operating conditions the solar panels are exposed to on the installation site.

Fig. 5: Solar panel

An enclosure called a Photo-Voltaic junction box is attached to the back of the solar panel and functions as its output interface. The External connections for solar panels use manufacturer multi-contact with 4mm diameter connectors known as MC4 connectors to facilitate easy weatherproof connections to the rest of the system.

C. Eye Blink Sensor

The eye-blink sensor is connected to the Arduino board using a UART Protocol as a wireless link that communicates between the board and the sensor. It senses the human eye blink using an infrared Sensor. The IR sensor consists of a transmitter and receiver where the transmitter transmits the IR rays onto the eyelids and monitors the reflected light by the sensor receiver. If the eye is closed for a particular given second the output will be high otherwise the output will be low, this can be easily read by the microcontroller or Arduino to automate the alert mechanism. If the rider sleeps, then the ignition would turn off to prevent serious injuries in case of an accident.

Fig. 6 Eye-blink Sensor

D. Battery

A battery is a source of electric power for electrical devices. An EVB stands for an electric-vehicle battery which is also known as a traction battery. It is used to power the motor of a battery electric vehicle (BEV) or hybrid electric vehicle (HEV) which runs with the help of the power supply. These electric vehicle batteries are usually rechargeable (secondary) batteries that can be charged with the help of a power supply, and are typically lithium-ion batteries. These batteries are specifically designed for the electric charge which is measured in high ampere-hour or kilowatt-hour capacity.

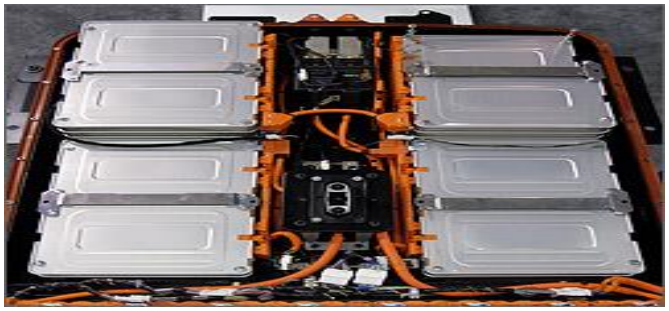

Fig7. EV Battery

E. Motor

A DC motor or direct current motor is an electrical machine that converts electrical energy into mechanical energy by creating a magnetic field that is powered by direct current. When the power is supplied to a DC motor then a magnetic field is created in its stator. This field attracts and repels magnets on the rotor; this causes the rotor to rotate. The commutator is attached to brushes that are connected to the power source to supply current to the motors wire windings to keep the rotor rotating continually. The main reason to prefer DC motors over other types of motors is their ability to precision control their speed, which is a necessity for industrial machinery. DC motors are able to start, stop, and reverse immediately; It is an essential factor for controlling the operation of production equipment.

Fig. 8 Motor

F. Push-Button

A push button is a simple switch that is used to control some aspect of a machine or a process. Buttons are usually made up of hard materials, such as plastic or metal. In our case, It is used to mimic the button for an electric start in vehicles. The push-button is used in calculators, push-button telephones, kitchen appliances, and various other mechanical and electronic devices, home, and commercial.

Fig. 9 Push Button

Push buttons are widely used in industrial and commercial applications. They are connected together by a mechanical linkage so that the act of pushing one button causes the other button to be released. In this way, a stop button can force a start button to be released and a start button can force a stop button to release. This type of mechanical linkage is used in simple human-operated operations in which the machines have no electrical circuits for control.

G. Buzzer

The buzzer is an audio signaling device that may be electromechanical or piezoelectric or mechanical type. The main function of the buzzer is to convert the signal from audio to sound. It is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, and so on. Based on the design and connections, it can generate different sounds like alarm or music or bell & siren.

Fig.10 Buzzer

5. Software Module ARDUINO IDE

The software used by the Arduino board is Arduino IDE. The Arduino IDE is a cross-platform application designed in Java application and is derived from the IDE for the Processing programming language and the also used for Wiring projects. It is designed to introduce programming the Arduino and others to designers, developers, and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax high lighting, brace matching, automatic indentation, and board selector and is also capable of compiling, running, and also for uploading programs to the Arduino board with a single click on the upload button. Typically there is no need to edit make files or run programs on a command-line interface. Although building on command-line is possible if required with some third-party tools such as Uno.

The Arduino IDE consists of the C programming and C++ libraries called "Wiring", which makes the common input/output operations easier. Arduino programs can be written in either C programming or C++, although users only need to define two functions to make a runnable program:

- setup() – a function run once at the start of a program that has initialized settings
- loop() – a function that can run repeatedly until the board powers off

6. Experimental Results

Connect the power supply to the Arduino from the 12V battery the output will be as shown in fig. The LED on the Arduino glows indicating the supply to the Arduino from the battery. Press the pushup button the motor will run. The motor runs till there is a power supply from the solar panel to the battery as the battery was non-rechargeable. Wear eyeglasses. If the eye blinks more than the required time then the buzzer will be ON indicating the drowsiness of the driver

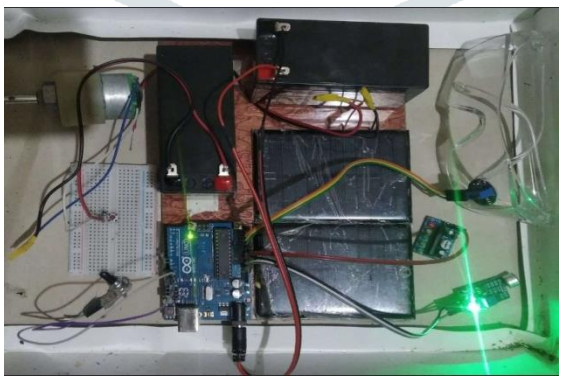

Fig11. Hardware Results

The simulation is done using TINKERCAD. The results for simulation is shown in fig. 12

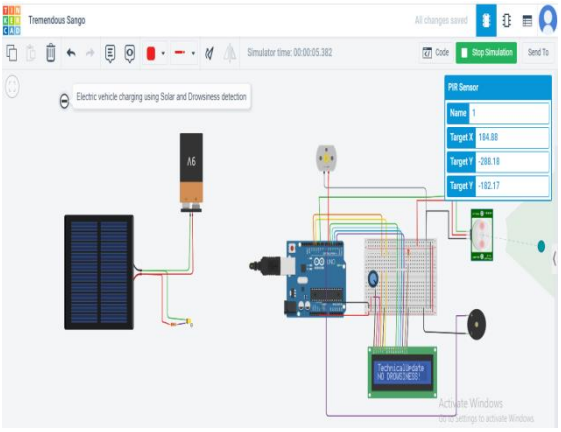

Fig12. Simulation Results

7. Conclusion

The aim of this project is achieved by using Arduino. The battery of the electric vehicle is charged using solar energy through PV panels. And the drowsiness is detected using the eye-blink sensor and prevents the vehicle by activating the buzzer. We can also extend this project by charging the electric vehicle through wind energy and can also add an alcohol detector to detect the alcohol consumption of the person. The vehicle will not start if the person takes alcohol.

References

[1] Yibin Zhang, Jiangbiao He, and Dan M. Ionel, "Modeling and control of a Multiport Converter based EV charging Station with PV and Battery", 2019 IEEE conference

[2] Mehul Garg, Devyani Gera, Aman Bansal, Arpan Kumar "Generation of Electrical Energy from Sound Energy ",2015 IEEE conference

[3] Hill, C.A., et al., Battery Energy Storage for Enabling Integration of Distributed Solar & Sound Power Generation. IEEE Transactions on Smart Grid, 2012. 3(2): p. 850-857.

[4] Eldeeb, H.H., S. Faddel, and O.A. Mohammed, Multi-Objective Optimization Technique for the Operation of Grid tied PV PoweredSSs Charging Station. Electric Power Systems Research, 2018. 164: p. 201-211.

[5] Ferro, G., et al., An optimization model for electrical vehicles scheduling in a smart grid. Sustainable Energy, Grids and Networks, 2018. 14: p. 62-70.

[6] Bhatti, A.R., et al., Electric vehicles charging using photovoltaic: Status and technological review.

[7] Renewable and Sustainable Energy Reviews, 2016. 54: p. 34-47.

[8] Coffman, M., P. Bernstein, and S. Wee, Integrating electric vehicles and residential solar & Sound PV. Transport Policy, 2017. 53: p. 30-38.

[9] Figueiredo, R., P. Nunes, and M.C. Brito, The feasibility of solar & Sound parking lots for electric vehicles. Energy, 2017. 140: p. 1182-1197.

[10] Islam, M.S. and N. Mithulananthan, PV basedSSs charging at universities using supplied historical PV output ramp. Renewable Energy, 2018. 118: p. 306-327.

[11] Jadhav, S., et al. Bidirectional DC-DC converter in Solar & Sound PV System for Battery Charging Application. IEEE.

[12] Liu, C., et al., Opportunities and challenges of vehicle-to-home, vehicle-to-vehicle, and vehicle-to-grid technologies. Proceedings of the IEEE, 2013. 101(11): p. 2409-2427.

[13] Ghenai, C., T. Salameh, and A. Merabet, Technico-economic analysis of off grid solar & Sound PV/Fuel cell energy system for residential community in desert region. International Journal of Hydrogen Energy, 2018.

[14] Bayati, M., et al., A novel control strategy for Reflex-based electric vehicle charging station with grid support functionality. Journal of Energy Storage, 2017. 12: p. 108-120.

[15] Zhou, T., et al. Power flow control in different time scales for a wind/hydrogen/super-capacitors based active hybrid power system. in 2008 13th International Power Electronics and Motion Control Conference. 2008. IEEE.
[16] Series, I., Microgrids and active distribution networks. The institution of Engineering and Technology, 2009.
[17] Gonzalez, A., Integration of photovoltaic sources and battery based storage systems–A DC analysis and distributed maximum power point tracking solution. 2019.
[18] Tran, V.T., et al., An Efficient Energy Management Approach for a Solar & Sound -PoweredSSs Battery Charging Facility to Support Distribution Grids. IEEE Transactions on Industry Applications, 2019. 55(6): p. 6517- 6526.
[19] Gassab, S., et al., Power management and coordinated control of standalone active PV generator for isolated agriculture area-case study in the South of Algeria. Journal of Renewable and Sustainable Energy, 2019. 11(1): p. 015305.
[20] Talebi, P. and M. Hejri, Distributed Control of a Grid-connected PV-battery System for Constant Power Generation. Journal of Energy Management and Technology, 2019. 3(3): p. 14-29.
[21] Koskela, J., A. Rautiainen, and P. Järventausta, Using electrical energy storage in residential buildings– Sizing of battery and photovoltaic panels based on electricity cost optimization. Applied energy, 2019. 239: p. 1175-1189.
[22] Talavera, D., et al., A new approach to sizing the photovoltaic generator in self-consumption systems based on cost–competitiveness, maximizing direct self-consumption. Renewable energy, 2019. 130: p. 1021-1035.
[23] Torreglosa, J.P., et al., Decentralized energy management strategy based on predictive controllers for a medium voltage direct current photovoltaic electric vehicle charging station. Energy Conversion and Management, 2016. 108: p. 1-13.
[24] Mohamed, A., et al., Real-time energy management algorithm for plug-in hybrid electric vehicle charging parks involving sustainable energy. IEEE Transactions on Sustainable Energy, 2014. 5(2): p. 577-586.
[25] Ye, B., et al., Feasibility Study of a Solar & Sound -Powered Electric Vehicle Charging Station Model. Energies, 2015. 8(11): p. 13265-13283.
[26] Chukwu, U.C. and S.M. Mahajan, V2G parking lot with PV rooftop for capacity enhancement of a distribution system. IEEE Transactions on Sustainable Energy, 2013. 5(1): p. 119-127.
[27] Chandra Mouli, G.R., P. Bauer, and M. Zeman, System design for a solar & Sound powered electric vehicle charging station for workplaces. Applied Energy, 2016. 168: p. 434-443.
[28] Fazelpour, F., et al., Intelligent optimization to integrate a plug-in hybrid electric vehicle smart parking lot with renewable energy resources and enhance grid characteristics. Energy Conversion and Management, 2014. 77: p. 250-261.
[29] https://en.wikipedia.org/wiki/Solar_panel
[30] http://www.atmel.com/Images/Atmel-42735-8-bit-AVR-Microcontroller- ATmega328-328P
[31] https://en.m.wikipedia.org/wiki/Electric_vehicle_battery
[32] https://www.elprocus.com/sound-sensor-working-and-its-applications/