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ADVANCE SOLAR HYBRID ELECTRICAL VEHICLE

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ABSTRACT- This paper of the modeling methods and software used to model EVs with BLDC motors are provided in this research. It examines the value of simulation in enhancing control, energy, and performance techniques for vehicles. This research also examines important variables, scenarios, and difficulties in simulating BLDC motor driven EVs, emphasizing their significant contribution to the development of EV technology. The battery is charged using a power converter and a DC/DC converter. In order to charge the battery, it also used regenerative braking. This model enables a thorough examination of battery performance under various operating circumstances, such as temperature changes and charge and discharge cycles. The battery efficiency of this lithium-ion battery is outstanding. An electric vehicle with a solar power source and a totally battery-powered design.We create a comprehensive and adaptable simulation environment that faithfully replicates real-world EV behavior by integrating the Simulink and Sims cape libraries from MATLAB.

I. INTRODUCTION

The introduction covers the rising environmental concerns brought on by technical advancements and the rising popularity of electric cars(EVs) as means of reducing the air pollution caused by gasoline-powered vehicles. It makes note of the technical and battery power constraints that have historically limited EV growth, making them less competitive with gasoline-powered vehicles [1]. The benefits of motor brakes over hydraulic brakes, including accuracy, responsiveness, and measuring simplicity, are highlighted in the introduction. Regenerative braking has been subject to a number of control systems, such as rule- based, fuzzy control, H control, and neural network approaches [2]. The introduction emphasisesthataddingmechanicalABStoRBSinHEVswouldcomplicatethesystem,rai se the cost of production, and decrease the amount of energy recovered during braking. Therefore, current research has concentrated on the usage of anti-lock and regenerative braking systems together.[3] The braking force distribution approach, which is a crucial factor, determines the efficacy of regenerative braking. Fuzzy logic-

distribution of friction and regenerative braking force.This trade-off is addressed in the study, which also offers real-world performance evaluations of regenerative braking techniques.

It presentsa MATLAB/Simulink-developed BEV powertrain model with an RBS and suggests three braking techniques for RBS: a high dynamic approach based on fuzzy versions of conventional strategies[5]. It is known tha EV development, a constrained driving range because of battery and motor constraints. By transforming kinetic and potential, (RBS) [6]. The aims of he study are presented in the introduction's final section, which covers the fundamentals of electric cars as well as design principles, method, and operational guidelines. It emphasizes the value of educating the public and stoking enthusiasm in the creation and use of electric vehicles [7].In place of mechanical contact, the OLEV is presented as an alternate method that draws electricity from subterranean coils. In order to goon the road without an underground coil and to provide extra power when necessary, OLEV vehicles are said to have a [8].Finally, it outlines the goals of the study, which include creatinga mathematical model. considers three handling techniques for spent batteries: recycling, remanufacturing, and disposal, with batteries being divided into different quality categories [9].

In order to evaluate different configurations and energy management techniques priorto for designing hybrid vehicles[10].These devices must be designed specifically for the intended use because they work in a variety of environments. This entails calculating the operating range using specific driving cycles and vehicle simulations [11].Double-layer super capacitors frequently use activated carbon with a large specific surface area, and high- performance variations are already available. Noble metal oxides for aqueous electrolytes and electrically conducting polymers (ECPs) for both aqueous and organic electrolytes are used as electrode materials in red ox super capacitors[12].The purpose of the study is to present a design methodology for electric machines, with a particular emphasis on a basic EV model and available vehicle attributes. With this method, the design process takes into account the most effective operating region and important electromagnetic performance, [13].Po loss in the vehicle is reduced driving torque to by omitting conventional gearbox and gearbox components. Additionally, since each wheel may be operated separately, in-wheel motors provide more effective regenerative braking[14].The main emerging markets for electric vehicles are, including those in North America, Europe, China, and Japan. are presented, followed comparison of their design, operation, efficacy, and charging equipment [15].

Due to the intrinsically quieter nature of electric vehicles, there is a need for calmer road traffic and less noise pollution in urban areas. However, given that electric vehicles can be incredibly silent, there is also a concern for pedestrian safety [16].Solid particles,

volatile chemicals (including lead, nitrogen-oxide and carbon monoxide),and carbon dioxide(CO_2) emissions from oil-fuelled automobiles are all mentioned. It is acknowledged that air pollution has a detrimental effect on both the environment and human health, highlighting the necessity of switching from petroleum- based fuels to electricity as a clean energy source for automobiles Despite having a smaller battery capacity and requiring passengers.

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Sector by bringing stress-free and safe travel options. A viable and commercial car sharing service is autonomous electric vehicle (AEV) sharing. In the study, AV is used to denote autonomous petrol cars, and the goal is to ascertain the viability and profitability of AEV sharing in comparison to conventional AV sharing services [19].In particular for diverse driving patterns, hybrid electric vehicles (HEVs) are emerging as solutions that can meet tendency is illustrated These design standards while achieve in gemission reduction and increased fuel economy. This by demonstrator cars like the PNGV demonstrators, Toyota Prius, and European HEV demonstrators.

However, while designing HEVs, performance and drivability goals must be sacrificed in favor of fuel economy and emissions goals [20]. This paper represents the hardware and simulation of the electric vehicle.

II. DESIGN OF ELECTRIC VEHICLE

As shown in the figure1the block diagram of an electric vehicle (EV) is a simplified visual depiction of the major component sands their link a gas that allow the vehicle to run effectively.
The power supply, energy conversion, power management, and vehicle control are four primary building components of an EV. A high-capacity battery pack, which stores the electrical energy neededfor propulsion, soften part of the power supply block. The electricmotor and power electronic sartor parts of the energy conversion block that transform the stored electrical energy in to mechanical energy to move the wheels. To maximize energy use and guarantee safe operation, the power man agreement block has several control mechanisms, including battery management and temperature management. The vehicle control block, which manages all aspects of vehicle operation, including acceleration, braking, and regenerative braking, includes sensors, software, and control units.

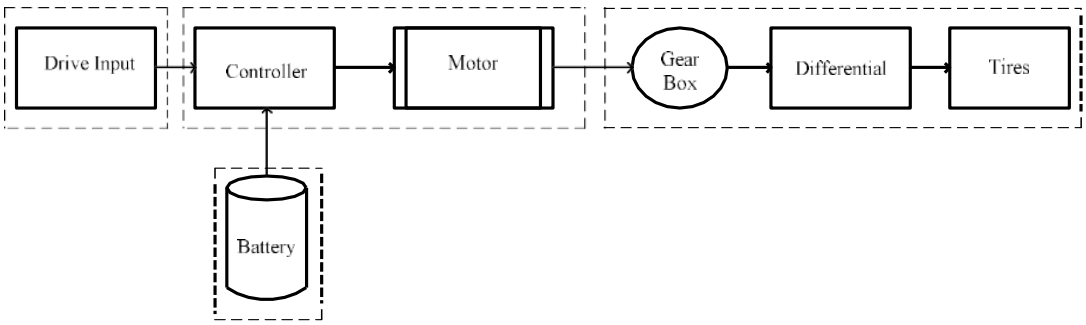

Fig.1 ElectricVehicle

A vehicle classified as an electrical vehicle(EV) is one that propelled by one or more electric motors rather than an internal combustion engine that burns fossil fuels like petrol or diesel. Since they have no exhaust emission and run on power that can produce From renewable resources, electric vehicle are made to be both environmentally and energy friendly. Battery electrical vehicle (BHV), plug in hybrid electrical cars (PHVS) and HVs are examples the several types of differently on electrical power and internal combustion engines. A scale and more environmentally friendly substitute to conventional gasoline-powered vehicles have grown in popularity, reduce greenhouse. The electric vehicles(EVs) are made up of a number of essential parts that, when combined, allow them to function as efficient

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BATTERY:

Anode, Cathode, Separator, Electrolyte, and two current collectors (positive and negative) make up a battery. As shown in figure 2, Lithium is stored in the anode and cathode. Positively charged lithium ions are transported through these praetor by the electrolyte from the anode to the cathode and vice versa, A charge is produced at the positive current collect or by the movement of the Lithium ions, which releases free electrons in the anode. The electrical current then travels from the positive current collector to the negative current collector after passing via a powered device (such asa computer or mobile game). The separator prevents electrons from moving freely inside the battery.

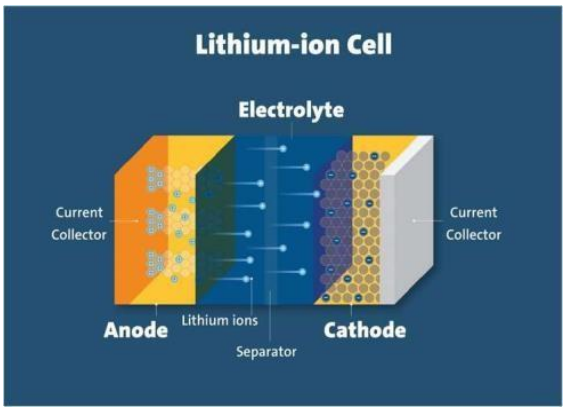

Fig 2:Lithium-ionbattery

BLD MOTOR

It resembles DC motors with permanent magnets in many ways. Because it lacks a commentator and brush setup, it is known as a brushless system. Because this motor's Commutation shaded electronically, BLDC motors. BLD motors provide strong beginning torque and high efficiencies of 95-98%, among other traction properties. The high-power density design technique is appropriate for BLDC motors. The most of their traction characteristics. By contrasting it with a typical brushed motor, you may understand more about BLDC motors.

2.3 Converter

A DC-DC converter is a crucial part of electric cars since they contain several electrical DC voltage is changed from one level to another using electromechanical circuitry known as DC-DC converter. The output volt age of a switched-operated DC-DC converter might be greater or lower than the input voltage depending on the requirements of the application. The converter temporarily stores energy during conversion and delivers the output at various intensities. Both capacitors and conductors' transformers store energy in the form of an electrical and magnetic field, respectively. Compared to linear

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INVERTER

Electric vehicles (EVs) must have induction inverters since they are essential in controlling the power flow between the battery and the electric motor. The EV's battery pack stores direct current(DC)electricity, he alternating current (AC) electricity required to power the electric motor. The precise AC waveform needed by the motor is provided by induction inverters using power electronics and high-frequency switching, allowing for precise control of speed and torque. They also make it possible for regenerative braking by reversing the process and transforming kinetic energy back into electrical energy so that the battery may be recharged during deceleration. Overall, enhancing their performance, efficiency, and versatility. Overall, induction inverters are a crucial component of modern electric vehicles (EVs), improving their functionally, effectiveness, and adaptability.

CHARGING UDING A SOLAR PANEL

Charging an electric vehicle (EV) using solar panels is an environmentally sustainable and increasingly popular way to harness renewable energy for transportation. Solar panel charging involves installing photovoltaic panels on rooftops or carports to capture sunlight and convert it into electricity. This solar- be used to charge an Ev's battery, reducing or even eliminating the reliance on grid electricity for recharging. Solar- charging systems can be designed with different capacities, from smaller setups for daily commuting to larger installations for full vehicle charging. Not only does this approach fossil fuels clean, renewable energy from thes un to power their vehicles. Furthermore, excess solar energy can be fed back,.

REGENERATIVE BRAKING

Most hybrid and all-electric carshave a regenerative braking system. In order to chargethe high voltage battery in the car, it transforms the kinetic energy from braking into electrical power. Regenerative braking helps conventional braking by slowing the vehicle down as well. Friction between brake pads and rotors causes an automobile to slow down in a traditional braking system. However, this approach is quite ineffective at saving energy. When you use the brakes, almost all of the kinetic energy that is pushing your automobile forward is converted to heat. That's a lost of energy lost. By recovering up to 70% of the kineticenergy that would otherwise be wasted while braking, regenerative braking provides a solution to this issue. Depending on your car type driving style, you can recover a certain amount of energy. Electricity Production by Regenerative Braking How Does It Work ?As shown in the figure 3, Regenerative braking is an innovative energy recovery device that converts kinetic energy into electrical energy during deceleration and braking in electric vehicles.

III. SIMULATION MODEL & RESULT

INVERTERS

Employing cutting-edge technology to create sustainable and efficient transportation solutions. Longitudinal Driver, Controlled PWM voltage, H-Bridge, Simple Gear, Differential, Tire, Vehicle Body, Battery and DC motor the behavior of an electric vehicle. While Controlled PWM voltage made sure that the H- bridge received accurate power, the longitudinal driver input acted as the dynamic control element, defining accelerating and braking circumstances. The H-bridge was essential in controlling the electric motor's direction and speed, simulating real-

world power management in the EV's. The simple gear and differential blocks emulated us to investigate how gear ratios and torque distribution impact the speed and efficiency of the vehicle. Traction and rolling resistance, which are crucial components in determining total. To evaluate ride quality, stability, consideration. DC on.of energy used, the voltage, and the current flow. We were able to gain simulations with these interconnected building blocks. These insights are crucial for optimizing design decisions, enhancing energy efficiency and ultimately advancing the development of sustainable electric vehicle in our quest for a greener and more environmentally friendly future of transportation. The figure 4 shows the simulation of electric vehicle.

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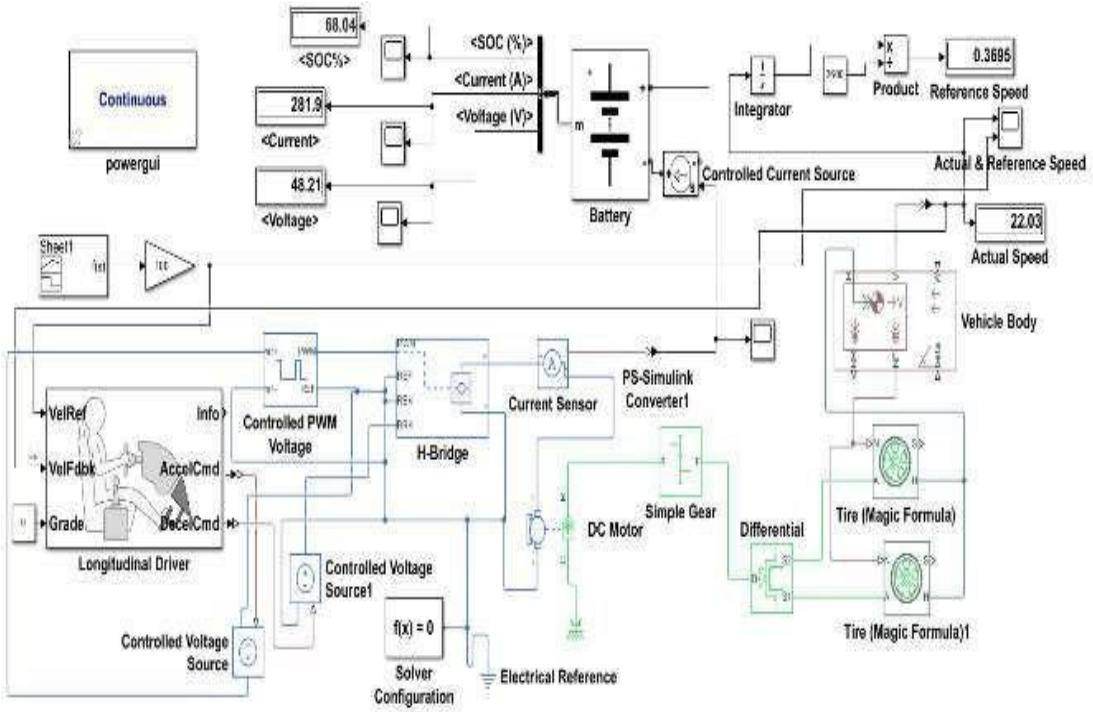

Fig 4:Simulation of Electric Vehicle

REGENERATIVE BRAKING

Results from the simulation show waveforms with four outputs. The a waveform shows the battery's level of charge in seconds. The electric vehicle's voltage is represented by the waveforms b and c, while its current is represented by the waveform d, and its real speed is shown by the waveform d. The first simulation's output demonstrates that from 0 to30 seconds .And when the speed decreases, the voltage and state of charge rise as a result of there generative braking, while the current decreases as shown in figure 5.

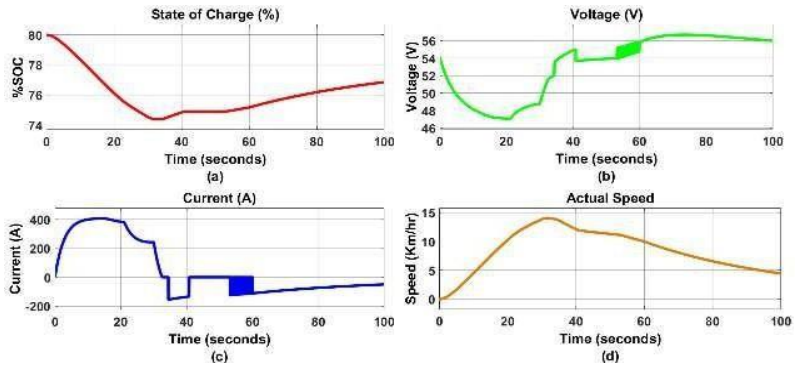

Fig 5: Output

ds, the voltage and state of charge both decrease as speed increases. And when the speed decreases, the voltage and state of charge both rise as a result of the regenerative braking, while the current decreases between 50 and 70 seconds as shown in the figure 6.

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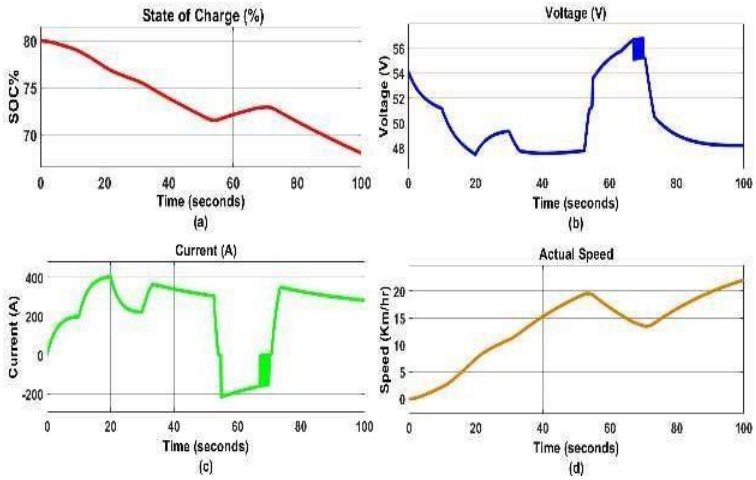

Fig 6:Out put waveforms

IV. IMPLEMENTATION OF ELECTRICAL VEHICLE

Using an electric vehicle (EV) that is fuelled by solar energy and a lithium-ion battery requires a sustainable and environmentally beneficial method of transportation. In this configuration, sunlight is captured and converted into electricity using photovoltaic solar panels that are often integrated in to the vehicle's body or positioned there of. The lithium
- ion battery pack, which stores the energy for the engine of the car, is then charged using the solar power. A solar charge controller, which optimizes energy harvesting, prevents overcharging, and ensures the most effective use of solar power, is a crucial part of this system.

Fig7: Speed control DC-DC Converter and Battery pack

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in the table1.In this table the parameters are Solar panel, Battery packs, DC-DC converter, BLDC motor.

Table1:Parameters & Rating of the Vehicle

Parameters	RANGEANDRAI NGS
SOLARPANNEL	12Volts,150WP(power)
BATTERYPACKS(LITHIUM-ION)-4	12Volts, 18Ah
DC-DCconverter	12Volts,10Ampoutput
BLCDCMOTOR	50W,0.16Nm,3000rpm

An electric vehicles (EV) speed controller is a crucial component in charge of accurately controlling the vehicle's acceleration and speed. It is essential for providing a comfortable and responsive driving experience while maintaining efficiency and safety. Pulse-width modulation (PWM) technology is typically used in EVs to regulate the power sent to the electric motor. The quantity of electrical energy given to the motor is efficiently controlled by the speed controller. In this inner. In order to maximize performance and range, advanced speed controllers use complex algorithms and sensors to take into account a variety of battery charge, and the driver's input through the accelerator pedal. In order for an electric, safely, is a crucial part of its functioning. Modern electric-accumulating vehicles' operational needs and structural limitations are directly related to the design of their electric propulsion systems. Due to the restricted space and weight constraints in mass-produced vehicles, Electric Propulsion Systems (EPS) configuration presents difficulties. The achievement of a lighter vehicle is crucial and strongly depends on cutting-edge.

Fig 8: Implementation of Electric Vehicle

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V. CONCLUSION

In conclusion, vehicle (EV), and each is essential in determining the final result. In order to maximize the performance, range, and safety of the EV, the hardware component comprises a thorough engineering process that combines advanced battery technology, lightweight materials, effective electric motors, and innovative power

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