ELECTRICAL CAR-PERFORMANCE AND ANALYSIS OF BLDC

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ABSTRACT--Many people consider electric cars to be the future of automobiles. They can be used for power regulation by the grid operator and are very effective, quiet, and do not contribute to local pollution. It is crucial to have a suitable test model in order to determine an electric vehicle's performance. This concept presents a brand-new design for an electric four-wheeler. The automobile is driven by a 48v, 1200W BLDC engine. The electric car has a 40 km/h top speed limit. The speed of the EV is managed by the DC-DC converter. An acid battery that can be recharged powers the electric vehicle. The kind, rating, and capacity of the EV's battery have a considerable impact on how long it can operate on a charge. Batteries in the proposed system are said to last for roughly eight hours and 25 to 30 kilometres before requiring recharging. The mechanical braking system on the EV makes stopping easy and comfortable. In the electric vehicle, the voice-assisted Left and Right indicators are used. Different load conditions were used to test and validate the suggested electric car.

keywords--Engine, Electric motor, Battery pack with controller & inverter, Fueltank, Control module , etc

I. INTRODUCTION:

The energy source for an electric vehicle (EV) is electricity. The primary electrical benefit is the electric motor's proposal system's great efficiency in power conversion. Large-scale research and development projects have recently been reported in both academia and industry. There are also commercial vehicles available. Many nations offer incentives to users in the form of reduced tax rates or tax exemptions, free parking spaces, and free charging stations. On the other hand, a substitute is the hybrid electric vehicle (HEV).

Over the past five years, it has seen considerable use. At least one hybrid electric vehicle model is available from almost all automakers. This essay will look at recent advancements in electric car technology and make predictions about what the future may hold. Electricity is the principal fuel for electric vehicles (EVs), while it can also be used to increase the efficiency of traditional vehicle designs. Both battery-electric vehicles (BEVs), also known as all-electric vehicles (EVs), and plug-in hybrid electric vehicles (PHEVs), fall within the category of EVs.

COPONENTS OF FCEVs:

Electric motor, Fuel-cell stack, Hydrogen storage tank, battery withconverter and controller

WORKING:

The electricity needed to power this vehicle is produced on the FCEV itself.

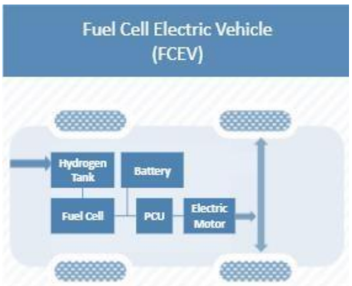


Figure1: fuel cell electric vehicle

EXISTING SYSTEM:

Electric vehicles (EVs) are getting more and more popular because of their little impact on the environment and potential financial benefits. Several current systems for electric vehicles exist, including:

Battery-powered automobiles (BEVs): These vehicles only need the electricity that is kept in rechargeable batteries to power them. BEVs don't have internal combustion engines, so they don't produce any pollution or use any fossil fuels.Hybrid Electric Vehicles (HEVs): These automobiles combine an internal combustion engine with an electric motor. HEVs alternate between using petrol and electricity depending on the road.

Compared to HEVs, plug-in hybrid electric cars (PHEVs) have a larger battery and the ability to be charged from an external power source. Compared to BEVs, PHEVs normally have a lower all-electric range, but they also have the option to switch to petrol power when the battery is running low.Vehicles that combine an internal combustion engine and an electric motor are known as hybrid electric vehicles (HEVs). Depending on the road, HEVs shift between utilising petrol and electricity.Plug-in hybrid electric vehicles (PHEVs) have a bigger battery than HEVs and can be charged from an outside power source. PHEVs typically have a shorter all-electric range than BEVs, but they also have the ability to switch to fuel when the battery is getting low. Overall, these current electric car systems provide a range of possibilities for customers with various demands and tastes.

ARCHITECTURE OF ELECTRIC VEHICLE

The term "electrical/electronic architecture" refers to the integration of electronics hardware, network communications, software applications, and wiring into one integrated system that security, infotainmentcontrols an ever-increasing number of vehicle functions in the areas of vehicle control, body and, active safety, and other comfort, convenience, and connectivity functionality.

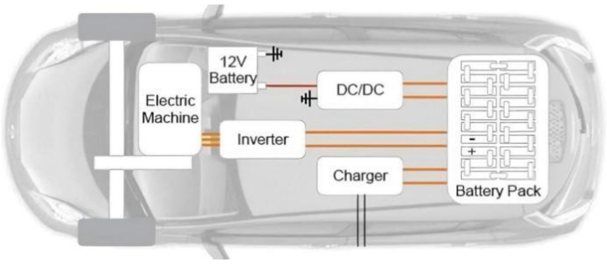


Figure 2: ARCHITECTURE OF ELECTRIC VEHICLE

PARTS OF EV:

Motor:

DC motors, Induction motors, DC brushless motors, Permanent Magnetic Synchronous Motors, and Switched Reluctance Motors are among the motors that are available for electric vehicles.Here, a brushless DC motor is used. For electric vehicles, BLDC motors' greater torque-to-weight ratio is crucial since it enables us to make the car lighter without sacrificing torque. BLDC motors are more dependable because there is less equipment to manage because they don't have brushes.

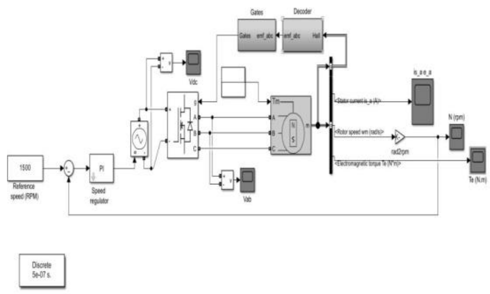
Charger--In order to charge the battery quickly, electric vehicles (EVs) need a DC charger. A DC charger delivers direct current power straight to the battery, enabling faster charging times than an AC charger, which transforms alternating current (AC) from the electrical grid to direct current (DC) to charge the battery. Depending on the battery's size and the charger's charging rate, DC chargers can charge an EV battery up to 80% in as little as 30 minutes. Being able to easily recharge at charging stations along the road makes them perfect for long distance driving.Not all DC chargers are compatible with all EVs, though. There are various types of DC chargers with different charging rates, and different EV models have distinct charging needs. Before using a particular DC charger, EV users must make sure that their vehicle is compatible with it.

Controller: An electrical component called a controller controls the electricity flow between the battery and the electric motor in an electric vehicle (EV). By regulating the amount of current flowing through the motor, the controller sets the vehicle's speed, torque, and acceleration. The accelerator pedal and other sensors provide input, and the power output is adjusted as necessary. The controller also monitors the battery and guards against harm by preventing overcharging or undercharging. The controller in regenerative braking collects the energy generated during braking and transfers it back to the battery for later use. The controller is essential for maximising an EV's effectiveness and efficiency.

Braking system: In the past, electric vehicles (EVs) have used braking systems called rear drum brakes. They are made up of a drum-shaped braking component that is housed within the car's rear wheels. When a driver applies the brakes, a hydraulic or mechanical system slams the brake shoes against the interior of the drum, causing friction that slows the car down. Rear drum brakes have a number of drawbacks despite being straightforward and efficient. They are typically less sensitive than other types of braking systems, such as disc brakes, and they can overheat and lose efficacy when used repeatedly or for extended periods of time. Because of this, many contemporary EVs use disc brakes on all four wheels for increased performance and safety.

Figure 3: block diagram

ELECTRICAL CAR- DESIGNING OF BATTERY PACKAGE ANDMANAGEMENT SYSTEM



II. **INTRODUCTION:** Battery electric vehicles in the United States still emit less pollution than their gasoline-fueled counterparts even when they are powered by the nation's worst coal-dominated grid. BEVs that are fueled by renewable energy sources like solar or wind produce almost no emissions. Battery electric cars are also substantially less expensive to fuel than traditional automobiles because they don't use petrol or diesel. Depending on the vehicle model and fuel rates, exact comparisons cannot be made, but using a BEV can result in yearly fuel savings of over $1,000.

Lead acid battery--Rechargeable lead-acid batteries are a type of battery that are frequently used in a variety of settings, including automotive, marine, and backup power systems.

Lead-acid battery management and packaging are crucial for ensuring their performance, longevity, and safety. Lead-acid batteries are often packaged in tough plastic or metal containers that protect the battery cells and other related parts, like the electrodes and terminals, physically. To stop the discharge of dangerous compounds and to give the battery structural support, the packaging must be made to withstand environmental variables including vibration, temperature changes, and shock.

Working of lead acid battery:

Such a battery is known as a storage battery or secondary battery because it allows electrical energy to be stored as chemical energy, which is subsequently transformed into electrical energy as and when needed. Battery charging is the process of converting electrical energy from an external electrical source into chemical energy. Discharging a secondary battery is the process of converting chemical energy into electrical energy for the purpose of powering an external load. Current is carried through the battery while it charges, which induces some chemical changes inside the battery. Energy is absorbed during the creation of these chemical modifications. The chemical reactions occur in reverse when the battery is linked to an external load, allowing the absorbed energy to be released as electrical energy and delivered to the load.

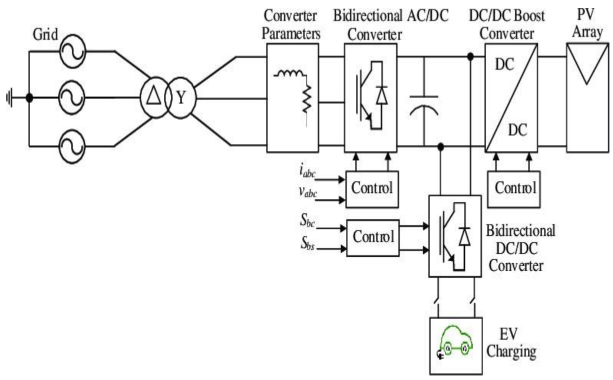
ELECTRICAL CAR- CHARGING SYSTEM

III INTRODUCTION--As more individuals choose electric cars (EVs) as their primary source of mobility, electric charging systems are growing in popularity. A network of charging stations known as an electric charging system enables electric vehicles (EVs) to run on electricity instead of conventional petrol or diesel fuel. Plugging the EV into the charging station and letting the battery recharge, which typically takes a few minutes to several hours depending on the charging station type and the size of the EV battery, constitutes the charging process.

Charging system based on 240-volt ac supply-- It charges more quickly than Level 1 because to the 240-volt AC power source used in this kind of charging system. Depending on the car and the charging station, level 2 charging can extend the range by 10 to 60 miles per hour. Although level 2 charging stations are typically found in homes and public charging stations, they call for the installation of specialised equipment by a licenced electrician.

Working-- The Level 2 charging station offers a 240-volt AC power source, which is changed into the DC power needed by the vehicle's battery via the charging station's inbuilt charger. Level 2 charging moves along more quickly than Level 1 charging, and depending on the car and the charging station, it can extend range by up to 10 to 60 miles per hour

Figure 4: Block diagram for charging



ELECTRICAL CAR- OPERATION OF LIGHTS BY VOICECOMMANDS--

IV. INTRODUCTION

Physical switches are still used as the standard method of lighting control in automobiles. However, due to its accessibility and ease, using voice commands to control automobile lights is growing in popularity. In order to operate automobile lighting without using physical switches, the project attempts to offer a solution. The system uses an Elechouse V3 Module for voice recognition, an Arduino Uno microcontroller for light control, and a 24V Dual Channel Relay for voice recognition.

WORKING OF MANUAL TURN INDICATORS:

Most automobiles have a traditional turn indication that is entirely operated manually. In order to make the needed turn, the driver must move the turn switch in the appropriate direction (upwards for a left turn and downwards for a right turn). The signal for a driver to turn on their turn signal may occasionally be delayed by this system. Because turning on the indication requires taking one's hands off the wheel, most drivers choose not to utilise the turn signal. This approach is especially trickier for inexperienced drivers. The following is how a traditional turn indicator is wired. When the brake pedal is applied and no indicator is selected, both brake lights will turn on.

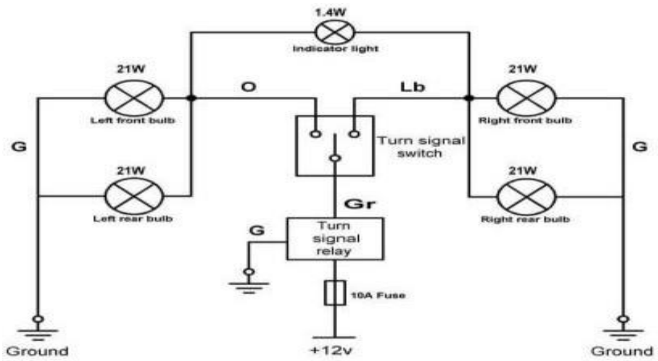


Figure 5: The schematic of the existing circuit diagram right/left indicator

PROPOSED SYSTEM:

The suggested method aims to completely eliminate manual control of the turn switch indicator and automate the vehicle signalling system. An Arduino UNO, a voice recognition module compatible with the Arduino, and an Arduino itself make up the framework's three main components. The speech of the assistant is captured using a voice sensor that is typically found in computer systems. The voice module is responsible for handling the recorded voice and will distinguish between the directions for left- and right-turns. The Arduino will then activate the necessary indicator that is present in the car using the perceived word as its contribution. The driver speaks commands into the primary control unit, the Arduino Uno microcontroller, which then transmits signals to the Elechouse V3 module to turn on the corresponding turn indicator. A voice recognition module called the Elechouse V3 can identify particular voice commands and translate them into digital signals that the Arduino Uno can understand. The turn indicators on and off on the car are switched by the 24V dual channel relay.

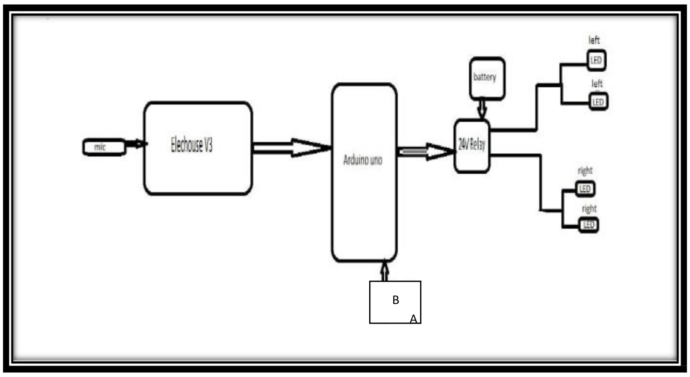


Figure 6: proposed system

ELECTRICAL CAR MECHANICAL AND AERODYNAMICS DESIGN

V. INTRODUCTION-- A system called an automotive differential is often included in most vehicles with two or more driving wheels. It is made to provide smooth turning and enhanced grip while still allowing the wheels to rotate at various rates while still receiving power from the engine. The differential, which is often positioned between the driving wheels, distributes torque among the wheels while permitting them to revolve at various speeds. The difference accounts for the fact that the inside wheel rotates at a slower rate than the outside wheel because it covers a shorter distance during a revolution than the outside wheel. This avoids the wheels slipping and guarantees a safe and easy turn.

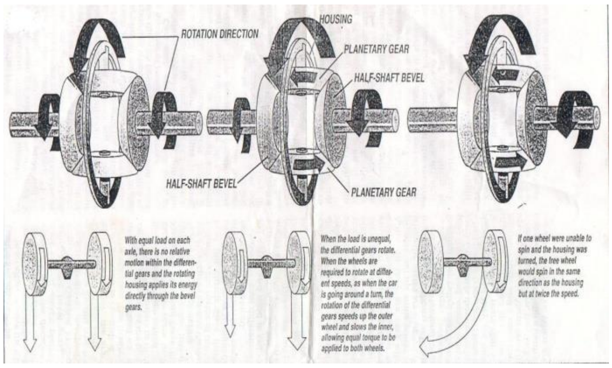
CONSTRUCTION--Due to the lack of a gearbox and internal combustion engine, an electric vehicle's differential is built similarly to a normal gasoline-powered vehicle, with minor changes. The differential is normally situated between the two electric motors on the front and back axles of an electric vehicle. The ring gear and pinion gear set, as well as bearings and seals to support and lubricate the gears, are housed in the differential housing's casing. The ring gear is coupled to the differential carrier and meshes with the pinion gear, which is located on the electric motor shaft. The side gears that engage with the driving axles and deliver torque to the wheels are supported by the differential carrier.

WORKING OF DIFFERENTIAL: The differential is essential to an electric vehicle's ability to transfer power from the electric motor to the wheels. A mechanical mechanism called a differential enables an axle's wheels to revolve at various speeds while still getting power from the engine. A housing comprising gears that mesh with the ring gear fastened to the driving shaft makes up the differential. The ring gear meshes with the pinion gear, which is positioned on the motor shaft's end. The ring gear, the differential housing, and the pinion gear are all rotated as a result of the motor's rotation. The outside wheel moves farther than the inside wheel as the automobile is turning. This indicates that in order to retain traction and avoid sliding, the outer wheel needs to rotate more quickly. This is made possible by the differential, which permits the side gear on the outer wheel to revolve more quickly than the side gear on the inner wheel. This is made possible by the side gears' ability to spin at various speeds thanks to the differential pinions' ability to do so.

Figure 7: working model of differential

ELECTRICAL CAR- RESULT AND OUTCOME

The overall working of an electric vehicle (EV) in the following steps:



Power Source: The EV is powered by a battery that stores electricalenergy, typically made of lead acid.
Motor: The battery supplies the DC power to the motor controller, whichmanages the flow of electricity to the BLDC motor.
Controller: The motor controller sends a sequence of signals to the motor's windings to create a rotating magnetic field. The speed and torque of themotor are controlled by adjusting the frequency and amplitude of these signals.
Acceleration System: The acceleration system in an EV includes the accelerator pedal, which sends a signal to the controller to increase the speed ofthe motor.
Transmission: The motor shaft is connected to a transmission, whichdrives the wheels of the vehicle.

Overall, the battery powers the BLDC motor, which drives the wheels of the vehicle through a transmission, and the acceleration is controlled by the motorcontroller. The result is a smooth and efficient driving experience with zero tailpipe emissions.

Figure 8**: Electric vehicle**

Figure 9: Steering

CONCLUSION:

Finally, because of their enhanced performance, lower running costs, and favourable environmental effects, electric vehicles (EVs) are growing in popularity. The driving range of EVs is expanding as battery technology advances, making them an attractive alternative for many motorists. Additionally, the hassle of charging an EV is decreasing as more charging infrastructure is put in place. However, many buyers continue to be discouraged by EVs' greater initial cost when compared to conventional gas-powered automobiles. Despite this, some people may find that purchasing an EV is a financially sound decision because to the long-term fuel and maintenance cost benefits. Overall, the move to electric vehicles is a positive trend in the fight against climate change and the reduction of greenhouse gas emissions. Given that they have zero tailpipe emissions and can be fuelled by renewable energy sources, electric cars are a potential way to cut greenhouse gas emissions and combat climate change. Although electric vehicles are more expensive up front, they provide long-term fuel and maintenance cost savings, making them a financially feasible alternative for some buyers. The driving range of electric vehicles is increasing as battery technology improves, and the installation of more charging infrastructure is making them a more convenient option for drivers Government incentives, market demand, and technology developments are accelerating the use of electric cars.

With rapid torque and silent operation, electric vehicles provide a better driving experience than conventional gas-powered vehicles, making them a desirable alternative for drivers who value performance.For many customers, the high initial cost of electric vehicles remains a deterrent, but for some, the long-term fuel and maintenance cost reductions may make them a financially sound decision.

Electric cars provide tremendous environmental advantages, but there are issues that need to be resolved with the manufacture and disposal of batteries. We can lessen our reliance on foreign oil and improve our energy security by using electric cars.

Autonomous electric vehicle development has the potential to transform how we see transportation, making it safer, more effective, and more sustainable.

Continuous research and development is necessary for electric cars, a quickly developing technology, to continue to advance and be used by more people.

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