DESIGN AND IMPLEMENTATION OF ELECTRICAL BUGGY

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Abstract

In our present days as we are using IC engine vehicles for any kind of transport or any other purpose. As we use diesel, petrol, kerosene and other kind of fuels for working of these engines. That increases the pollution in the environment. So, as the pollution is increasing day by day and also the fuel is getting depleted, we should look after an alternative source in replace. According to the recent survey we can hold our fuels like oil, petrol, diesel etc. up to 50-60 years. So, we are moving to the renewable energy sources for all kind of things like power generation etc. We can replace IC engines with an electric motor and the fuel can be replaced by rechargeable batteries. We can charge those batteries with renewable energy sources like Solar energy, Wind energy etc. In this we are using an electrical motor in place of IC engine to run this vehicle. We installed this concept in ATV (all-terrain vehicles).

Keywords: All terrain vehicles (ATV); Energy management system; Alcohol detection; Finger print sensor; Arduino; Relay circuit.

I. Introduction

Electrical buggy is a fully electrically controlled vehicle. Generally, the ATV (all-terrain vehicles) are working with IC engines So we are replacing this engine with an electrical motor [I]. This ATV is generally used in hilly areas like mountain climbing, and on uneven surfaces. These vehicles will move very easily on any kind of surfaces. The main thing required in these vehicles is the force required to run the vehicle in uneven surfaces and at climbing. So, in electrical words the main requirement is torque. It is the force produced by an electrical motor to reach our requirements. In this vehicle we are using a 3-phase induction motor, it produces the required torque to move the vehicle on any kind of surface. We use lead acid batteries for running of this motor. We can charge the batteries either by normal power supply or by renewable energy source like Solar energy [I]. We use a solar panel at back of the vehicle to charge the batteries. In this vehicle the most important part is the mechanical part, when the vehicle is moving on an uneven surface the body of the vehicle is to be in constant position and only the tires should move by protecting the vehicle body from sudden shocks [II]. So, for this we install Shock absorbers for the smooth movement of the vehicle and the person sitting in that vehicle will feel comfortable when driving on an uneven surface. The tires we used for this vehicle is a...
button type tires which has the less contact of surface and the width of the wheel is also less for fast movement [IV]. As we see in our daily life that so many people are dying because of drunk and drive, so to avoid this kind situation we are using an Alcohol detecting sensor [III,V,IV, VII, VIII]. And we use a Finger print locking system for security purpose, the vehicle is accessible to the person whose finger print is registered in it. There is also a Vehicle tracking system in this vehicle by which we can track the vehicle with latitudinal and longitudinal values which sends the message of that values to a registered contact number.

II. Different parts in the construction of Electrical Buggy

In the design of electrical buggy several equipment’s are required. The various parts are:-

i) 3 phase induction motor  
ii) Battery  
iii) Motor controller  
iv) Mode changer  
v) Arduino board  
vi) Alcohol detecting sensor  
vii) Finger print sensor  
viii) Vehicle tracking system  
ix) Relay Circuit  
x) Shock absorbers  
xii) Mechanical Suspensions.

2.1 3-phase induction motor

For the movement of any vehicle motor is required. In the design of electrical buggy 3 phase induction motor is preferred because it produces high starting torque, good speed regulation and overload capacity. Its full load efficiency varies from 85 to 97%. Fig 1 shows the 3-phase induction motor.

Fig 1: 3-phase induction motor

2.2 Batteries

The idea of electrical buggy is to design it in complete electrically controlled mode. In order to achieve the desired idea batteries are employed. Depending on the specifications accordingly the number and ratings of batteries are chosen. Fig 2 represents the type of battery available in the market.
2.3 Motor Controller

In case of electrical buggy the motor used should have a motor controller which is an electronic device which is used to control the motor. The power available from the batteries is a single phase and we convert that single phase to three phase and given to the motor, the entire process and control is done by the motor controller. Fig 3 represents the motor controller.

2.4 Mode changer

As it is a non-gear vehicle, we require a mode changer to change the mode of the vehicle to go front and back. This mode changer consists of 4 modes they are:

- a) Neutral
- b) Forward
- c) Boost
- d) Reverse

Initially the vehicle should be started in neutral mode and when the key is turned on the vehicle starts and the mode changer knob is moved to forward mode and when the acceleration is given the vehicle starts moving. For reverse mode we need to keep the knob in reverse mode. For each and every step of mode changing initially we should bring the vehicle to neutral except from forward to boost. Fig 4 represents the mode changer.

2.5 Arduino

Arduino is an electronic device which is used to run the any kind of sensors in our required manner. It can be done by writing the required code into it. Microcontroller is used in it to run the specific operations. The code is in normal C language. This board consist of the power controllers, Analog and Digital pins for connecting the sensors. There is also Transmitting and Receiving pins for communication with modules like GSM, GPS etc. Fig 5 shows the Arduino Board.
2.6 Alcohol Detecting Sensor

This sensor is used to detect whether the person had taken alcohol or not. The sensor is MQ-3 alcohol sensor. Initially the person should blow the air in front of this sensor and if the air containing alcohol level is not within the specified limit then the sensor gives an alarm connected to it and vehicle will not start. During driving also if driver is drinking alcohol it will detect the alcohol level in surrounding air and firstly it gives an alarm sound for 2 min and after 2 min the vehicle slowly stops. Fig 6 shows the chip used in alcohol detecting sensor.

2.7 Finger print Sensor

This sensor is used for security purpose. The sensor is R307. The vehicle is accessible to only the persons whose finger print is registered in the sensor. We can register up to 1000 finger prints in this sensor, this sensor also consists of a small memory to store finger prints. The time taken by this sensor to read a finger print in approximately 1-2 sec. While driving if a finger is kept on the sensor which is not registered the alarm sound is produced and the vehicle stops after 2-3 min. Fig 7 shows the fingerprint sensor.

2.8 Vehicle Tracking system

This system consists of GPS and GSM modules that are used to track the vehicle and send the location message. Initially when the GSM module receives the message from any tracker, it sends an signal to the Arduino and Arduino will send another signal to GPS to track the location and GPS send the latitudinal and

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Fig 5: Arduino Board

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Fig 6: Chip used in alcohol detecting sensor

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longitudinal values to the GSM module and that GSM module will send the message of valued to the registered mobile number. This are connected to the transmitter and receiver ports of Arduino. Fig 8 shows the vehicle tracking system.

![Vehicle tracking system](image)

**Fig 8: Vehicle tracking system**

2.9 Relay circuit

The relay circuit is used to operate all the above-mentioned equipment’s. If any one of the cases, weather alcohol sensor or finger print sensor is failed the relay circuit will disconnect the vehicle from battery. Fig 9 shows the relay circuit.

![Relay circuit](image)

**Fig 9: Relay circuit**

2.10 Shock absorbers

When the vehicle is moving on uneven surface if gets sudden shocks, so to avoid those sudden shocks, Shock Absorbers are used and this are arranged at an inclination of about 45 degrees. This can be operated according to the arrangement of suspensions. Fig 10 shows the shock absorber.

![Shock absorber](image)

**Fig 10: Shock absorber**

2.11 Mechanical Suspensions

It is the mechanical part in this vehicle. It is also the most important in the movement of the vehicle. The body of the vehicle is almost depended on the...
suspensions for this kind of vehicles. The arrangement of the suspension angle is between 45-50 degrees. Fig 11 shows the mechanical suspensions.

![Fig 11: Suspensions](image)

### III. Operation of electrical buggy

Electrical buggy uses different parts in its construction. The designed electrical buggy follows the set of operations as shown in Flowchart 1. The operation can be explained in steps as:-

i) On starting alcohol detection and fingerprint is tested. If both the tests are passed then it indicates green light and mode change comes into picture. If anyone of the test fails red light glows and vehicle stops.

ii) After the mode changer comes into operation it checks whether the vehicle is in neutral position or not. If it is neutral then mode changes to forward or reverse otherwise mode will not change.

iii) After mode changing into forward or reverse alcohol detection is done during driving. If the result is yes the vehicle stops otherwise the drive continues and vehicle tracking can be done.
Alcohol detection and Finger print test passed

Indicates Green light

Mode changing

If Vehicle is in Neutral Mode changing Forward/Reverse Indicates Red light/vehicle will stop Mode will not change

If Alcohol is detected during driving vehicle Tracking is needed

Received the vehicle track message/alert

Track the location and send the data to registered mobile number

No operation

YES

NO

YES

NO

YES

NO

NO

YES

NO

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IV. Conclusion

The designed electrical buggy completely operates on the electrical energy supplied by the battery installed in the buggy. Many vehicles are now operating on this principle and are in demand because it reduces the pollution levels and helps in environment conservation. The vehicle designed can be used in all terrains and does not cause any strain to the user. The charging of battery can be done by using renewable sources of energy particularly solar. On installing the solar panels on the top or back of the vehicle it can act as charging source for the vehicle.

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