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DESIGN AND FABRICATION OF ON ROAD REAL TIME E CAR UTILIZE TO TESTING AND IMPLEMENT THE SELF DRIVING CAR USING AI TECHNOLOGY

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Abstract: The aim of this project is to portray a constructed Electric Automobile for research purposes in order to build real-time on-road self-driving car utilizing machine learning and neural network algorithms with a Raspberry Pi controller. This autonomous automobile was built using a Raspberry Pi and an Arduino UNO with a camera. To manage the car, all impediments and traffic signs must be identified. As a result, in order to take use of advanced technology such as electric cars and artificial intelligence, this study paper depicts the design and manufacturing of a self- driving automobile that uses machine vision technology to operate a real-time driverless vehicle on the road. The driving motor is attached to the differential unit of this automobile, which has four tyres. A 24 V DC BLDC motor with a speed controller is utilized to adjust the speed. The driving motor is attached to the differential unit of this automobile. This BLDC motor runs on a 24V DC power supply and is connected to a 24V DC lithium battery through a speed controller. The entire setup is made out of 18mm square tube channel. The E car's steering is handled by a rack and pinion steering system.

Keywords: BLDC motor, BLDC motor speed controller, lithium batteries,

1. Introduction;

Today in automobile industry making the four wheeler car uses the latest advanced technology utilizing Electronic Control Unit (ECU) with various sensors. Further in the advancement of artificial intelligence technology, the four wheeler car runs without the need of driver and so it is called self-driving car. To make the self-driving car, it is very important for automatic steering control and can be implemented in battery car reducing the so much of needed design. Already the battery cars are running in the road resulting zero pollution. To implement the self-driving car in real time mode, four wheeler battery car is needed.

This paper exposes the model of battery car and fabricated using low cost used components from the old four wheeler car components like differential unit, shock absorber, rack and pinion steering mechanism and wheels with drum type brake unit. Here the electrical components like BLDC motor, drive controller and lithium batteries are utilized to satisfy the four wheeler battery car which is further going to make self-driving car. The model of this battery car is designed in solid works and simulated the design model. Here the chase is fabricated as per the dimensions in cad design, thus making the resulting work by cutting, grinding and welding the metal tube to form the required structure of chase unit. All the components are assembled in the chase unit. Finally spray painting is carried out to get the attractive decorative finishing model of four wheeler car.

1.1 Literature review;

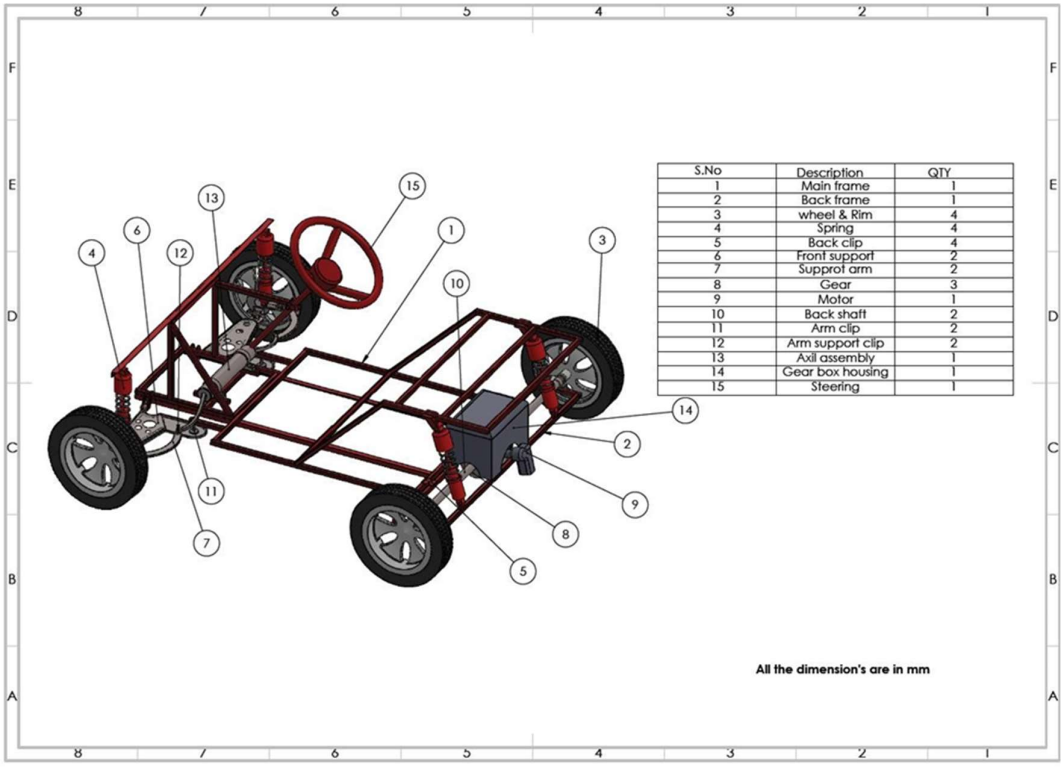
1.2Methodology;

Literature review: after researching on various journal papers, E Car manufacturer and service agency sponsored YouTube channel we collect the design ideas of drive concept and the components needed to accomplish the fabrication of E car.

Design of E-car: After arriving the design model for E-car, the differential gear unit is assembled in the rear axle and the steering mechanism with front and rear wheels are fitted at its position. Finally fitted the BLDC motor to the differential gear input coupling through the chain drive.

Calculations on E-car: After the design of E-car using solid works modelling software, find out the calculations required for the pulling capacity, speed, horse power of the motor and controller unit of E- car.

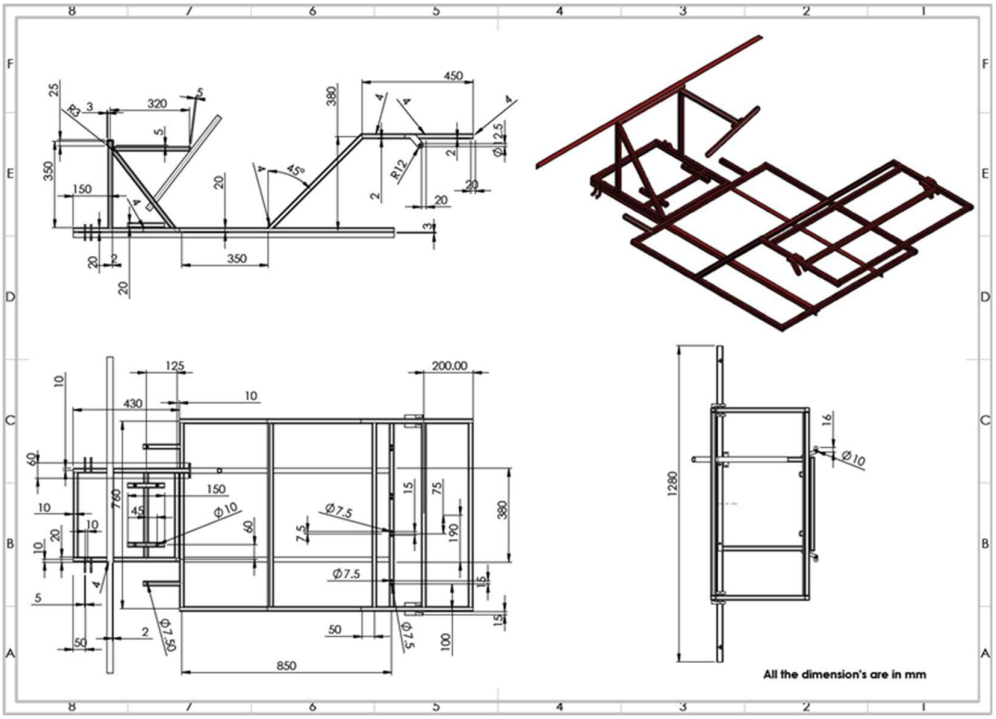
Selection of components: After arriving the calculations, all the electrical components are purchased to match the capacity and range. The purchased components are shown in figure .2

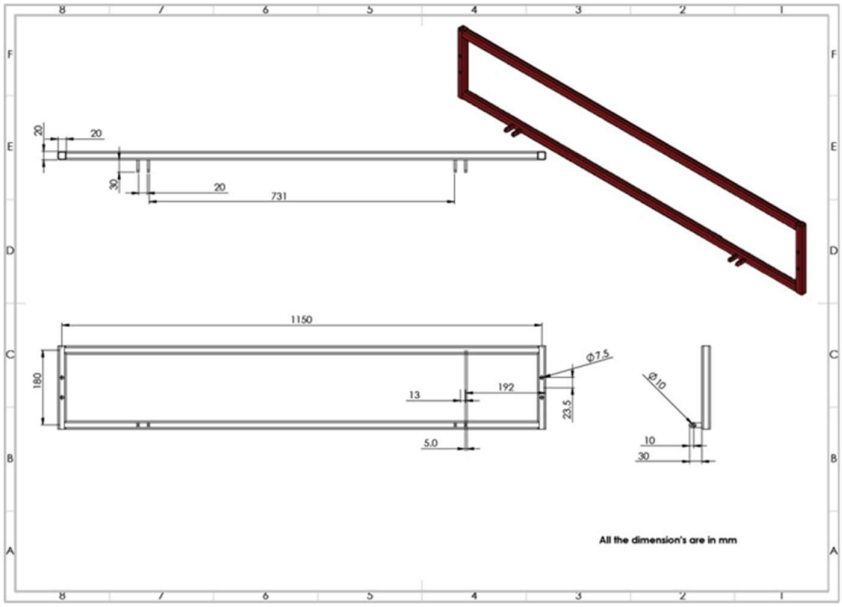


S.No	Description	QTY
1	Main frame	1
2	Back frame	1
3	wheel & Rim	4
4	Spring	4
5	Back clip	4
6	Front support	2
7	Supprol arm	2
8	Gear	3
9	Motor	1
10	Back shaft	2
11	Arm clip	2
12	Arm support clip	2
13	Axil assembly	1
14	Gear box housing	1
15	Steering	1

Figure2; 48v 750 watts E Bike, Pedal Rickshaw Gear Motor Complete Kit

Fabrication: The E-car is fabricated using 25mm Square tube with 2mm thickness and many operations were carried out like cutting the tube, welding and finishing with grinding machine in order to make the E-car chase body.





Testing: After installing the electrical components and connecting the controller with the battery, various tests were carried out on the E-car like speed in kmph testing with accelerator, the load carrying capacity and the range of E-car (distance travelled by E-car on full charge).

i) First section is designed in solid works and fabricated as per the dimensions in the CAD design. The four wheels are assembled and drives from the motor is coupled to the rear wheels through the differential gear unit.

ii) Electrical control unit having BLDC motor, motor drive controller, accelerator and lithium ion batteries

Brushless DC electric motor:

In this four wheeler E- car is propelled by the 48v 750 watts capacity BLDC motor. The reason

to select this type of motor is easier to change the speed using electronic controller.

Calculations for the capacity of the BLDC motor purchased:

Weight of the E-car 60 kg
Maximum weight of the driving person 100kg
Total weight to be propelled –60kg+100 kg = 160 kg
Weight act on the each tyre i.e. Normal reaction acting on each tyre is 160/2 = 80 kg x 9.81= = newton on each tyre.
Force of friction on each tyre is F = coefficient of friction x normal reaction force F = 0.3 x 800 N
Torque required T = F x radius of the tyre
= 240N x 0.2m = 48Nm
Speed of the E-car;- v= rw
w = v/r (speed =10 km/hr)
= 10 x 1000 / 0.2x 3600
w = 14.60 radians/second w = 2x3.14 x N / 60
N = 60 x 14.6 /2 x 3.14 = 130 rpm
N = 130 rpm Power required;
P = 2 x 3.14 x 130 x 48 /60 = 720watts

48v 750 watts Gear Motor

48v 7.5AH EBike, EScooty, ECycle Lithium Ion Battery

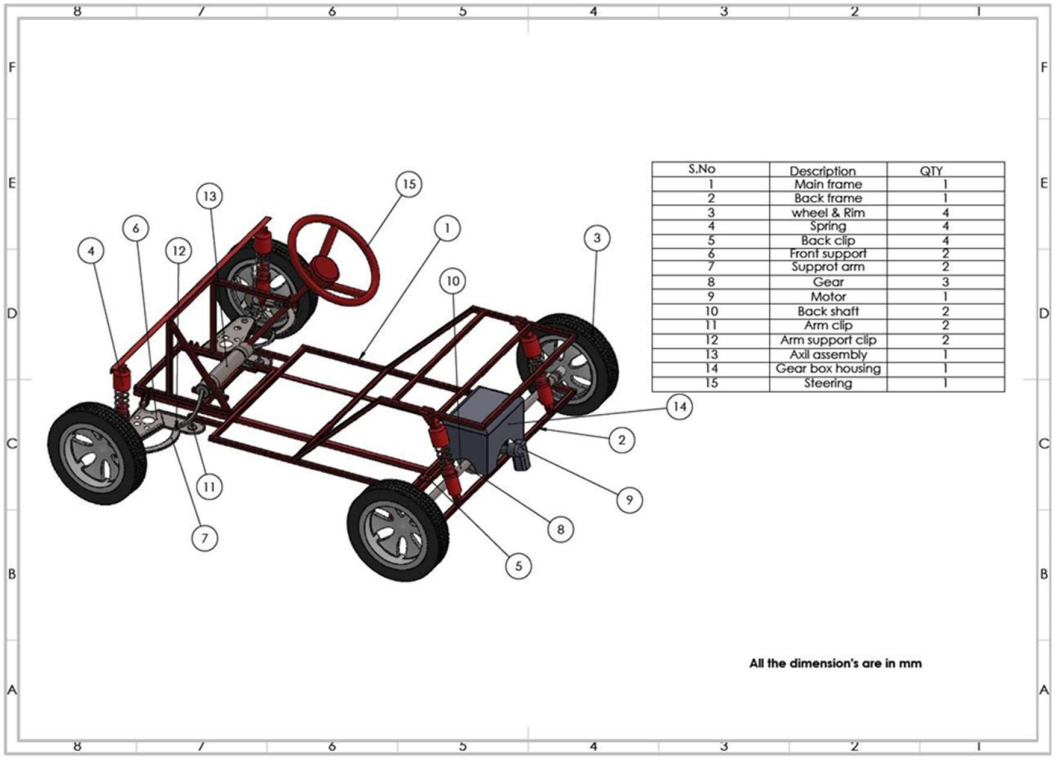
48v 3Amps Lithium Battery Auto Cutoff Charger, EBike ECycle Battery Charger

ECycle, EBike Throttle with Horn for 24v,36v,48v Compatible, Acceleration Handle

Working operation:

This E-car is propelled by the 48VDC, 750watts capacity BLDC motor connected through the controller to the differential gear transmission shaft. The speed of the E-car depends on the speed of the BLDC motor which is controlled by the controller through the signals from the accelerator. The controller is connected to the 48VDC /7.5AH lithium ion rechargeable battery .Hence the power supply to the motor is supplied from the controller. The various connections of speed (throttle) control, reverse direction of motor control, brake control, theft control, cruise control headlight lighting and horn system arrangement are shown in figure3.

PHOTO VIEW



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3D VIEW BY SOLID WORKS

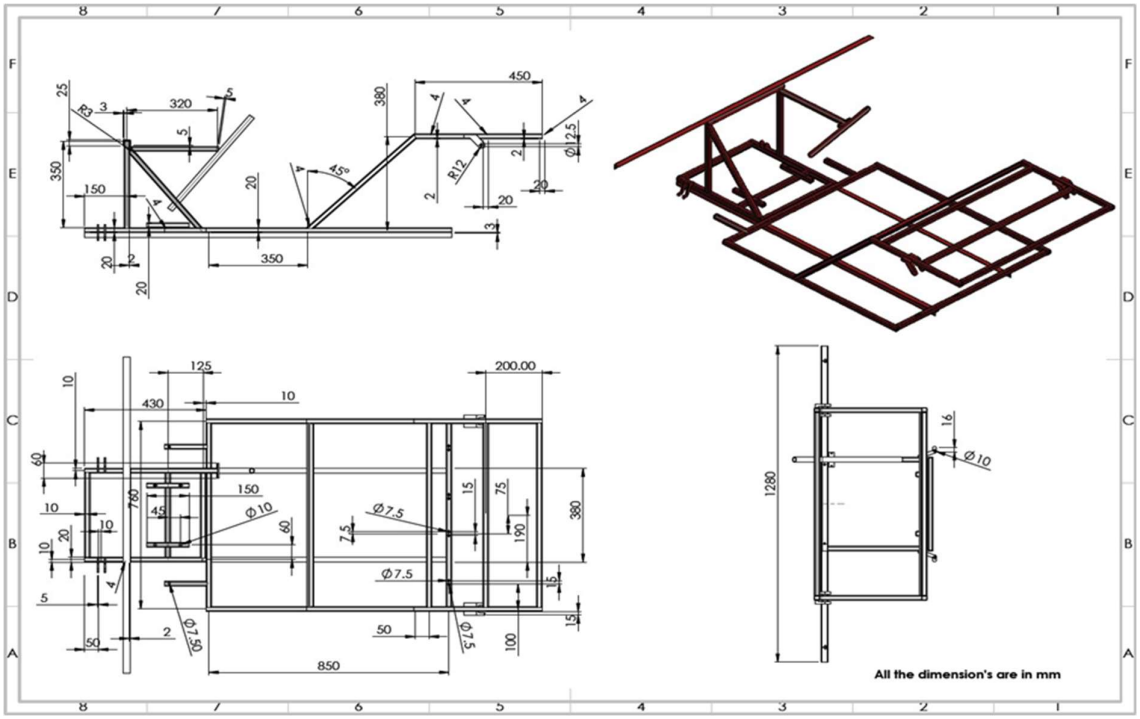

FIGURE ; FRAME DESIGN

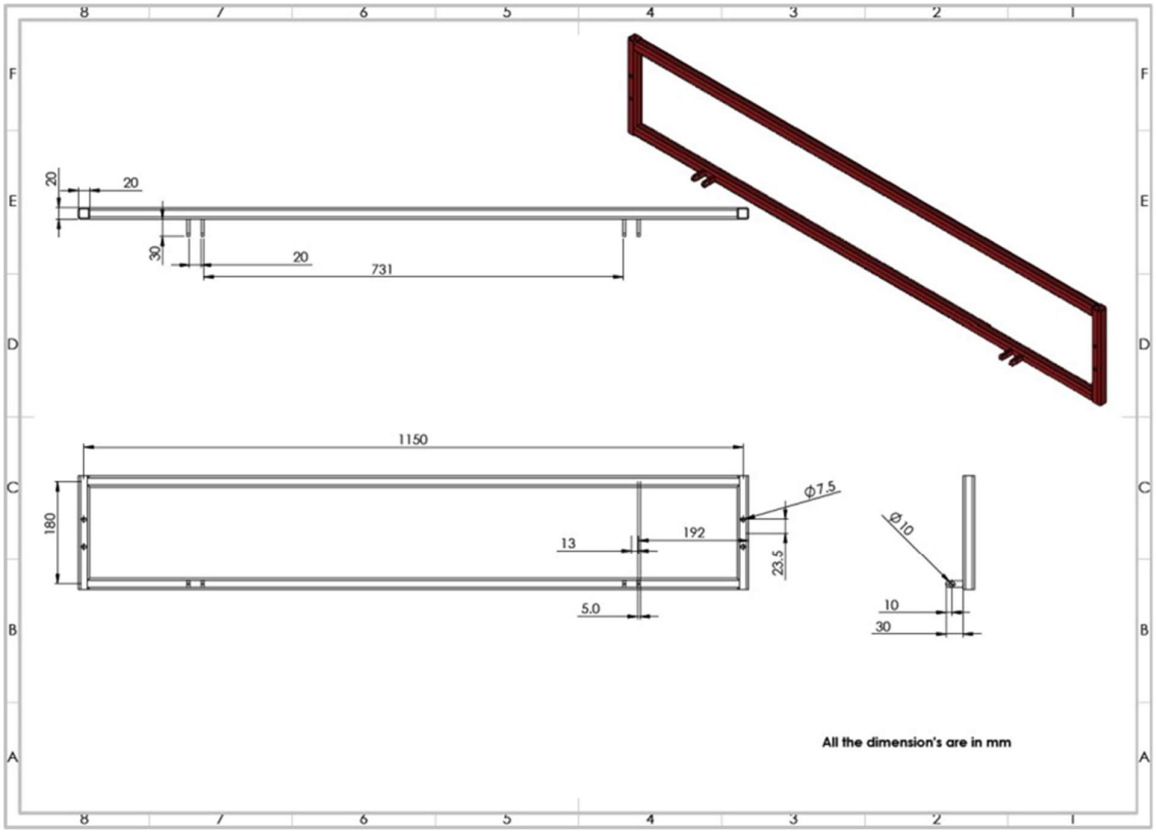

FIGURE ;BOTTOM FRAME

Results:

We are able to design E car with available used old car components along with new electrical components. After making this battery car tested in laboratory and trail run testing is made in road. The video for the test running is taken and the same is published in YouTube channel for further review and reference for this paper.

The range of E- car ride was successfully increased with the help of E –car kit by using Brushless DC motor (BLDC motor) to run the car and powered by the lithium ion battery .The entire unit set up was controlled by the controller board. The estimated range of E- car unit is 40km, with the speed of 30-40kmph and the torque obtained on the wheel is 28 N-m. E-cars are claimed to have a significantly lower environmental impact than conventional automobiles and generally seen aseco-friendly.

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