DESIGN & ANALYSIS OF ELECTRIC GO-KART

[1]Akarsh Balram H, [2]Eshaana S Udupa, [3] Akhil M, [4]Angadh P, [5] Gajanan M Naik
[1,2,3,4]Student, Department of Mechanical Engineering,
[5]Assistant Professor, Department of Mechanical Engineering,
[1,2,3]R V Institute of Technology and Management, Bangalore, Karnataka

Abstract - A kart is a small four-wheeled vehicle without suspension or differential. These are cheap, easy and safe modes of flat outdoor racing. Go-karts can use 2-stroke or 4-stroke engines, but batteries and electric motors are greener options. We replace the internal combustion engine of a generic graphics card with a battery and an electric motor, analyze the load and safety of the chassis with analysis software, and produce it as economically as possible. The main goal is to model, design, analyze and build a cost-effective, easy-to-use, fully functional and functional electric card without compromising performance.

Index Terms - Battery, Electric-Motor, Chassis

I. INTRODUCTION

II. Go-karts are a recreational racing sport that does not involve precision and professional vehicles. Drivers are not professionally trained and do not have to drive at high speeds. The vehicles are also very rudimentary and safe [1]. Traditionally, motorized go-kart racing has used small two-stroke and four-stroke internal combustion engines. Power is transmitted from the engine to the rear axle via a chain. There are electric go-karts that only require the go-kart batteries to be plugged into a series of chargers after each run. Because they are pollution-free and emit no smoke, racetracks can be indoors in a controlled environment. Electric karts powered by lead-acid batteries can run for a maximum of 20-30 minutes before performance is affected, while karts powered by lithium batteries can last up to 2 hours on a single charge [2,3]. Acceleration in an electric go-kart is usually better than in a classic gasoline go-kart, and the speed is sufficient for use. The torque of electric motors is usually greater than the torque of the gasoline engine equivalent. Electric go-karts are low-maintenance, requiring only the go-cart's lead-acid batteries to be plugged into a series of chargers after each run. Because they are pollution-free and emit no smoke, racetracks can be indoors in a controlled environment. Most fully charged electric go-karts powered by lead-acid batteries can run for a maximum of 30 minutes before the performance shows. Alternatives are lithium-polymer or lithium-ion batteries, which last longer and offer higher performance [4]. Electric go-karts do not have fuel tanks or other flammable materials, which can prove to be safer in the event of an accident. Despite lower maintenance, electric go-karts often have higher operating and parts costs because batteries and electric motors are usually more expensive than conventional motors, especially those powered by lithium batteries. Electric go-karts powered by lead-acid batteries are low-energy and have a very short battery life; these karts can only run for a maximum of 20 or 30 minutes before performance is affected, making them unsuitable for use in more serious racing. For this reason, more expensive lithium batteries are commonly used for professional electric kart racing [5-7].

II. Analysis

Parts: There are mainly five parts in karts. Engine, steering, transmission, brake and chassis.**A. Chassis**

The chassis is a very important element in the kart and must provide a suspension system using elasticity to provide good grip at the front. Go-karts have no suspension and are usually large enough to accommodate a driver's seat and a small engine. The chassis structure is usually a tubular structure and various degrees of GI are common as shown in Figure 1. This cart uses 1 inch diameter GI B grade pipe. This chassis supports engines, drive units, vehicle systems, etc.

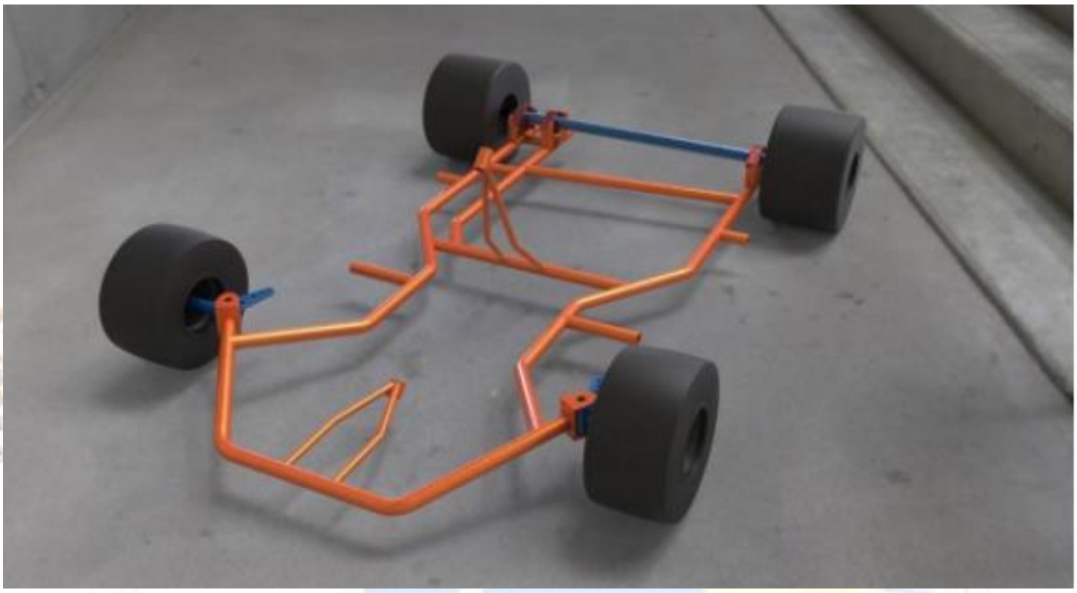

Fig-1 chassis

B. Steering System

The steering is very responsive. It is difficult to change the natural direction of the card as there are no spaces. But the two wheels are attached to the fixed axle and therefore must move together, so one wheel has to slide of f the track to turn. On this board we use a special steering system, discs and linkage. This body modification is widely used in racing cars, especially Formula 1.

In this system, the steering column is attached to a disc or plate, which is connected to the front two wheels usin g two links. When the steering wheel turns, the puck also turns, that is, the connection works and the wheel turn s according to the rotation of the steering wheel

C. Transmission system

The power provided by the generator is transmitted to the wheels through the gearbox. We use CHAIN ward B LDC motors which are better than PMDC and AC motors.

D. Electrical system Battery

48v, 60AH, passive balance BMS lithium-ion battery, specifications not reported, 13 wire lithium-ion is 40/80A continuous current, (glass fiber reinforced plastic + metal) volume, capacity 2.40kwh.

E. Tyres

Wheels and tires for karts are smaller than those used on modern cars. Tires will add grip and stiffness. And it c an withstand high temperatures. We use a 14" diameter front wheel and a 16" rear wheel on this board. It is use d for aerodynamic shapes.

Left leg actuated the pedal to actuate the brake

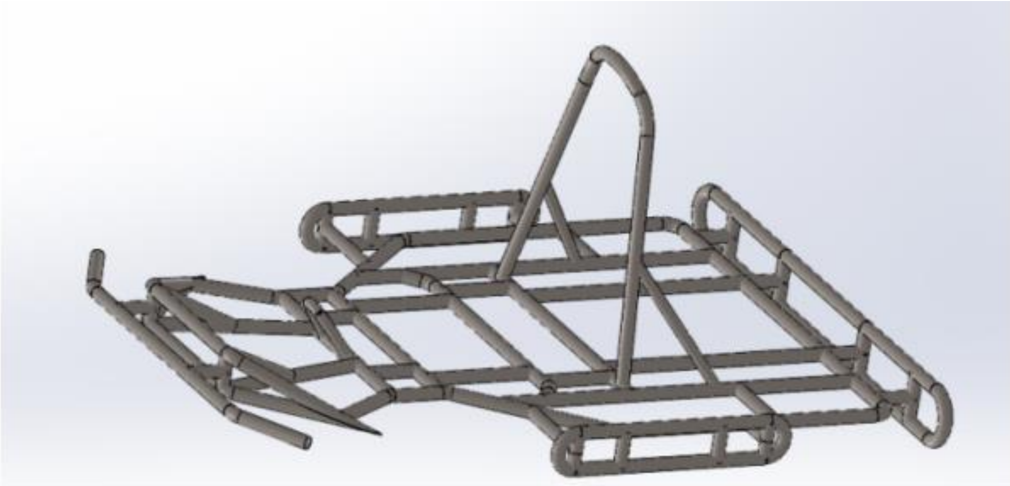

Fig. 2 Wire frame of chassis

III. Results

Impact analysis

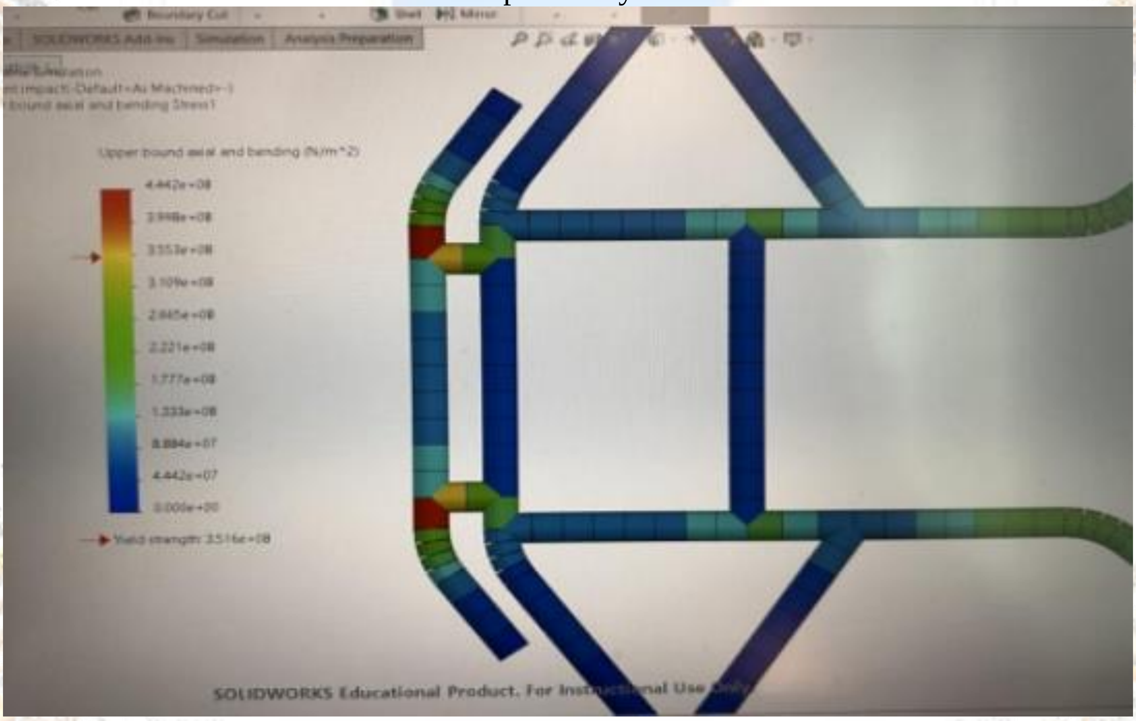

Fig-3 Stress for the front impact of the original structure.

The value was found to be 4.5x108 N/m^2

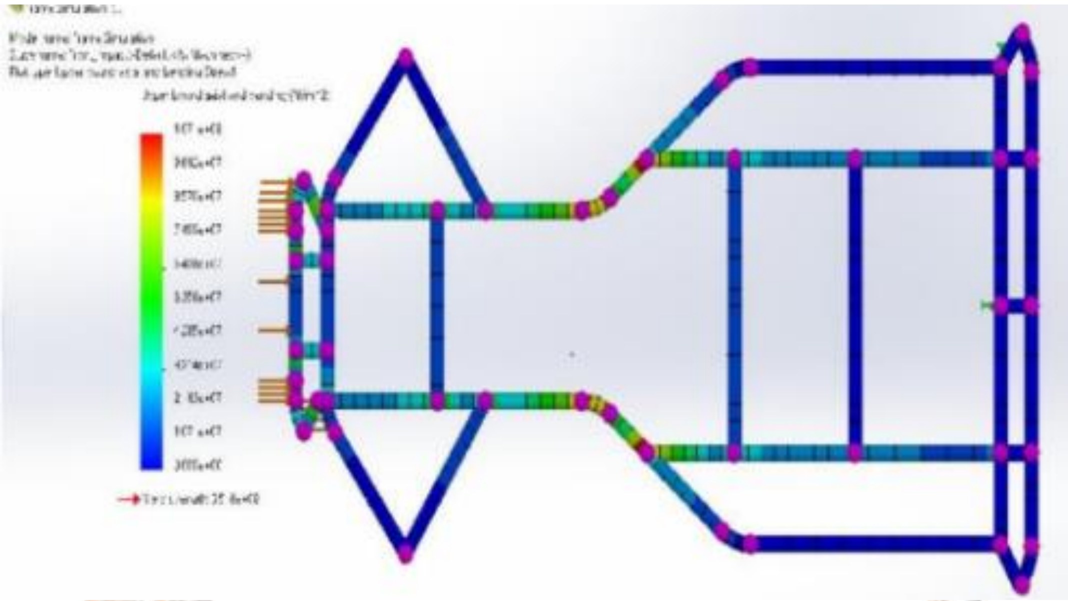

Fig-4 stress for the front impact of the corrected structure.

The stress value was found to be 3x108 N/m^2, Stress for the front impact before and after correcting the structure was found to reduce from 4.5x108 N/m2 to 3x108 N/m

Deformation:

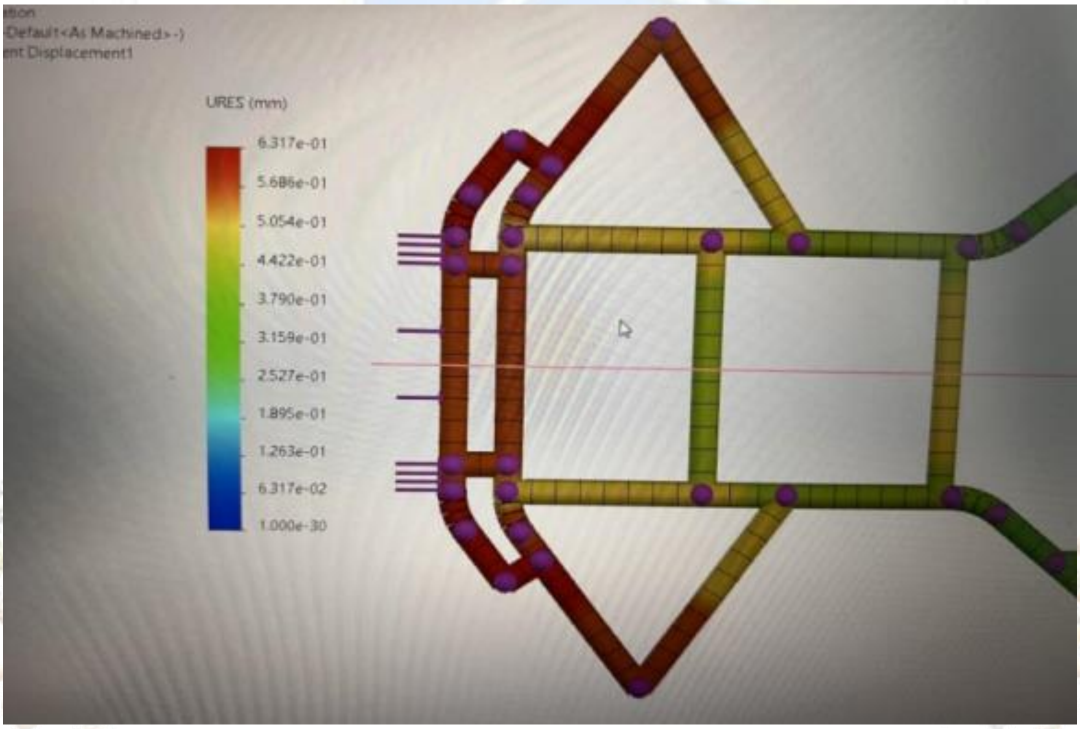

Fig-5 Deformation of the original structure for 800N load was 0.6mm

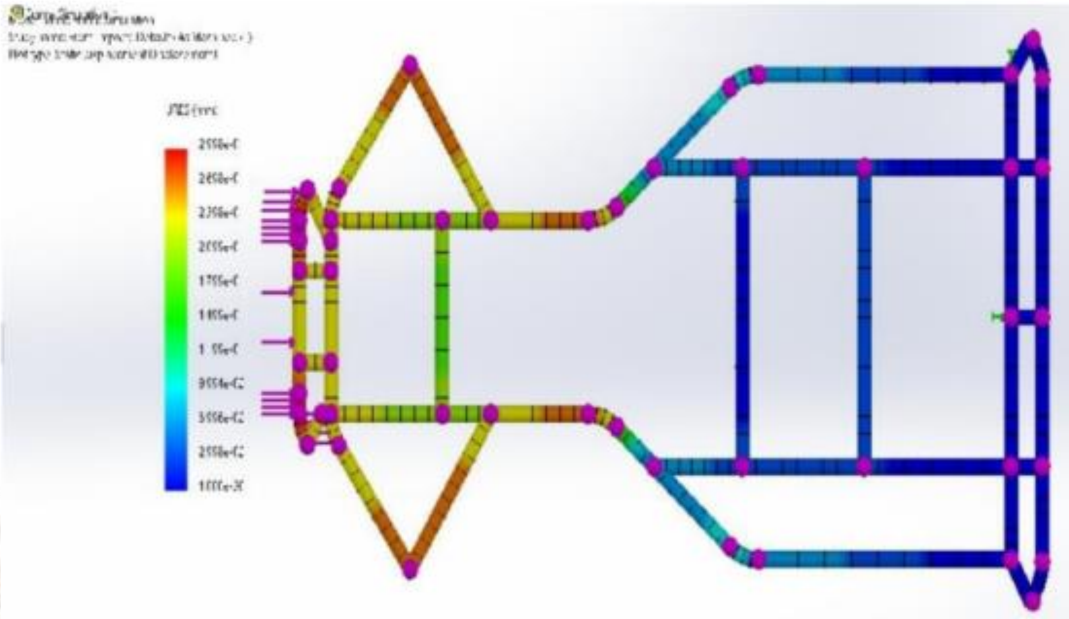

Fig-6 Deformation of the original structure for 800N load was 0.6mm.
Deformation before and after correcting the structure was reduced from 0.6 mm to 0.2mm.

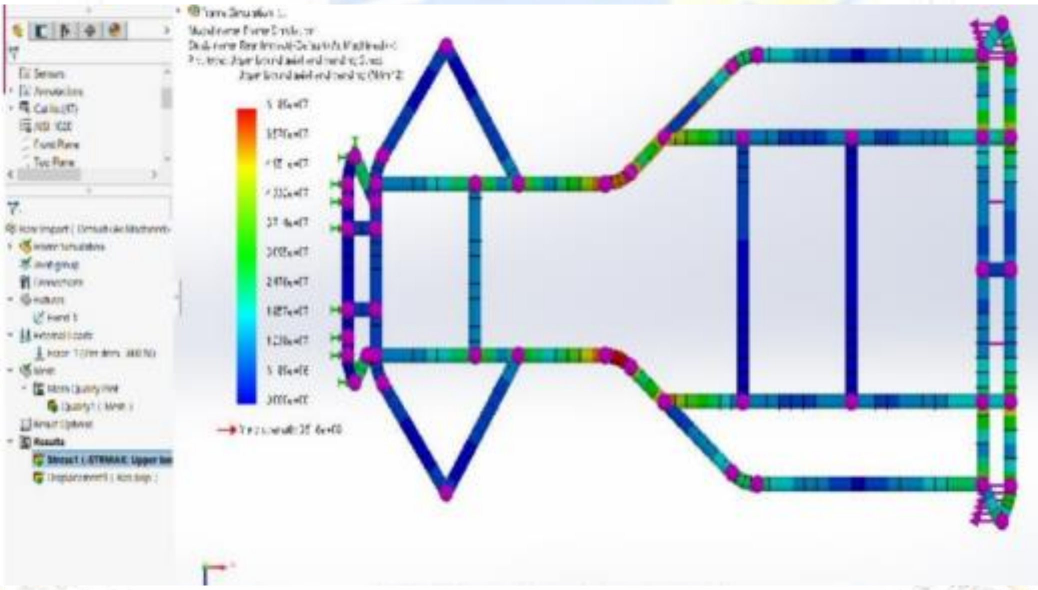

Fig-7 Axial Stress of Rear Impact for 800N force was found to be 6.1x107N/m2

Rear Impact:

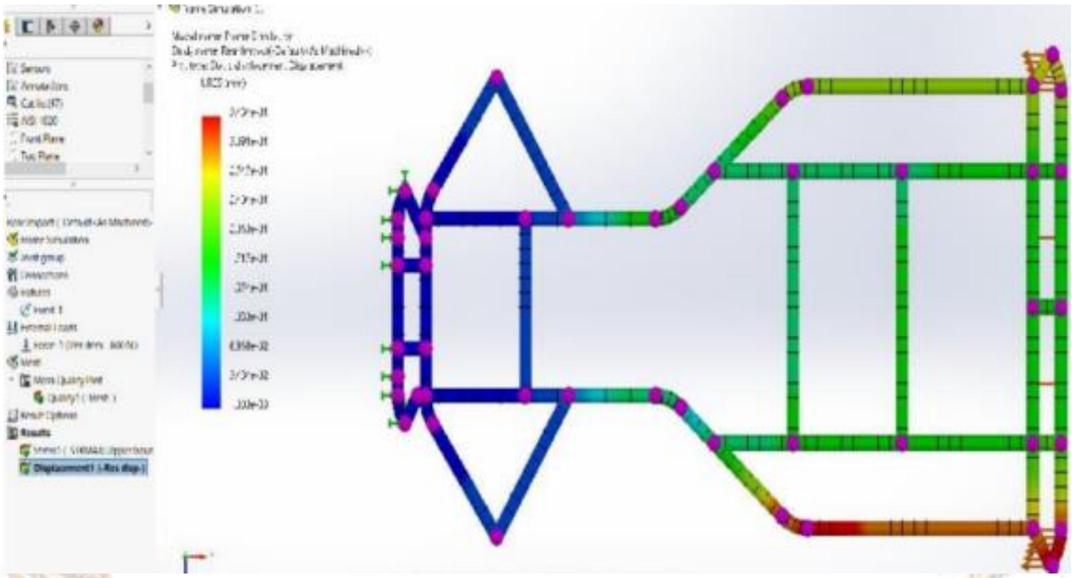

Fig-8 Rear Impact Deformation is found to be 0.34 mm.

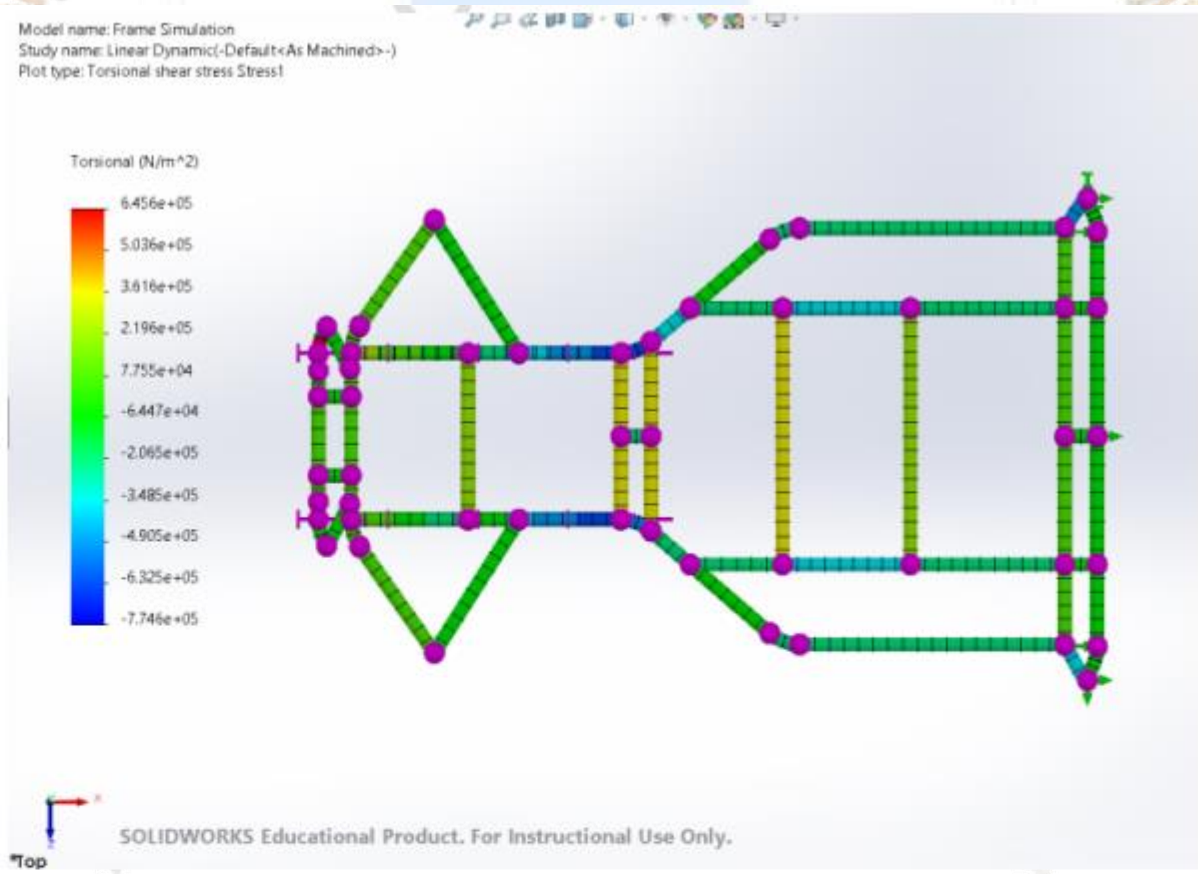

Fig-9 Torsional shear stress was found to be 6.4x105 N/m2

Fig-10 Deformation due to torsion is 0.21mm

Static Analysis:

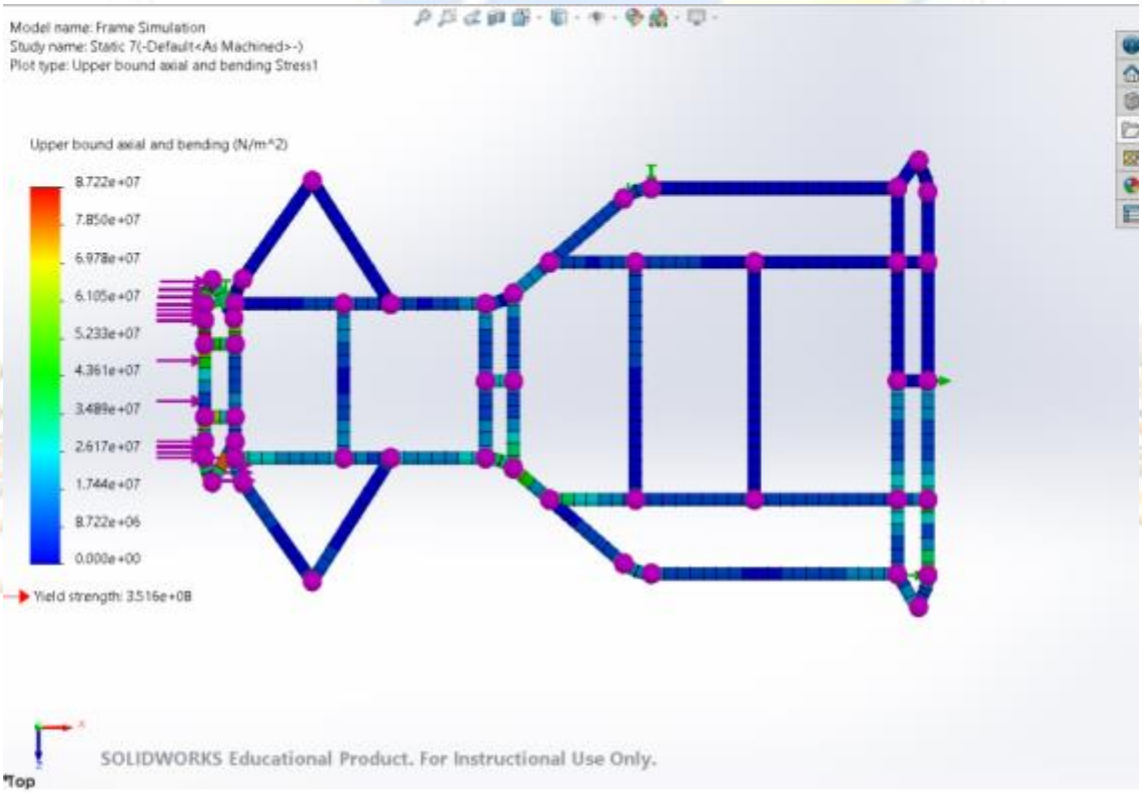

Fig-11 Stress due to static analysis is s 8.72x107 N/m^2

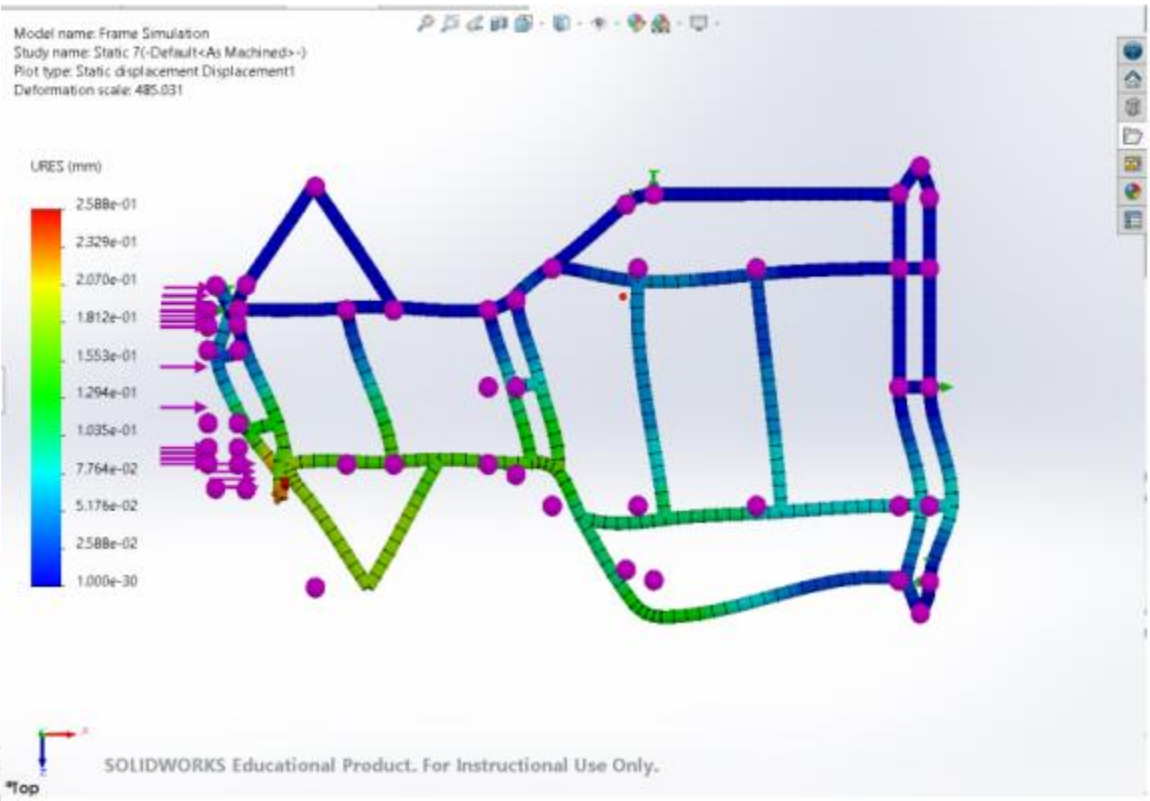

Fig-12 Deformation due to Static load analysis is 0.25mm

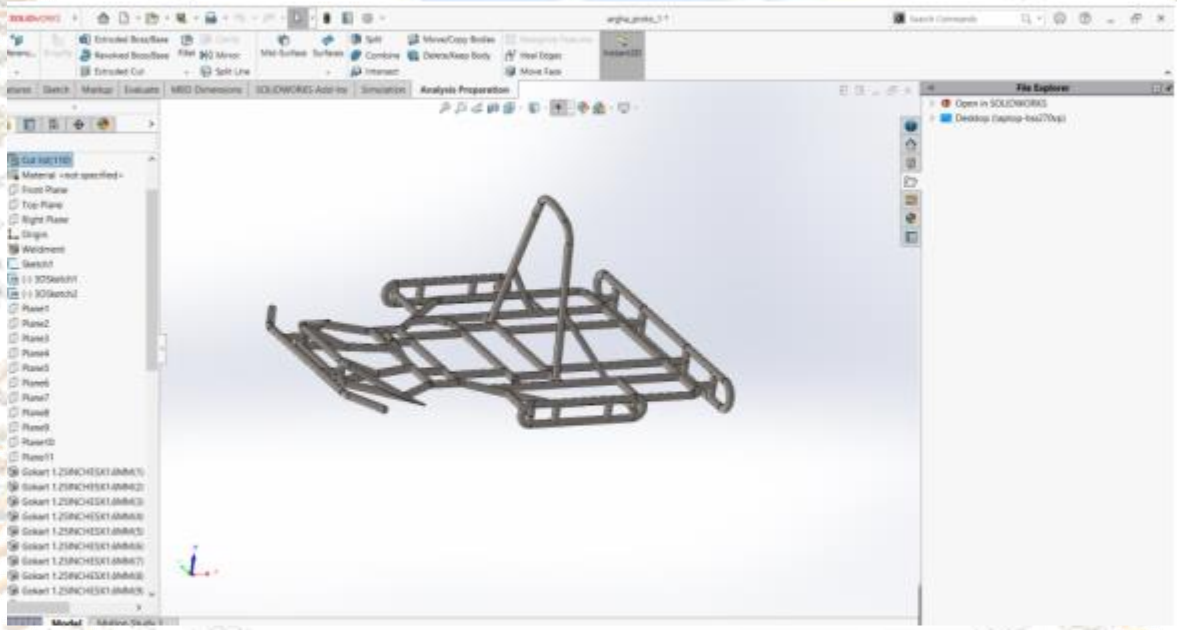

Fig-13 Final 3D design of the chassis after subjecting to various tests and simulations

Performing the tests and analyzes described above provides an understanding of how the model behaves accord ing to the demands of the load, allowing the chassis design to be improved and optimized as needed**.**

Conclusions and Future scope

Our goal with this project is to create a car that combines the principles of electricity and technology, and stand s out in terms of aesthetics and ergonomics. With its very light and strong chassis, elegant steering, efficient bra king system and maximum power/mass ratio, the car easily passed all static and dynamic tests.

Electric go-karts are a growing business and young people want to learn more about the sport of driving without pollution and noise and this is a phenomenon nowadays In the car industry, most of the students are passionate about racing. Students and teenagers are hot cakes for the growth of this industry. These electric cars are low-cost and safe products that come in attractive designs and are fun to drive.

This is the perfect ball for competition. The idea is to provide our visitors with the safety and entertainment they seek.

REFERENCES:

[1] Abhinay Nilawar, Harmeet Singh Nannade, Amey Pohankar and Nikhil Selokar, "DESIGN OF GO-KART", Maharashtra,India, IJFEAT, ISSN: 2321-8134.

[2] Baja 09 design report: Paper Number-TTTITM2 Uploaded by Midhun Davis

[3] Kanaad Bhardwaj , Mahesh Kumawat, Abhinav Pamecha , Aryan Sharma, Hemant Choudhary , Dhruv Rana , Ajit Singh Gour and Atul Katara " Design and Performance Evaluation of an Electric Go-Kart " IJARIIE-ISSN(O)-2395-4396 Vol-6 Issue-3 2020

[4] "Electric Vehicle Technology Explained" by James Larminie and John Lowry published 2012 by John Wiley and sons limited.

[5] Ravindra Laxman Gaikwad, Prathmesh Vishwas Waghmare, Lalit Daulatrao Deo and Akshay Mukesh Mutake , Matoshri College of Engg & Research Centre, Nashik, Maharashtra, (India) "DESIGN OF GO-KART VEHICLE SYSTEM", ISSN: 978-81-932074-7-5

[6] "Practical Finite Element Analysis" by Nitin S Gokhale, Sanjay S Deshpande, Sanjeev V Bedekar and Anand N Thite published 2002 by Finite to Infinite.

[7] "Design and Simulation of 4 Wheel Steering System" ISO 9001:2008 Certified International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 12, June 2014