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Review Paper on Study of Design and Analysis of Go-Kart Chassis

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***Abstract:** This paper focusing on theoretical understanding of the design and engineering aspects of making Go-kart chassis. We are made the Go-kart with a few restrictions. This paper deals with objectives of assumptions, calculation and analysis of Go-kart chassis. The design of Go-kart chassis is chosen in such that the kart is easy to fabricate in every possible manner. The main purpose of this review is to explaining the modeling and then further analysis on it.*
***Keywords:** Design, Assumptions, Analysis*

I. INTRODUCTION

In this world of Automobile different types of vehicles are present for different purpose like traveling, transporting, defense, security, racing, etc. but go-kart is specifically used for racing and amusement purpose. The simple definition of Go-kart is that, the vehicle has no differential and suspension less. It is simple four-wheeled, self propelled, light weighted, compact, single seated and open wheel racing car. The first kart was built in California in 1956. There are various Go-karting championships held all over the world like Formula 1, BAJA, Go-Karting, SUPRA, etc. Go-Kart is usually used as a low-cost and relatively as per driver comfort. The county like America and Europe it used as on road vehicle.

The karting is adventurous and great sport for those people who love it. So it is very important to make vehicle safer and cost effective. This paper deals with design and of chassis frame for Go-kart and various loading tests on it like front impact, rear impact and side impact. The modeling and analysis are preformed on CREO 3.0 and ANSYS WORKBWNCH respectively. The chassis is designed in such way that it requires less pipes and ability to withstand with optimum loads applied on it with no compromise in strength and stability. Moreover, the chassis is made by welding pipes together.

Go-Karts are usually raced on any plain tracks with speed breakers. However, these vehicles are not designed for transportation and it is considered illegal in most places to drive them on road.

II. DESIGN METHODOLOGY

In a way to get better strengthful design for Go-Kart chassis there is some protocol is to be followed like step by step stairs to go upside. The design methodology of our kart chassis is illustrated as per following flow chart.

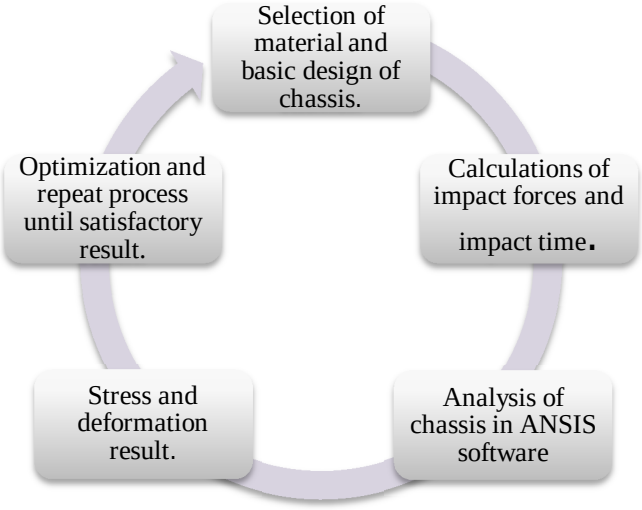

Figure 1: Methodology Of Frame Design

III. SELECTION OF MATERIAL

The amount of carbon in steel is important factor to determine the hardness, providing desired strength, endurance, safety and reliability of the vehicle. The main chemical component of steel is carbon percentage which increases the hardness of the steel. Generally, the materials used for chassis frame are various grades of steel, cast iron and aluminum alloy etc. Aluminum alloys are expensive than steel so mainly steel is used for construction of chassis. There are three commonly used materials for construction chassis are AISI-1018, AISI-1026 and AISI-4130. But we use chassis material as AISI-4130 which is a type of medium carbon steel and it has more hardness compare to AISI-1018 and AISI-1026. This material is selected due to its good availability, light weight, better weld ability and comparatively easy machining.

Properties	AISI 1018	AISI 1026	AISI 4130
Density (gm/cm^2)	7.8	7.8	7.8
Elasticity (GPa)	210	210	210
Elongation %	18 – 19	17 – 27	18 – 26
Strength to weight ratio (KNm/Kg)	55 – 60	60 – 68	72 – 133
Thermal expansion (цm/mK)	11.9	11.9	11.8
UTM (Mpa)	430 – 470	470 – 530	560 – 1040
Yield Strength (Mpa)	240 - 400	415 - 450	435 - 980

IV. MODELING OF CHASSIS

The modeling of chassis is first starts with rough modeling by paper and pen with consideration of some parameters. Our main objective is to design the chassis for racing competition purpose. Hence we consider some fundamental parameters according from competition manual.

The modeling of chassis is done on CREO 3.0 by taking this basic parameter which is mainly required.

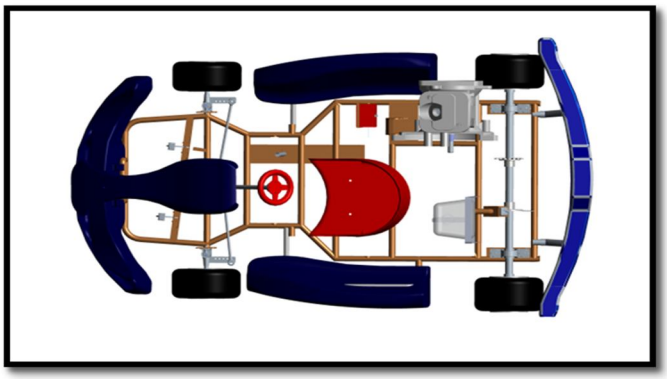

Figure 2: Design Of Chassis Frame On Creo 3.0

V. CHASSIS FRAME SAFETY ANALYSIS

The very important next step after designing is the finite element analysis of the chassis frame. In this step we are applying various load condition on different side of chassis frame to get value of deformation occur in the frame during accident or meshing with heavier and more rigid solid substances than it.

The chassis that we have modeled in CREO 3.0 it is then analyzed through static structural analysis using FEA tool ANSYS.

A. Finite Element Analysis

The effect of impact force on the chassis is done by the structural analysis. To determine the maximum deformation for worse condition the impact force testing is performed.

For protection of driver, the frame of driver cabin should resist the impact forces. The driver safety can be checked and improved by analysis.

B. Meshing

Meshing is probably the most important part in any of the computer simulation, because it can show drastic changes in result.

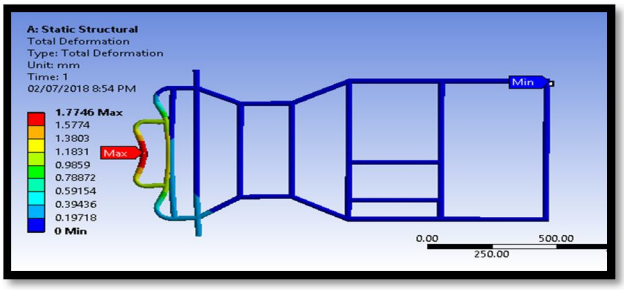

Figure 3

C. Boundary Conditions & Loading

Boundary value analysis testing technique is used to identify errors at boundaries rather than finding those exist in centre of the input domain. Boundary value analysis is next part of equivalent partitioning for designing test cases are selected at the edges of the equivalent classes. In loading the load of driver and every part which is mounted on the chassis is uniformly and equally distributed on the chassis frame.

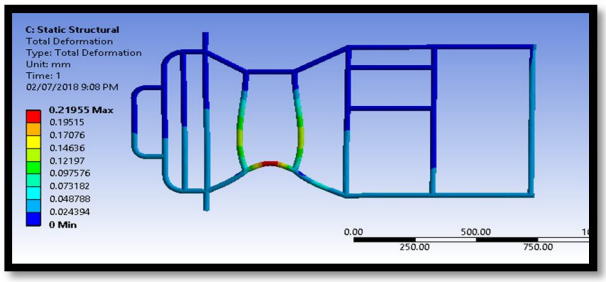

Figure 4

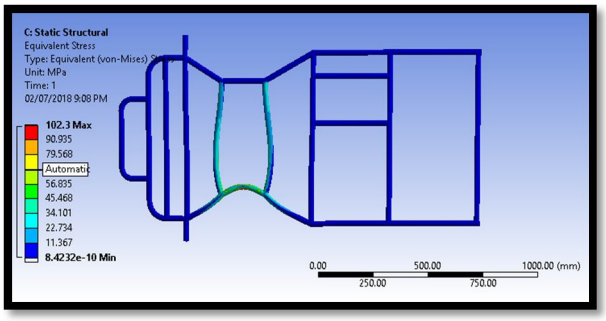

Figure 5

VI. CONCLUSION

The design and fabrication of Go-Kart chassis develops many skills. We fabricate our Go-kart according to the rulebooks of different competitions. We got the better result comparing to other karts. The FEA analysis of chassis is performed to evaluate the maximum stress on different member of chassis that can bear. From the analysis we can predict the chassis is safe or not and also by seeing the deformation and stresses modification in the kart chassis is possible. Some researchers and their research methodology with remarks are included.

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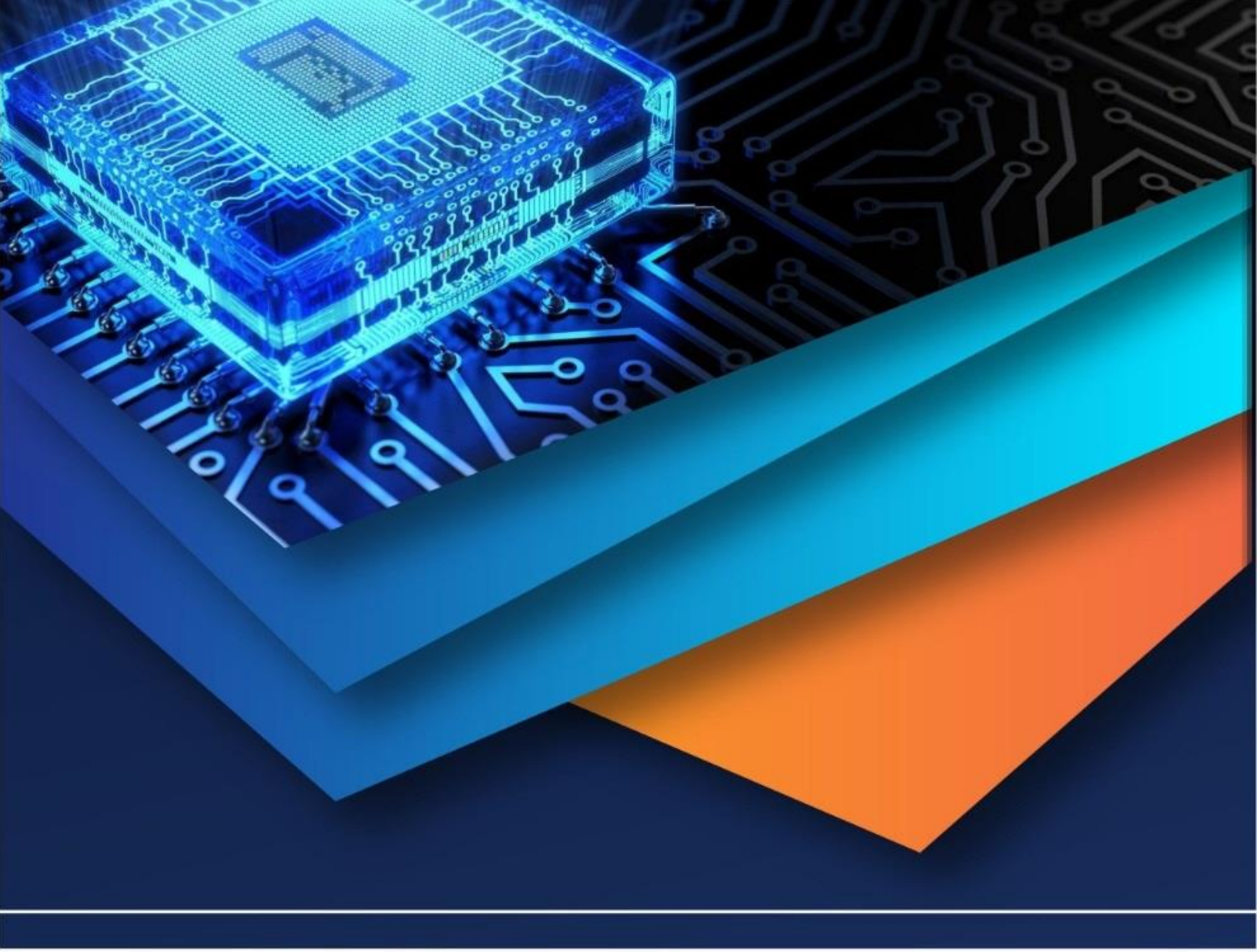

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