Journal of Science, Computing and Engineering Research (JSCER)
Volume-7, Issue-6, June 2024.
DOI: *https://doi.org/10.46379/jscer.2023.070608*

A Case Study Paper on Important Impact of Go-Kart race Application

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Article Information

Received : 02 June 2024
Revised : 06 June 2024
Accepted : 18 June 2024
Published : 22 June 2024

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Abstract— Go-Kart racing is a constantly growing concept all over the world. Go-Kart is four wheeled vehicle designed for racing and in some countries for enjoyment purpose also. It is not a factory made product. Kart racing is accepted as it is one of the most economic forms of racing. It is bridge between theoretical knowledge and practical knowledge. It is a fun activity. We have designed, fabricated and manufactured the Go-Kart for racing application. This paper includes design of ideas, imaginary concept, designing, analysis, teamwork, project management and development, costing and budgeting. The main objective of kart is to manufacture the kart within a given period time, without any loss of time. So the remaining time can be utilized to increase the performance of kart to get better result in racing. Most of time is wasted in manufacturing and fabrication of the various parts of kart.

Keywords: ***Dynamic latch comparator, speed, power consumption, high speed analog to digital converter.***

Citation: Ram Kartik, "A Case Study Paper on Important Impact of Go-Kart race Application", Journal of Science, Computing and Engineering Research, 7(6), June 2024.

I. INTRODUCTION

Go-Kart is four wheeled racing car that can be used by any one and can be made by professional and non-professional personal so. Driver in Go-Kart may or may not be professional. They denote Formula1 car in manners of speed but it is less costly. They are widely used for racing in America and now increasing its popularity in India because of cost effectiveness and racing thrill. Gokart is simple, light weight and easy to operate. Most of go-kart used simple mechanical principles to manufacture its body. As the popularity is increasing new participants are introducing themselves in competition. Each team has to the go through many positive and negative aspects throughout the designing process to achieve the exact solutions. We decided to stay focus on the event because of high point value. This was our first time, so the questions raised such as – How much timed design will consume? – How much time manufacturing will consume? – What will be the total cost of project?

II. RELATED WORKS

The following design methodology was used during design: – Requirements – Design calculations and Analysis – Considerations – Testing – Acceptance

III. BACKGROUND OF STUDY

Weight, and operator ergonomics. The number one priority in the chassis design was driver safety. By the competition rules and Finite Element Analysis (FEA), the design assured

IV. METHODOLOGY

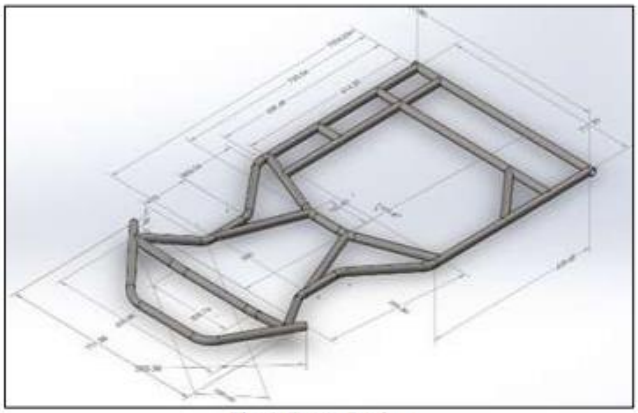


Fig. 1: Frame Design

Design The main components of the frame are divided into the two major parts: The front block (cockpit) for steering and seat position, etc. Rear block (engine compartment) for transmission and brake assembly. Both the blocks are separated by the firewall. The frame model can be viewed as shown below. Material The material AISI-4130 is used in the frame design because of its good weld ability relatively soft and strengthens as well as good machine ability. A good strength material is selected while designing the roll cage in order to absorb as much energy as possible to prevent it from fracturing at the time of high impact. AISI-4130 has chosen for the chassis because it has structural properties to provide the low weight to strength ratio.1-inch diameter tube with a wall of thickness of 2mm is used. The required

Properties were satisfied for the material Dimensions taken. The various physical properties of the material are as follow

Table – 1

SR. NO.	PROPERTIES	VALUES
1	-Ultimate Tensile Strength	440 Mpa
2	Yield Tensile Strength	365 Mpa
3	Yield Bulk Modulus	140 Gpa
4	Shear Modulus	80 Gpa
5	Modulus Of Elasticity	200 Gpa
6	Poisson's Ratio	0.3
7	Elongation At Break	21.5 %

The chemical composition of the material is as:

Table – 2

Carbon	C	0.246%
Manganese	Mn	0.536%
Sulphur	S	0.004%
Phosphorus	P	0.013%

The above mentioned properties satisfy the technical requirements of material which is to be used in a frame.

V. RESULTS AND DISCUSSIONS

Roll cage feature were 1st implemented by keeping on mind the safety requirements of the event. The 1st primary safety standard focused on during design was maintaining the proper clearance of the driver's body rest to the other rigid parts like engine compartment, firewall structure, and panel bracing of the vehicle. Once the basic requirements fulfilled the other safety design were implemented. The chassis was designed to give occupant extra space to operate the vehicle easily. The place of the fire extinguisher is designed in the easily accessible point and also the earthen foam padding is provided over the pipe adjacent to driver.

The Finite Element Analysis The aim is to carry out a design check of the given Go-kart chassis under estimated loading conditions and to minimize the weight of the frame keeping Highest Possible Safety Factor

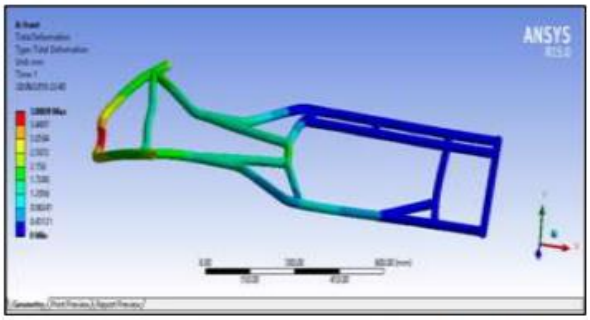
Material of the tubes is AISI 4130, Hot Rolled with properties: – Syt = 610 MPa – Sut = 664 MPa The following tests were used to check the design by using ANSYS 15.0 1) Front impact test 2) Side impact test 3) Rear impact test Front Impact Test: In this Test Chassis is tested, when it Strikes from Front. – Mass of the vehicle with driver 120 Kg – Velocity of vehicle is 16m/s – Consider impact time is 0.13 sec WD = ½ mv2 =1/2 *120*162 WD = 15360 J Calculating front impact force: WD = (F* Displacement) WD = F *(t*v) 15360 = F*0.13*16 F=7384.61 N Side Impact Test: In this test chassis is tested, when it strikes from Side. Consider impact time is 0.3 sec Calculating side impact force: WD = (F* Displacement) WD = F *(t*v) 15360 = F*0.3*162 Hence, F=3200 N

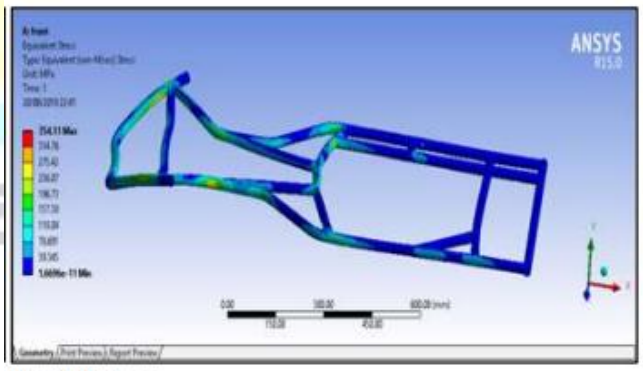
Table – 3

Test	Total applied Force (N)	Max. Deformation (mm)	Safety Factor Min.
Front Impact	7384.61	3.889	1.87
Side Impact	3200	2	1.9
Rear Impact	7384.61	17.53	1.82

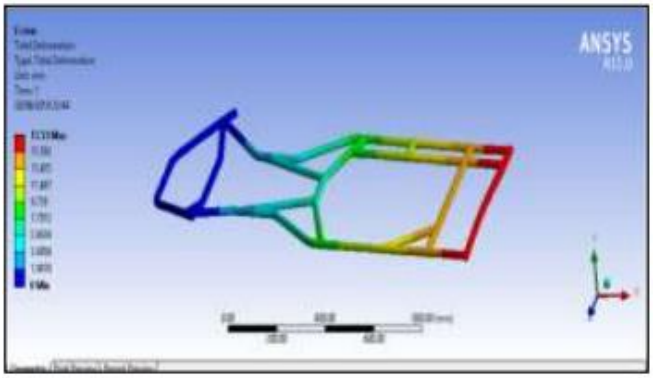
All the circuits are designed by using Cadence Virtuoso tool and simulated in 90 nm CMOS technology with the supply voltage of 0.6V. The output waveform of comparator shown in Fig 8. Power waveform of the single tail comparator is shown in Fig 9.

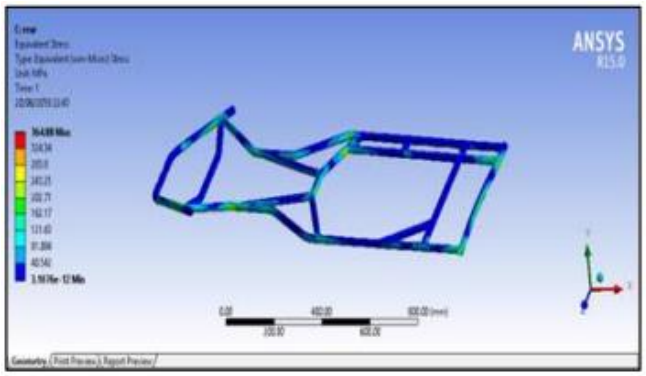
B. Front Equivalent Stress



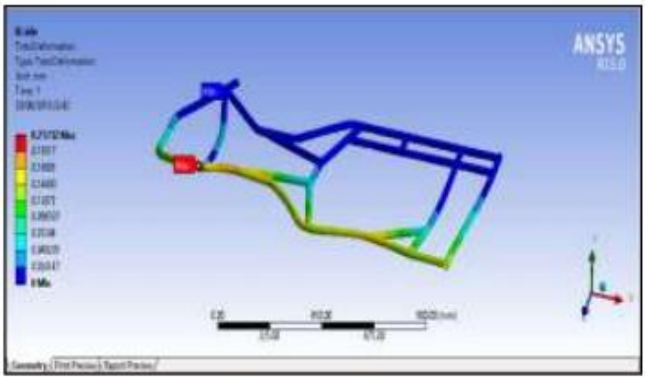


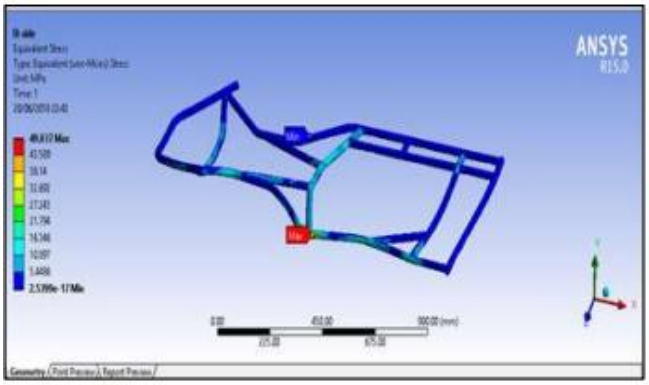
Rear Total Deformation





Side Total Deformation





VI. CONCLUSION

Comparison From the above calculation we have calculated that AISI 4130 is one of the best suitable material for the fabrication of the Go-kart chairs as it has the high weight to strength ratio which gives the better performance. The design of the chassis for the Go-kart helps to in finding the strength weakness of the design fabrication.

REFERENCES

[1]. P. Nirmala, T. Manimegalai, J. R. Arunkumar, S. Vimala, G. Vinoth Rajkumar, Raja Raju, "A Mechanism for Detecting the Intruder in the Network through a Stacking Dilated CNN Model", Wireless Communications and Mobile Computing, vol. 2022, Article ID 1955009, 13 pages, 2022. https://doi.org/10.1155/2022/1955009.

[2]. D. Sathyanarayanan, T. S. Reddy, A. Sathish, P. Geetha, J. R. Arunkumar and S. P. K. Deepak, "American Sign Language Recognition System for Numerical and Alphabets," 2023 International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE), Chennai, India, 2023, pp. 1-6, doi: 10.1109/RMKMATE59243.2023.10369455.

[3]. J. R. Arunkumar, Tagele berihun Mengist, 2020" Developing Ethiopian Yirgacheffe Coffee Grading Model using a Deep Learning Classifier" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-4, February 2020. DOI: 10.35940/ijitee.D1823.029420.

[4]. Ashwini, S., Arunkumar, J.R., Prabu, R.T. et al. Diagnosis and multi-classification of lung diseases in CXR images using optimized deep convolutional neural network. Soft Comput (2023). https://doi.org/10.1007/s00500-023-09480-3

[5]. J.R.Arunkumar, Dr.E.Muthukumar," A Novel Method to Improve AODV Protocol for WSN" in Journal of Engineering Sciences" ISSN NO: 0377-9254Volume 3, Issue 1, Jul 2012.

[6]. R. K, A. Shameem, P. Biswas, B. T. Geetha, J. R. Arunkumar and P. K. Lakineni, "Supply Chain Management Using Blockchain: Opportunities, Challenges, and Future Directions," 2023 Second International Conference on Informatics (ICI), Noida, India, 2023, pp. 1-6, doi: 10.1109/ICI60088.2023.10421633.

[7]. Arunkumar, J. R. "Study Analysis of Cloud Security Chanllenges and Issues in Cloud Computing Technologies." Journal of Science, Computing and Engineering Research 6.8 (2023): 06-10.

[8]. J. R. Arunkumar, R. Raman, S. Sivakumar and R. Pavithra, "Wearable Devices for Patient Monitoring System using IoT," 2023 8th International Conference on Communication and Electronics Systems (ICCES), Coimbatore, India, 2023, pp. 381-385, doi: 10.1109/ICCES57224.2023.10192741.

[9]. S. Sugumaran, C. Geetha, S. S, P. C. Bharath Kumar, T. D. Subha and J. R. Arunkumar, "Energy Efficient Routing Algorithm with Mobile Sink Assistance in Wireless Sensor Networks," 2023 International Conference on Advances in Computing, Communication and Applied Informatics

(ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10201142.

[10]. R. S. Vignesh, V. Chinnammal, Gururaj.D, A. K. Kumar, K. V. Karthikeyan and J. R. Arunkumar, "Secured Data Access and Control Abilities Management over Cloud Environment using Novel Cryptographic Principles," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ACCAI58221.2023.10199616.

[11]. Syamala, M., Anusuya, R., Sonkar, S.K. et al. Big data analytics for dynamic network slicing in 5G and beyond with dynamic user preferences. Opt Quant Electron 56, 61 (2024). https://doi.org/10.1007/s11082-023-05663-2

[12]. Krishna Veni, S. R., and R. Anusuya. "Design and Study Analysis Automated Recognition system of Fake Currency Notes." Journal of Science, Computing and Engineering Research 6.6 (2023): 16-20.

[13]. V. RamKumar, S. Shanthi, K. S. Kumar, S. Kanageswari, S. Mahalakshmi and R. Anusuya, "Internet of Things Assisted Remote Health and Safety Monitoring Scheme Using Intelligent Sensors," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ACCAI58221.2023.10199766.

[14]. R. S. Vignesh, R. Sankar, A. Balaji, K. S. Kumar, V. Sharmila Bhargavi and R. Anusuya, "IoT Assisted Drunk and Drive People Identification to Avoid Accidents and Ensure Road Safety Measures," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10200809.

[15]. I. Chandra, G. Sowmiya, G. Charulatha, S. D, S. Gomathi and R. Anusuya, "An efficient Intelligent Systems for Low-Power Consumption Zigbee-Based Wearable Device for Voice Data Transmission," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10083856.

[16]. G. Karthikeyan, D. T. G, R. Anusuya, K. K. G, J. T and R. T. Prabu, "Real-Time Sidewalk Crack Identification and Classification based on Convolutional Neural Network using Thermal Images," 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS), Pudukkottai, India, 2022, pp. 1266-1274, doi: 10.1109/ICACRS55517.2022.10029202.

[17]. R. Meena, T. Kavitha, A. K. S, D. M. Mathew, R. Anusuya and G. Karthik, "Extracting Behavioral Characteristics of College Students Using Data Mining on Big Data," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10084276.

[18]. S. Bharathi, A. Balaji, D. Irene. J, C. Kalaivanan and R. Anusuya, "An Efficient Liver Disease Prediction based on Deep Convolutional Neural Network using Biopsy Images," 2022 3rd International Conference on Smart Electronics and Communication (ICOSEC), Trichy, India, 2022, pp. 1141-1147, doi: 10.1109/ICOSEC54921.2022.9951870.

[19]. I. Chandra, G. Sowmiya, G. Charulatha, S. D, S. Gomathi and R. Anusuya, "An efficient Intelligent Systems for Low-Power Consumption Zigbee-Based Wearable Device for Voice Data Transmission," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10083856.

[20]. Revathi, S., et al. "Developing an Infant Monitoring System using IoT (INMOS)." International Scientific Journal of Contemporary Research in Engineering Science and Management 6.1 (2021): 111-115.