International Journal of Applied Sciences and Smart Technologies

English title:
International Journal of Applied Sciences and Smart Technologies
ISSN:
2685-9432 (online)
GICID:
n/d
DOI:
10.24071/ijasst.v3i1
Website:
https://e-journal.usd.ac.id/index.php/IJASST/index (https://e-journal.usd.ac.id/index.php/IJASST/index)
Publisher:
n/d
Country:
ID
Language of publication:
EN

Main page (http://jml.indexcopernicus.com)

© **Index Copernicus 2017**

Deposited publications: 43 › Full text: 42% | Abstract: 100% | Keywords: 100% | References: 100%

Issues and contents

INDEX COPERNICUS
INTERNATIONAL
(http://indexcopernicus.com)

Journal description () Details () Scientific profile () Editorial office ()

Publisher () **Metrics ()**

International Journal of Applied Sciences and Smart Technologies (IJASST) is published by Faculty of Science and Technology, Sanata Dharma University Yogyakarta-Central Java-Indonesia. IJASST is an open-access peer reviewed journal that mediates the dissemination of academicians, researchers, and practitioners in engineering, science, technology, and basic sciences which relate to technology including applied mathematics, physics, and chemistry. IJASST accepts submission from all over the world, especially from Indonesia

Non-indexed in the ICI Journals Master List

ICV :

Archival ratings

Citations: Coming soon

MSHE points: n/d

Archival ratings

International Journal of
Applied Sciences and Smart Technologies

Volume 03, Issue 01, June 2021

Frequency Distribution Fitting for Electronic Documents
Arockia David Roy Kulandai

Artificial Generation of Realistic Voices
Dhruva Mahajan, Ashish Gapat, Lalita Moharkar, Prathamesh Sawant, Kapil Dongardive

Human Detection in Video Surveillance
Sushama Khanvilkar, Santosh Gupta, Hinal Rane, Calvin Galbaw

IoT Based Smart Classroom
Prajas Kadepurkar, Prim Dsouza, Nivya Jomichan

Stone, Paper, Scissors Mini-Game for AI Pet Robot
Aditya Aspat, Elton Lemos, Abhishek Ghoshal

OpenCV Image Processing for AI Pet Robot
Abhishek Ghoshal, Aditya Aspat, Elton Lemos

Effects of the Existence of Fan in the Wood Drying Room and the Performance of the Electric Energy Wood Dryer
Wibowo Kusbandono, Petrus Kanisius Purwadi

Effects of Shock Wave Phenomenon on Different Convergent Lengths in the Mixing Chamber of the Steam Ejector
Stefan Mardikus

Identity Graph of Finite Cyclic Groups
Maria Vianney Any Herawati, Priscila Septinina Henryanti, Ricky Aditya

Obtaining the Efficiency and Effectiveness of Fin in Unsteady State Conditions Using Explicit Finite Difference Method
Petrus Kanisius Purwadi, Budi Setyahandana, R.B.P. Harsilo

Conceptual Design of Modular Chassis Jig of Student Competition Car
Heryoga Winarbawa

Classification of Toddler Nutrition Using C4.5 Decision Tree Method
Kartono Pinaryanto, Robertus Adi Nugroho, Yanuarius Basilius

p-ISSN 2655-8564 & e-ISSN 2685-9432

International Journal of Applied Sciences and Smart Technologies

Volume 3, Issue 1, page ii

p-ISSN 2655-8564, e-ISSN 2685-9432

EDITORIAL BOARD

Editor in Chief
Dr. I Made Wicaksana Ekaputra *(Sanata Dharma University, Yogyakarta, Indonesia)*
Email: made@usd.ac.id

Associate Editor
Dr. Pham Nhu Viet Ha *(Vietnam Atomic Energy Institute, Hanoi, Vietnam)*
Dr. Hendra Gunawan Harno *(Gyeongsang National University, Jinju, The Republic of Korea)*
Dr. Iswanjono *(Sanata Dharma University, Yogyakarta, Indonesia)*
Dr. Mukesh Jewariya *(National Physical Laboratory, New Delhi, India)*
Dr. Mongkolsery Lin *(Institute of Technology of Cambodia, Phnom Penh, Cambodia)*
Dr. Yohanes Baptista Lukiyanto *(Sanata Dharma University, Yogyakarta, Indonesia)*
Dr. Apichate Maneewong *(Thailand Institute of Nuclear Technology, Bangkok, Thailand)*
Dr. Sudi Mungkasi *(Sanata Dharma University, Yogyakarta, Indonesia)*
Dr. Pranowo *(Universitas Atma Jaya Yogyakarta, Yogyakarta, Indonesia)*
Dr. Mahardhika Pratama *(Nanyang Technological University, Singapore)*
Dr. Augustinus Bayu Primawan *(Sanata Dharma University, Yogyakarta, Indonesia)*
Prof. Dr. Leo Hari Wiryanto *(Bandung Institute of Technology, Bandung, Indonesia)*

Editorial Proofreader
Ir. Ignatius Aris Dwiatmoko, M.Sc. *(Sanata Dharma University, Yogyakarta, Indonesia)*
P. H. Prima Rosa, S.Si., M.Sc. *(Sanata Dharma University, Yogyakarta, Indonesia)*

Editorial Assistant
Eduardus Hardika Sandy Atmaja, M.Cs. *(Sanata Dharma University, Yogyakarta, Indonesia)*
Vittalis Ayu, M.Cs. *(Sanata Dharma University, Yogyakarta, Indonesia)*

Administration
Catharina Maria Sri Wijayanti, S.Pd. *(Sanata Dharma University, Yogyakarta, Indonesia)*

Contact us
International Journal of Applied Sciences and Smart Technologies
Faculty of Science and Technology
Sanata Dharma University
Kampus III Paingan, Maguwoharjo, Depok, Sleman
Yogyakarta, 55282
Phone : +62 274883037 ext. 523110, 52320
Fax : +62 272886529
Email : editorial.ijasst@usd.ac.id
Website : http://e-journal.usd.ac.id/index.php/IJASST

IJASST is an open-access peer-reviewed journal that mediates the dissemination of research and studies conducted by academicians, researchers, and practitioners in science, engineering, and technology.

International Journal of Applied Sciences and Smart Technologies

Volume 3, Issue 1, pages iii-iv

p-ISSN 2655-8564, e-ISSN 2685-9432

PREFACE

Volume 3 Issue 1 of *International Journal of Applied Sciences and Smart Technologies* (IJASST) contains 12 research articles. In the present issue, the authors are from three countries, namely, the United States of America, India and Indonesia. It covers research results in the areas of Mathematics, Science, Engineering and Technology.

Submitted papers were peer-reviewed using the open journal system (OJS). After the review process, accepted papers of the journal are publicly available at the website of IJASST. Readers can access the published papers free of charge.

Currently, we obtain increasing interests of researchers submitting their results to be published in IJASST. With this fact, we are sure that IJASST has gained more attention from the scientific community. Please, enjoy reading our IJASST papers!

Dr. I Made Wicaksana Ekaputra
Editor in Chief
IJASST

International Journal of Applied Sciences and Smart Technologies

Volume 3, Issue 1, page i

p-ISSN 2655-8564, e-ISSN 2685-9432

CONTENTS

CONTENTS i

EDITORIAL BOARD ii

PREFACE iii

Frequency Distribution Fitting for Electronic Documents 1–10
Arockia David Roy Kulandai

Artificial Generation of Realistic Voices 11–26
Dhruva Mahajan, Ashish Gapat, Lalita Moharkar, Prathamesh Sawant, Kapil Dongardive

Human Detection in Video Surveillance 27–34
Sushama Khanvilkar, Santosh Gupta, Hinal Rane, Calvin Galbaw

IoT Based Smart Classroom 35–54
Prajas Kadepurkar, Prim Dsouza, Nivya Jomichan

Stone, Paper, Scissors Mini-Game for AI Pet Robot 55–64
Aditya Aspat, Elton Lemos, Abhishek Ghoshal

OpenCV Image Processing for AI Pet Robot 65–82
Abhishek Ghoshal, Aditya Aspat, Elton Lemos

Effects of the Existence of Fan in the Wood Drying Room and the Performance of the Electric Energy Wood Dryer 83–92
Wibowo Kusbandono, Petrus Kanisius Purwadi

Effects of Shock Wave Phenomenon on Different Convergent Lengths in the Mixing Chamber of the Steam Ejector 93–100
Stefan Mardikus

Identity Graph of Finite Cyclic Groups 101–110
Maria Vianney Any Herawati, Priscila Septinina Henryanti, Ricky Aditya

Obtaining the Efficiency and Effectiveness of Fin in Unsteady State Conditions Using Explicit Finite Difference Method 111–124
Petrus Kanisius Purwadi, Budi Setyahandana, R.B.P. Harsilo

Conceptual Design of Modular Chassis Jig of Student Competition Car 125–130
Heryoga Winarbawa

Classification of Toddler Nutrition Using C4.5 Decision Tree Method 131–142
Kartono Pinaryanto, Robertus Adi Nugroho, Yanuarius Basilius

AUTHOR GUIDELINES 143

International Journal of Applied Sciences and Smart Technologies

Volume 3, Issue 1, pages 125–130

p-ISSN 2655-8564, e-ISSN 2685-9432

Conceptual Design of Modular Chassis Jig of Student Competition Car

Heryoga Winarbawa[1,*]

[1]*Department of Mechanical Engineering, Faculty of Science and Technology, Sanata Dharma University, Yogyakarta, Indonesia*
[*]*Corresponding Author: winarbawa@gmail.com*

(Received 28-05-2021; Revised 16-06-2021; Accepted 16-06-2021)

Abstract

Chassis jig is needed to ensure that the welded chassis components does not warp or deform during welding process. Through concept screening and concept scoring, multiple design of chassis jigs is narrowed down to next development process. This study aims to design a chassis jig for the fabrication of student car competition chassis. The desired result of this design process is chassis jig with the ability to manufacture a wide variety of student competition car chassis.

Keywords: Car, chassis, jig, fixture

1 Introduction

Students of mechanical engineering programs are often challenged to study implementations. Student competition is one of study implementations. Those competitions drive students to build something based on what they learn in class. Formula Student (FS), Shell Eco Marathon (SEM), Kompetisi Mobil Hemat Energi (KMHE), and Kompetisi Mobil Listrik Indonesia (KMLI) are examples where student need to build cars to compete.

Volume 3, Issue 1, pages 125–130
p-ISSN 2655-8564, e-ISSN 2685-9432

Car chassis is the important thing to ensure vehicle stability and driver/passenger safety. There are several types of chassis, ladder frame, space frame, and monocoque. A lot of student teams apply space frame chassis for their cars. Space frame chassis is chosen due to simpler manufacturability and cost effectiveness.

Space frame chassis are manufactured by welding some of tubing. To ensure accuracy, space frame chassis materials are welded on chassis jig and several fixtures. Welding fixtures are typically the most common devices used to align and retain the various pieces for welding [1]. Some chassis jig on the market are using steel as their table top. Steel table top are usually coated with other material to prevent rust.

The scope of this study was limited to accommodate competition car chassis welding process. This study summarizes the design of chassis jig that accommodate several kind of chassis that suite for each competition.

2 Research Methodology

This study applied three stages of process as shown at Figure 1. The first stage is to collect all requirement measurement, such as, length, width, and height of car chassis based on technical rules for each competition. As the second stage, we recall that concept selection is the process of evaluating concepts with respect to customer needs and other criteria, comparing the relative strengths and weaknesses of the concepts, and selecting one or more concepts for further investigation, testing, or development [2]. Material selection criteria are limited to ease of manufacturing and assembly process, and rust resistance properties. The third stage is when chassis jig was design and some feature were added.

Figure 1. Study process

Volume 3, Issue 1, pages 125–130

p-ISSN 2655-8564, e-ISSN 2685-9432

Collect Data. Car dimension can be found at technical data of each competition [3-5]. The KMHE competition adopts SEM environment, so basically the technical rules for car dimension are the same. Maximum dimension requirement are selected so the chassis that need to be manufactured doesn't break the competition rules. The closest car chassis CAD design for each type of competition are also collected to simulate availability on chassis jig top.

Concept Selection. A chassis jig is constructed by table top and some legs. Steel tube, hollow aluminum tube, and aluminum extrusion are the most common materials to build such thing. Concept A is bulky, heavy duty chassis jig constructed by square hollow steel as frame and thick steel sheet as table top. Concept B is knock-down slatted steel sheet as top, frame and some legs. Concept C is constructed by all aluminum extrusion. Concept D has steel sheet with welded ribs as table top, and bent steel sheet that constructed as frame. Concept E is assembled by welded square hollow steel and aluminum extrusion as table top. All of those concepts are narrowed down through concept screening which tabulated in Table 1.

Table 1. Concept screening

	Concepts				
Selection Criteria	A	B	C	D	E
Weight	-	-	0	+	-
Rust Resistant	-	0	0	0	0
Easy to Assemble	-	0	0	+	+
Manufacturing Cost	-	-	0	+	+
Fixture Modularity	+	+	0	0	0
Rigidity	+	+	0	-	+
Easy to Move	-	+	0	+	-
Sum +'s	2	3	0	4	3
Sum 0's	0	2	7	2	2
Sum –'s	5	2	0	1	2
Net Score	-3	1	0	3	1
Rank	5	3	4	1	2
Continue?	No	Yes	Combine	Yes	Combine

Through concept screening, concept variation has been reduced to three concepts, Concept B, Concept D, and combination of Concept C and E, thus called Concept CE. Further investigated issue needs to be clarified before chosen final concept. Selection criteria are weighted to increase the sensitivity of concept determination as shown in Table 2.

International Journal of Applied Sciences and Smart Technologies

Volume 3, Issue 1, pages 125–130

p-ISSN 2655-8564, e-ISSN 2685-9432

Table 2. Concept scoring

		Concepts					
		B		CE		D	
	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Selection Criteria							
Weight	10%	2	0.2	4	0.4	5	0.5
Rust Resistant	15%	3	0.45	4	0.6	3	0.45
Easy to Assemble	10%	3	0.3	2	0.2	3	0.3
Manufacturing Cost	25%	1	0.25	3	0.75	4	1
Fixture Modularity	15%	4	0.6	4	0.6	3	0.45
Rigidity	20%	4	0.8	4	0.8	1	0.2
Easy to Move	5%	4	0.2	4	0.2	4	0.2
Total Score		2.8		3.55		3.1	
Rank		3		1		2	
Continue		No		Develop		No	

The total score for each concept is the sum of the weighted scores, and formulated as:

$$S_j = \sum_{i=1}^{n} r_{ij}\, w_i. \quad (1)$$

Here, r_{ij} is the raw rating of concept j for the ith criterion, w_i represents the weighting for ith criterion, n is the number of criteria, and S_j denotes the total score of concept j.

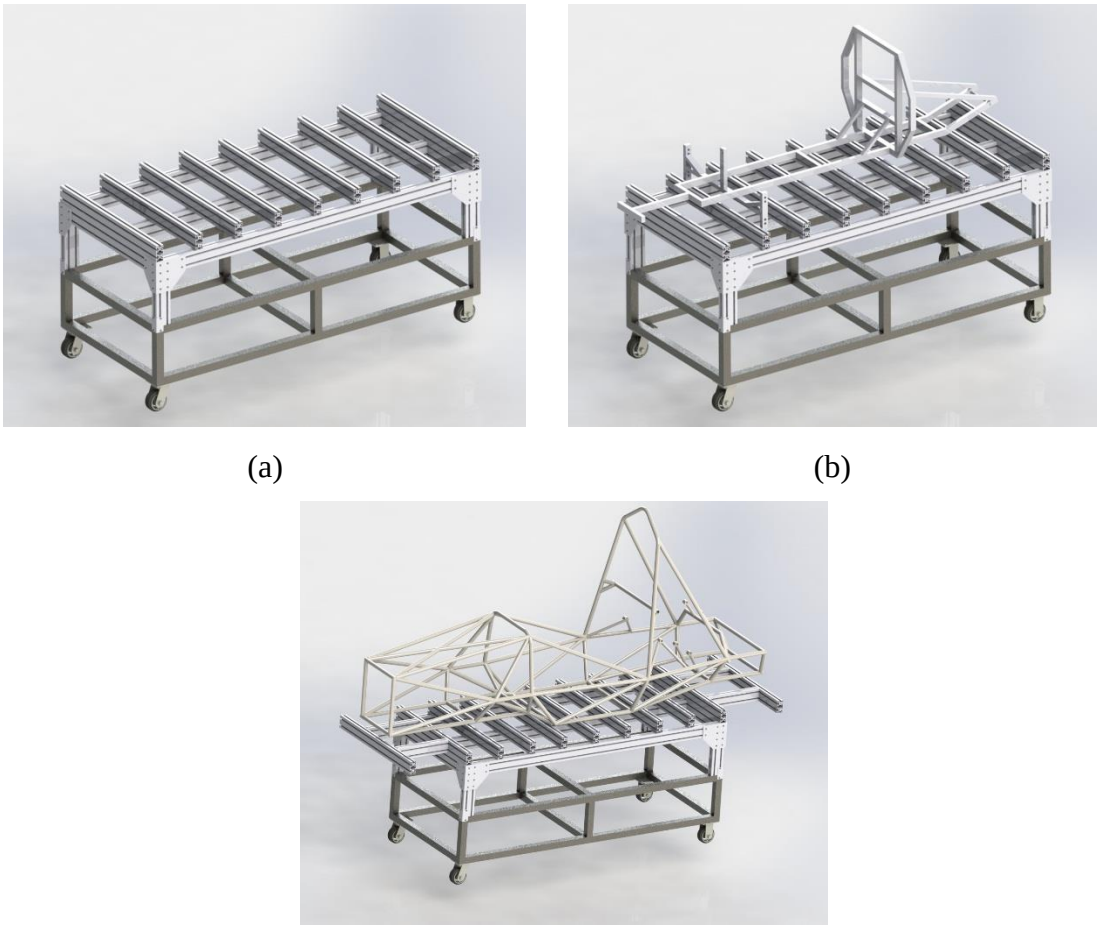
3 Results and Discussion

Chosen concept is combination of concept C and E. Concept CE is constructed by welded square hollow steel as bottom part of frame and slatted arrangement of aluminum extrusion as table top as shown in Figure 2a. From bottom part of frame to table top is raised by another aluminum extrusion. That configuration provide better stability as center gravity is lower. The lower part also useful for storing jigs/fixtures, welding equipment, and power tools that required during chassis fabrication. Figure 2b shows chassis jig with SEM prototype car chassis on top of it. For FS car chassis, some additional jig members were added to support front and back section of car chassis as shown in Figure 2c. Fixtures for holding chassis materials will be design as future work.

International Journal of Applied Sciences and Smart Technologies

Volume 3, Issue 1, pages 125–130

p-ISSN 2655-8564, e-ISSN 2685-9432



(a) (b)

(c)

Figure 2. Some illustrations of chassis jigs: (a) Chassis jig, (b) Chassis jig with SEM prototype car chassis, (c) Chassis jig with FS car chassis

4 Conclusion

Concept CE has been concluded as best concept after several steps. The excellence of Concept CE amongst others are:

- **Lightweight**: using aluminum extrusion as the most component are reducing overall weight
- **Rust resistant**: aluminum is already rust resistant since it already provides oxide film all over the surface.
- **Easy to assemble**: aluminum extrusion provides tracks that has standardized dimensions and their own accessories such as nuts, bolts and connectors.

Volume 3, Issue 1, pages 125–130

p-ISSN 2655-8564, e-ISSN 2685-9432

- **Low manufacturing cost**: since it already has tracks and accessories, fabricating process and assembly is just simply as cut and connect. It does not need complex manufacturing process on many machines.
- **Modular fixture**: lower fixture design are mainly based on aluminum extrusion track design, and the top one are following work piece design, that is, aluminum hollow tube for chassis.
- **Rigid enough**: aluminum extrusion cross-section is already designed to maintain rigidity along its length. Bigger cross-sectional area provides minimum deflection and maximum rigidity when they are made into a structure.
- **Easy to move**: since it is already lightweight because half part is using aluminum material, the movement also help by castor wheel.

Note that because this concept using aluminum as top, so it does not provide impact protection. Top surface is only used as planar reference and placing fixtures.

References

[1] E. G. Hoffman, *Jig and Fixture*, 5th Edition, Clifton Park, NY: Delmar, 2004.

[2] K.T. Urlich and S.D Epingger, *Product Design and Development*, New York, NY: McGraw-Hill Education, 2016.

[3] "Formula Student," [Online]. Available: https://www.imeche.org/docs/default-source/1-oscar/formula-student/2021/forms/fs2020-rules.zip?sfvrsn=2. [Accessed 24 March 2021].

[4] "Shell Eco Marathon," [Online]. Available: https://base.makethefuture.shell/en_gb/service/api/home/shell-eco-marathon/global-rules/_jcr_content/root/content/document_listing/items/download_1733386233.stream/1598973488368/0e057b48fe5e2adc044ac860f83ebf26f8ccd5f9/shell-eco-marathon-2020-official-rul. [Accessed 24 March 2021].

[5] "Kompetisi Mobil Listrik Indonesia," [Online]. Available: http://kmli.polban.ac.id/component/phocadownload/category/1-panduan-lomba.html?download=6:panduan-kmli-xi-2019. [Accessed 24 March 2021].