International Interdisciplinary Congress on Renewable Energies, Industrial Maintenance, Mechatronics and Informatics
Booklets

RENIECYT 1702902 CONACYT

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Title: Application of CAD, CAM, CAE, in prototype design and manufacturing of electric car lift

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Editorial label ECORFAN: 607-8695
BCIERMMI Control Number: 2021-01
BCIERMMI Classification (2021): 271021-0001

Pages: 10
RNA: 03-2010-032610115700-14

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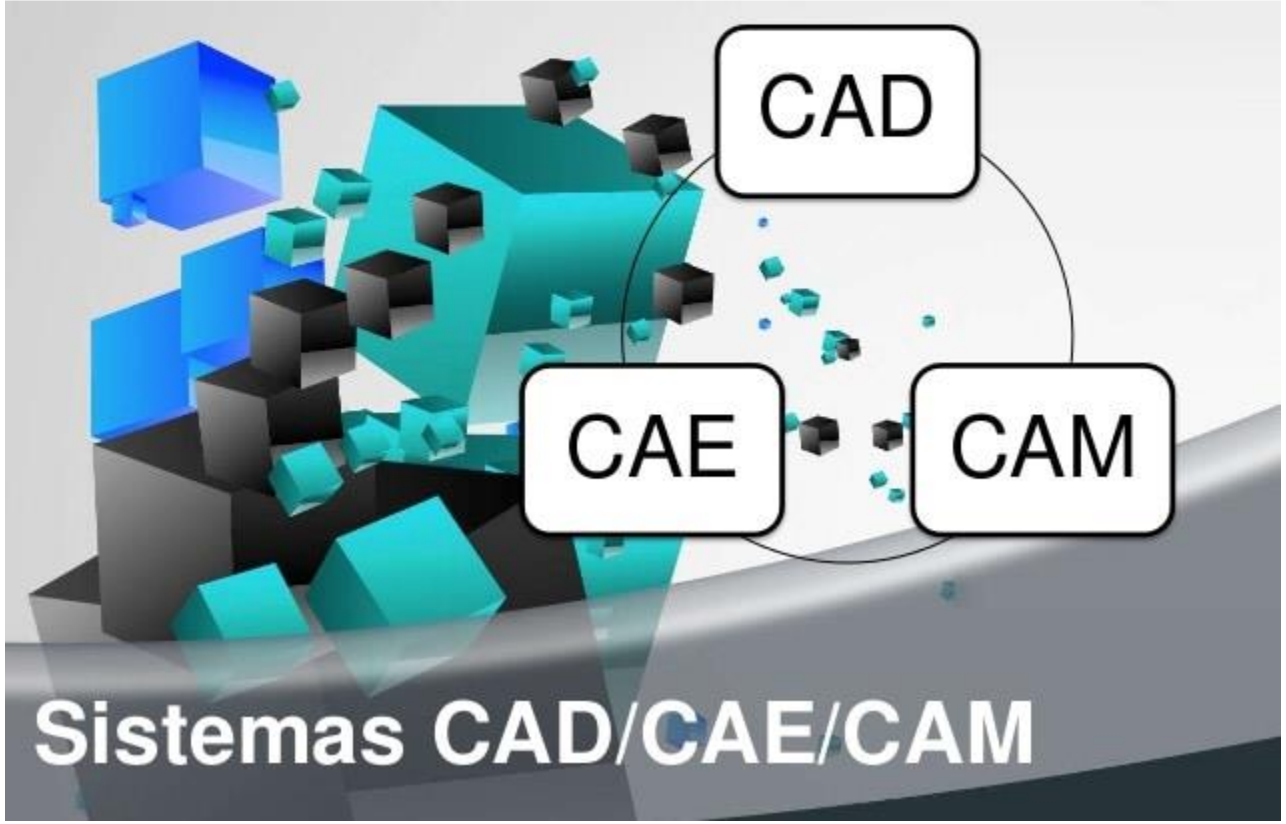
Introduction

The industry is becoming more competitive and demanding, they have to apply technological tools to be more efficient and more competitive, one area of application is that of design. When designing we must avoid manufacturing it and that they do not work because it has too many errors and this causes us costs, with the tools we anticipate and minimize errors, cost and time.

Introduction

OBJETIVE

Demonstrate the application of technology in the design and manufacture of a prototype of an electric device for a car scissor lift (scissor jack), using additive technologies, CAD software, CAE, and 3D printer.

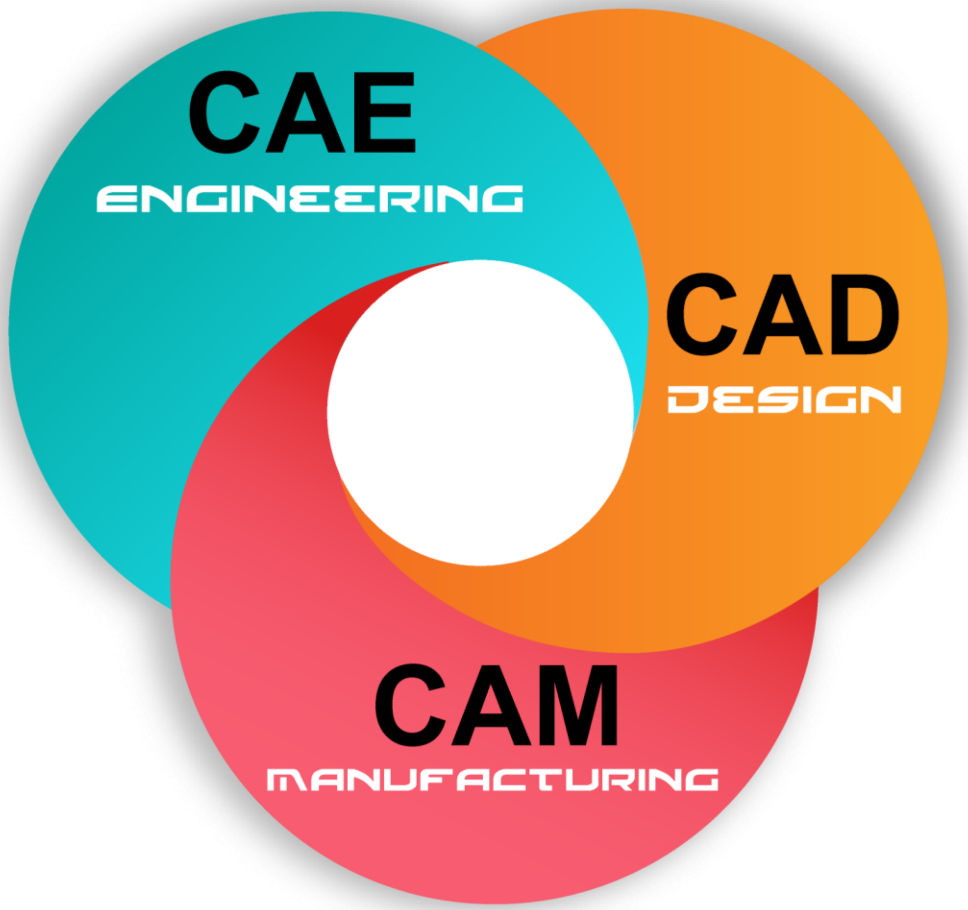


Methodology

It began with the drawing of a standard equipment scissor jack, scaled 1: 1

Using design software, each component was designed for subsequent assembly as a whole.

Subsequently, a finite analysis of the components was carried out to analyze that the parts and materials with which they were designed, if they are adequate, simulate the effort to which the components will be subjected, and if necessary correct the model before making the prototype.



Methodology

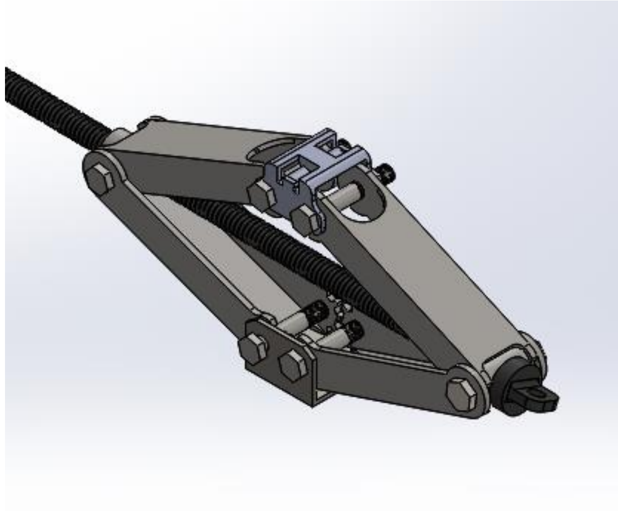


Figure. 1 Drawing of a conventional scissor lift, design software

The next step was to design the fastening elements to join the motor to the scissor lift, such as: a motor support base, to fasten the 12 volt motor to one side. And in turn will join the scissor lift, PLA material was assigned, for subsequent 3D printing.

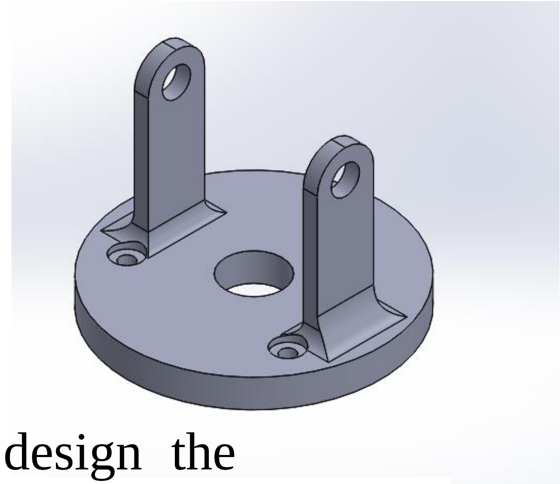


Figure. 3 *Design of motor support in LA, design software.*

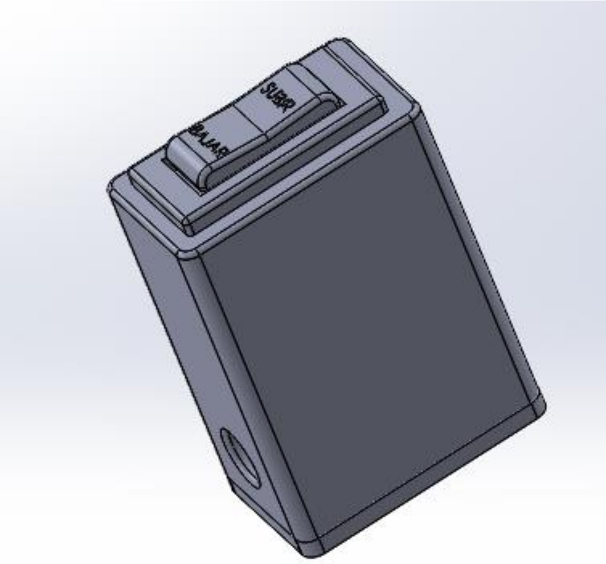


Figure. 5 *Control design, design software*

Methodology

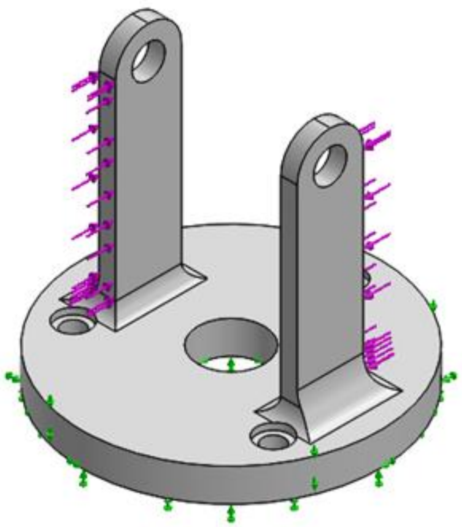


Figure. 6 *Finite analysis support model, finite analysis software.*

Having the components designed, we proceed to the finite analysis applying a force of 150 nm. For torsion, we started with the base of the motor support and the results were as follows.

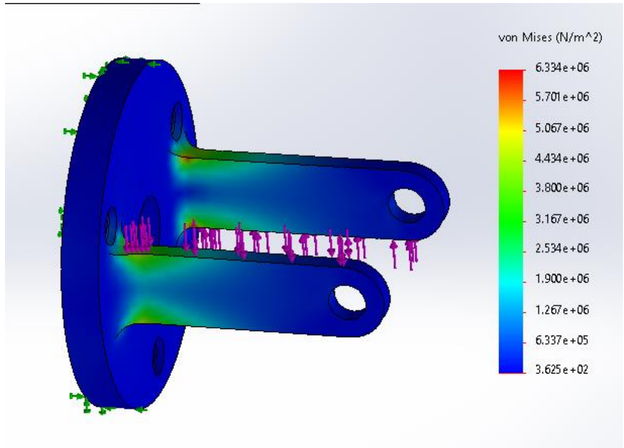


Figure. 7 *Results VonMises Tensions, finite analysis software.*

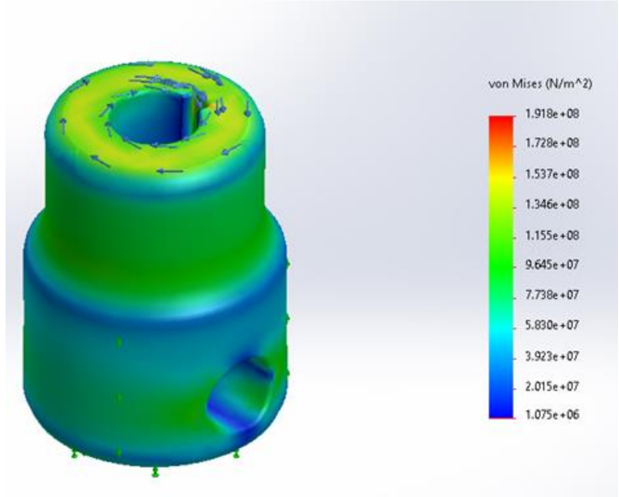


Figure. 12 *Results Strain analysis, finite analysis software.*

Methodology

4 Assembly and motion simulation

It was assembled in a simulator with the components, such as, scissor lift, motor, motor support, coupling, switch and hardware, movement was applied.

Assembled with all fastening accessories and movement simulation was performed.

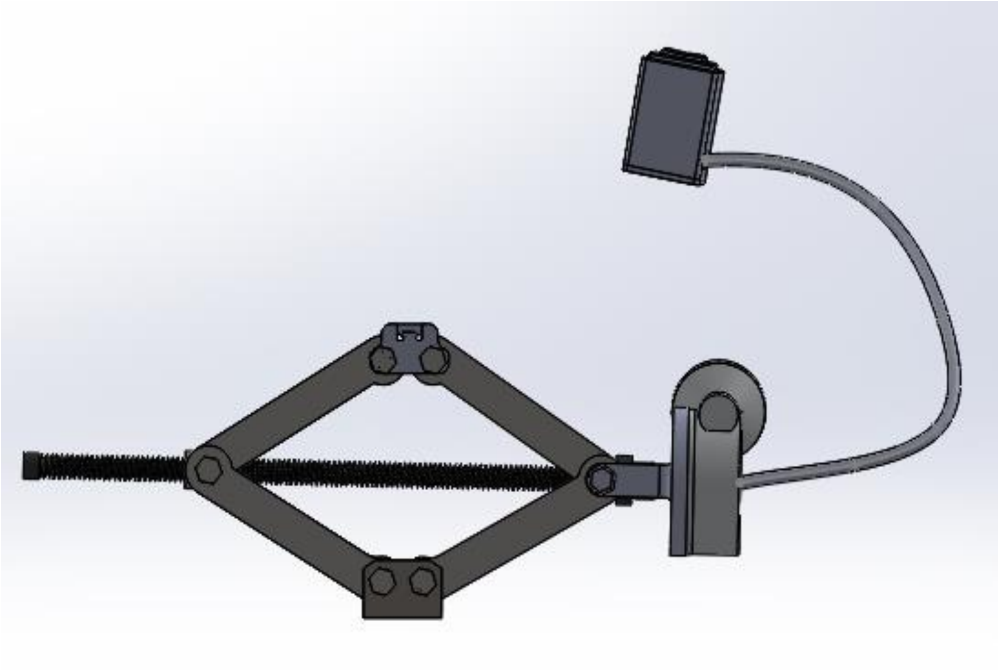


Figure. 13 *Assembled set, design software*

Methodology

printing PLA (polylactic acid) material

A 3D printer was used, with a printing area of 250 x 250 x 300 mm. For the manufacture of elements such as motor support, switch housing and coupling, the material was used PLA.

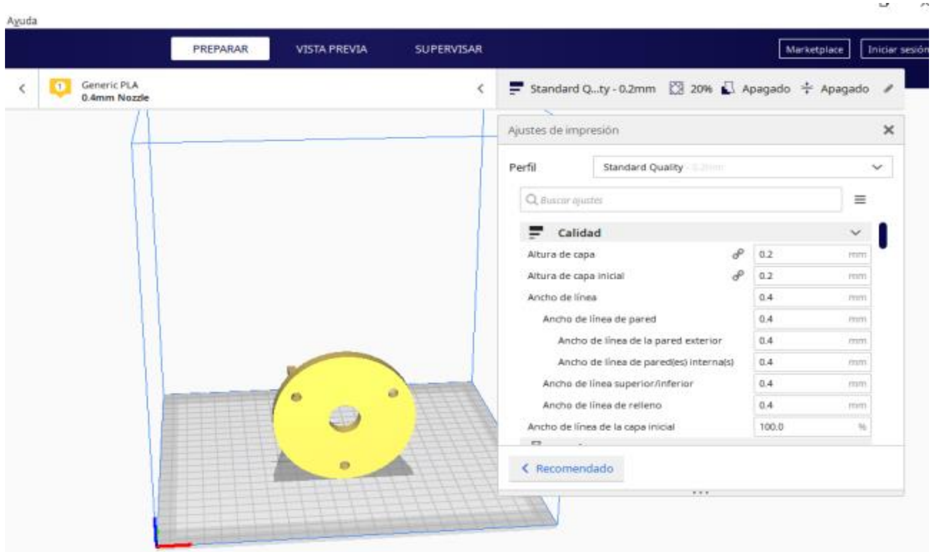


Figure. 14 *3D Printing software screen, CURA software.*

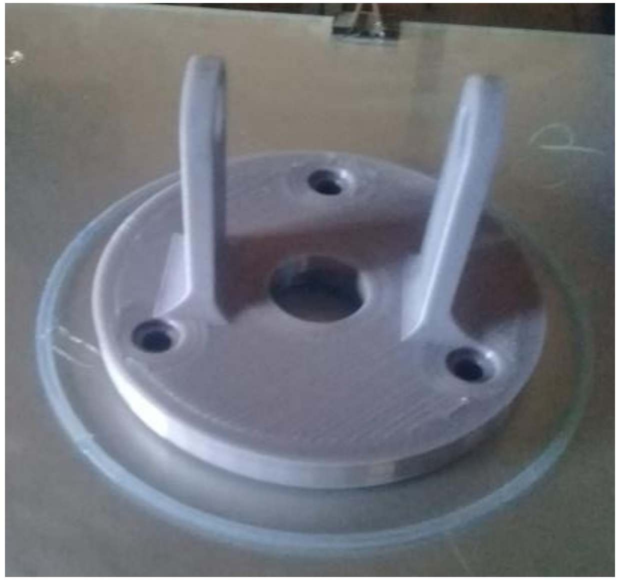


figure. 15 *3D Printing in PLA. Motor mount, own sourc*

Results

Prototype assembly and test run. Prototype with all the attachments, already assembled and connected, there were no setbacks in terms of component design.

Figure. 19 *Empty test, own source.*

Figure. 20 *Load test, own source.*

Results

The desired ones were obtained, in terms of design (CAD) and components; Several adjustments were made in dimensions and shape, adjusting the elements of the elevator and the motor, to later validate it with the software, the load and torsional stresses (CAE), the motor and coupling support elements were analyzed, giving certainty From the design, with this technology, manufacturing costs and times were saved.

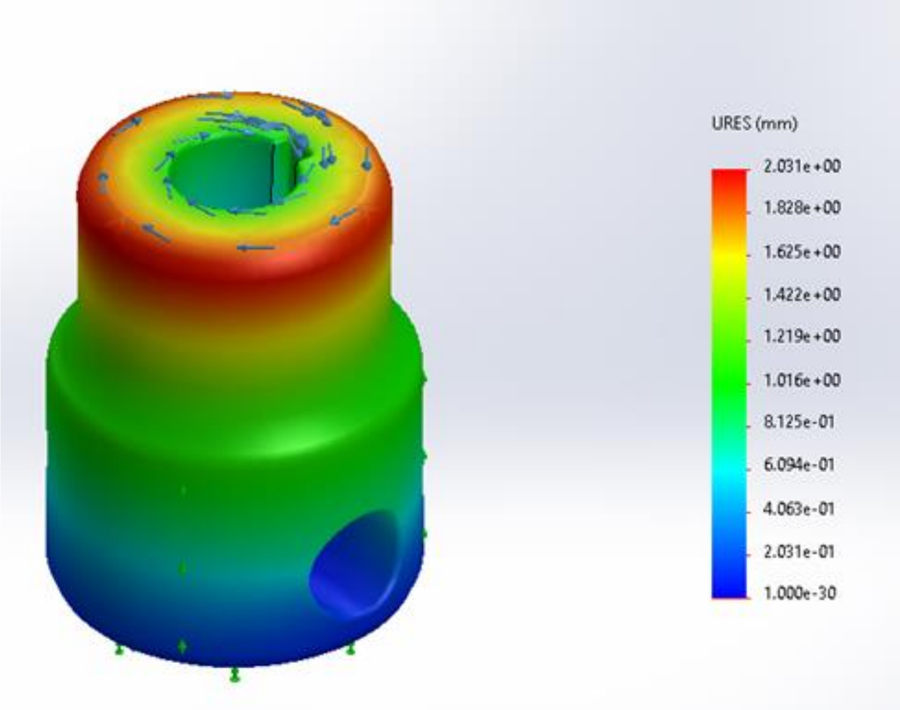


Figure. 11 *Results Torsion analysis –displacement, finite analysis software*

Acknowledgements

Thanks: I thank my fellow teachers for their suggestions and contributions, and TESCI for supporting these activities for the development of knowledge.

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