ANJUMAN-I-ISLAM'S KALSEKAR TECHNICAL CAMPUS,NEW PANVEL

DESIGN ANALYSIS AND FABRICATION OF FOLDABLE BICYCLE

Partial Fulfillment of Dissertation work

By

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Introduction

- Bicycle is the most efficient low cost eco friendly mode of city transportation.
- As we see the fuel cost are rising day by day.
- And global warming is a major issue in todays world.
- By using bicycle as a mode of transport we can lead to a greener and economical alternative.

Problem definition

- Nowadays a person has to travel a long distance to reach to its work place or his/her destination.
- For this cycle cannot be used troughout the journey.
- So there is a need of merging the two modes of transport i.e. bicycle and conventional mode of transport like cars, buses and trains.
- Problem is the size and the weight of conventional bicycle.
- We want a cycle that can be carried along in the cars, buses and trains.

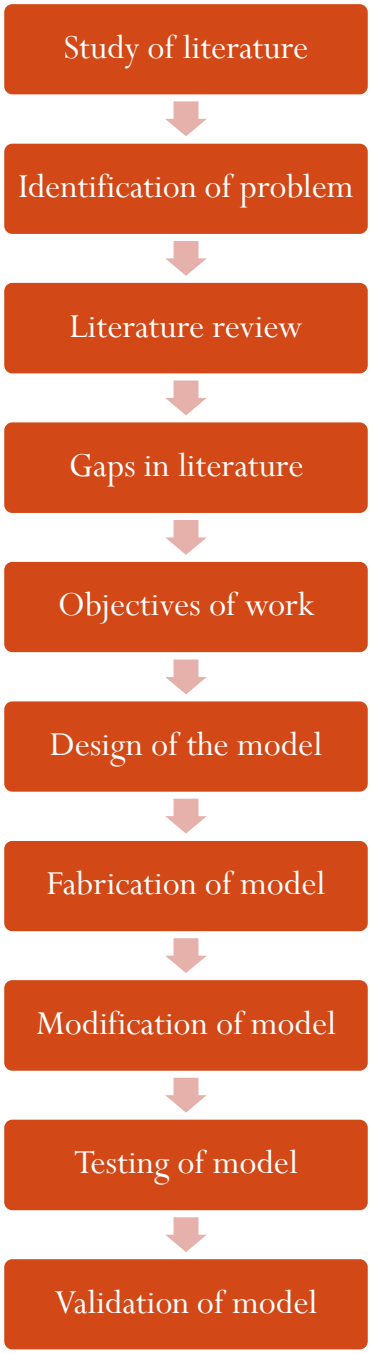
Survey review

- There are many light weight cycle available in the market, but again there size is problem.
- They cannot be carried along with in the cars and buses.
- There are many designs of foldable lightweight bicycles but they are too small to be used by the average men and to complete long distances with it.
- And there cost is very high which a common man can not afford.

Objective of reserach

- To develop and modify the present model of bicycle in the market by making it foldable at minimum, affordable cost.
- To make the bicycle light weight.
- To reduce the size of the bicycle and make it compact
- To make the bicycle easy to carry.
- To modify the conventional bicycle
- To create a positive image about the bicycle in peoples mind and make them use the foldable bicycle.

Methodology



Design

- We design a modification for the conventional cycle with foldable cycle.
- This cycle contains 4 folds.
- Firstly the model was made on the CAD softwares for rendering .

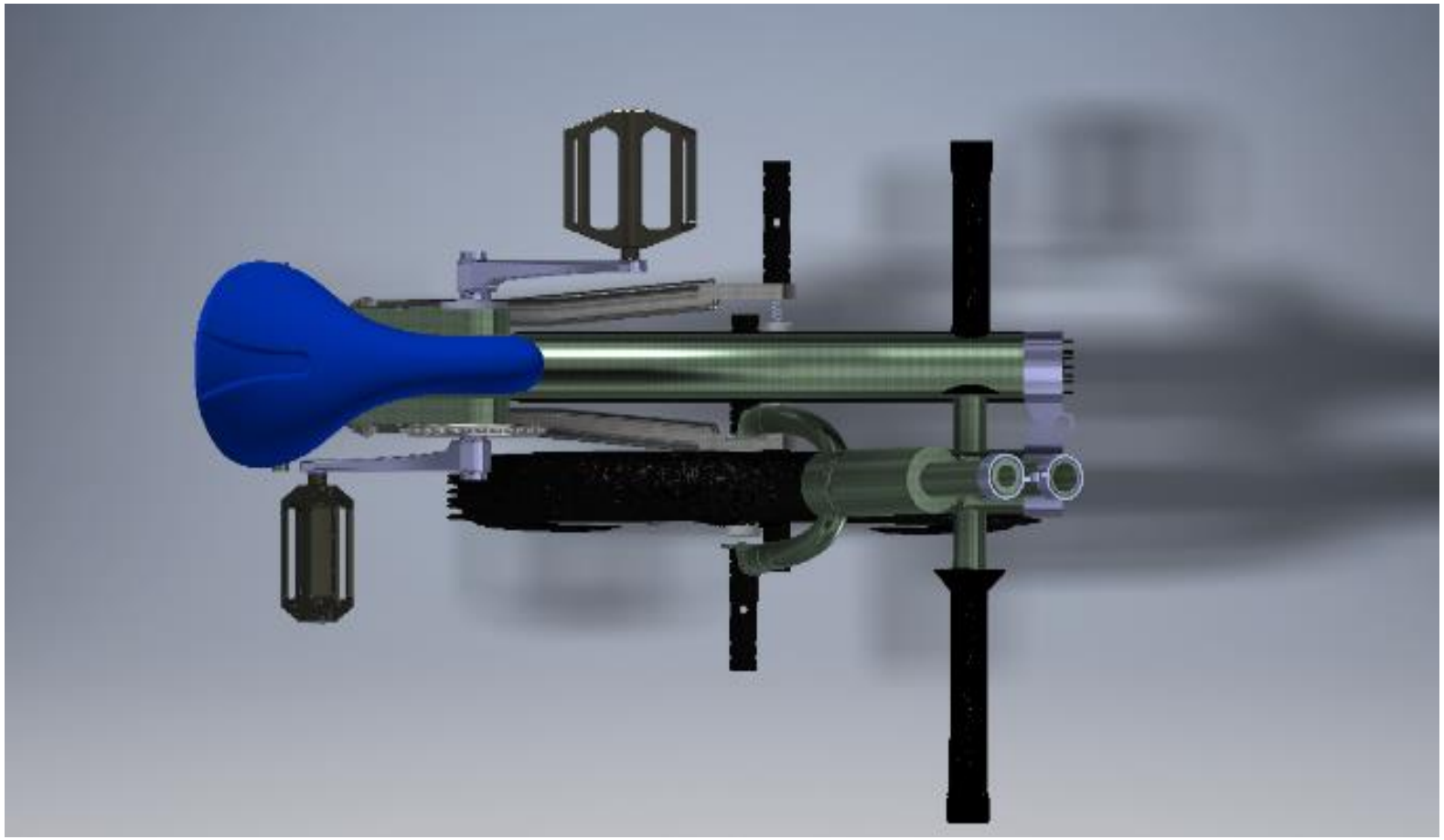
Designed image of cycle

Designed 1st fold

Designed 2nd fold

Designed 3rd and 4th fold

Complete folded top view



Material slection

- Material for the cycle should be strong enough to withstand the load and shocks
- On the other hand it should be light in weight.
- Cost of the material is also major factor to be considered.

Material	Fatigue strength (Mpa)	Yield strength (Mpa)	Density (kilogram/cubic metre)
Titanium	612	1085	4430
Mild steel	120	240	7850
Carbon fibre	402	700	1800
Aluminium	98	280	2710

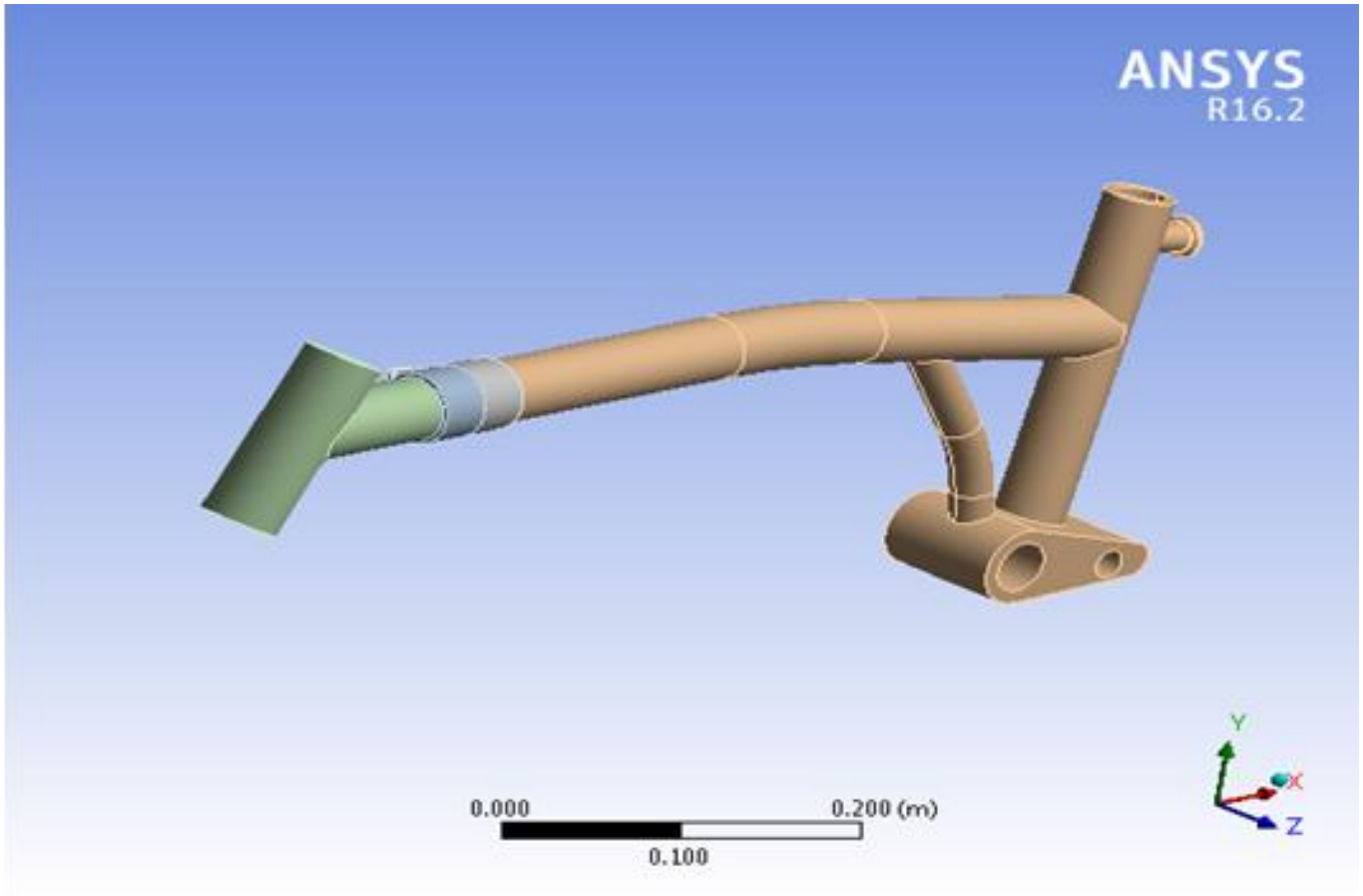
Conclusion of material selction

- As the table shows the titanium as the maximum strength but the its density and cost is more which makes it a heavier material for use.
- Carbon fibre and aluminium have less density but the cost of these materials are high.
- So the mild steel suits best for our use because of its cost and weigth and it have enough strength to withstand the loads.
- Hence we started our research and analysis using mild steel.

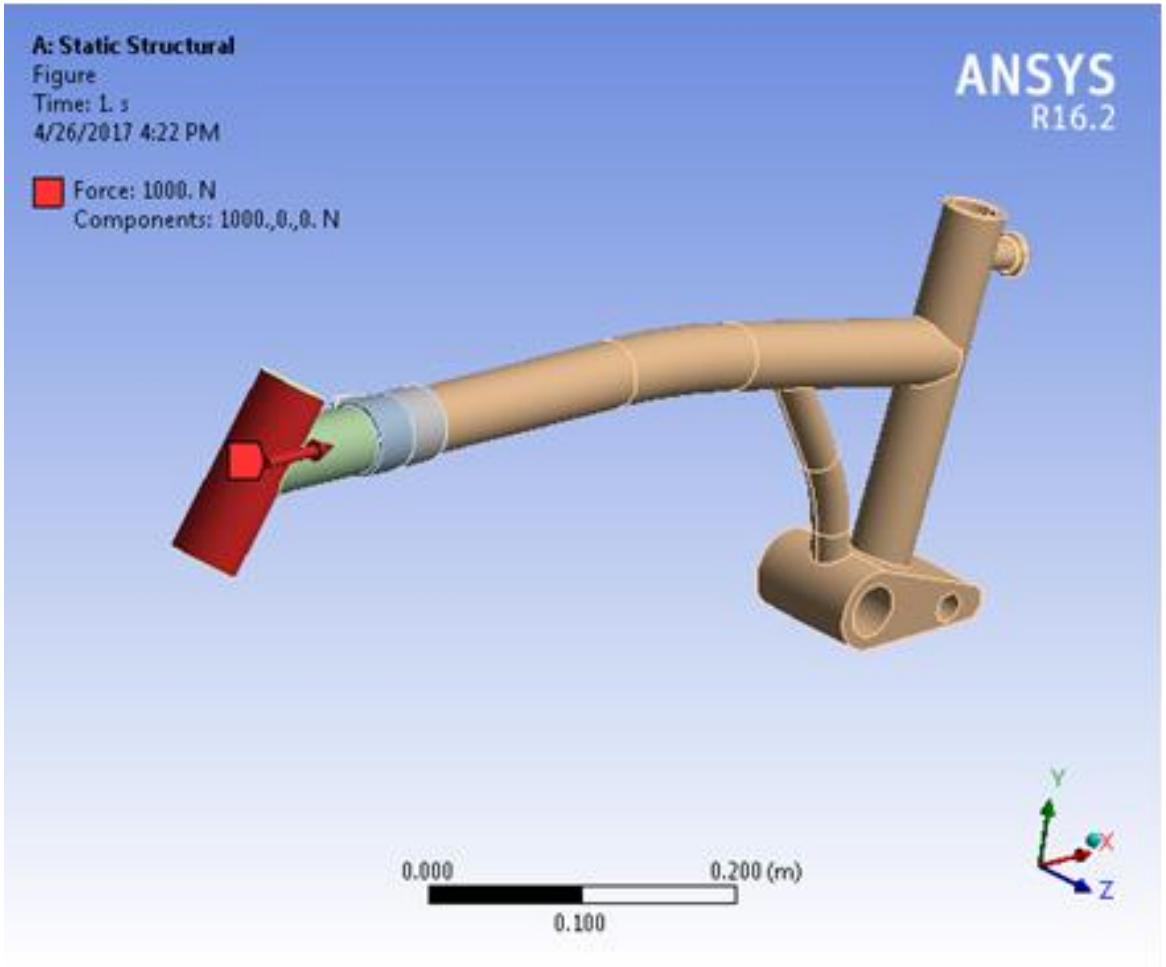
Analysis

- The main frame of the cycle supports the whole assembly and take the load of the rider.
- So the maximum stress is seen in the the frame of the cycle.
- For validating our design we did the analysis of the frame of the bicycle.
- Load of 1000N was applied on the frame to test it.

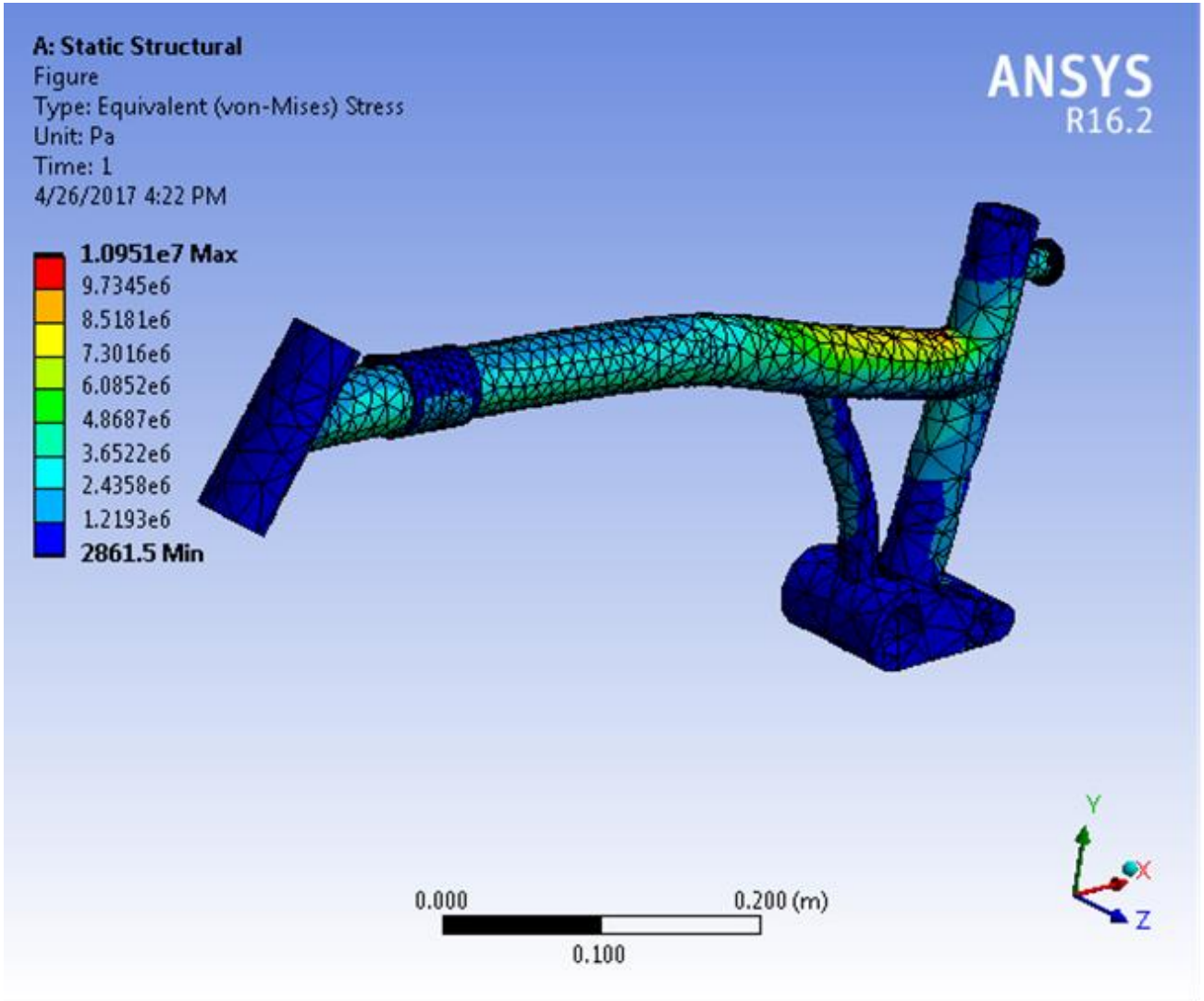
ANSYS FRAME



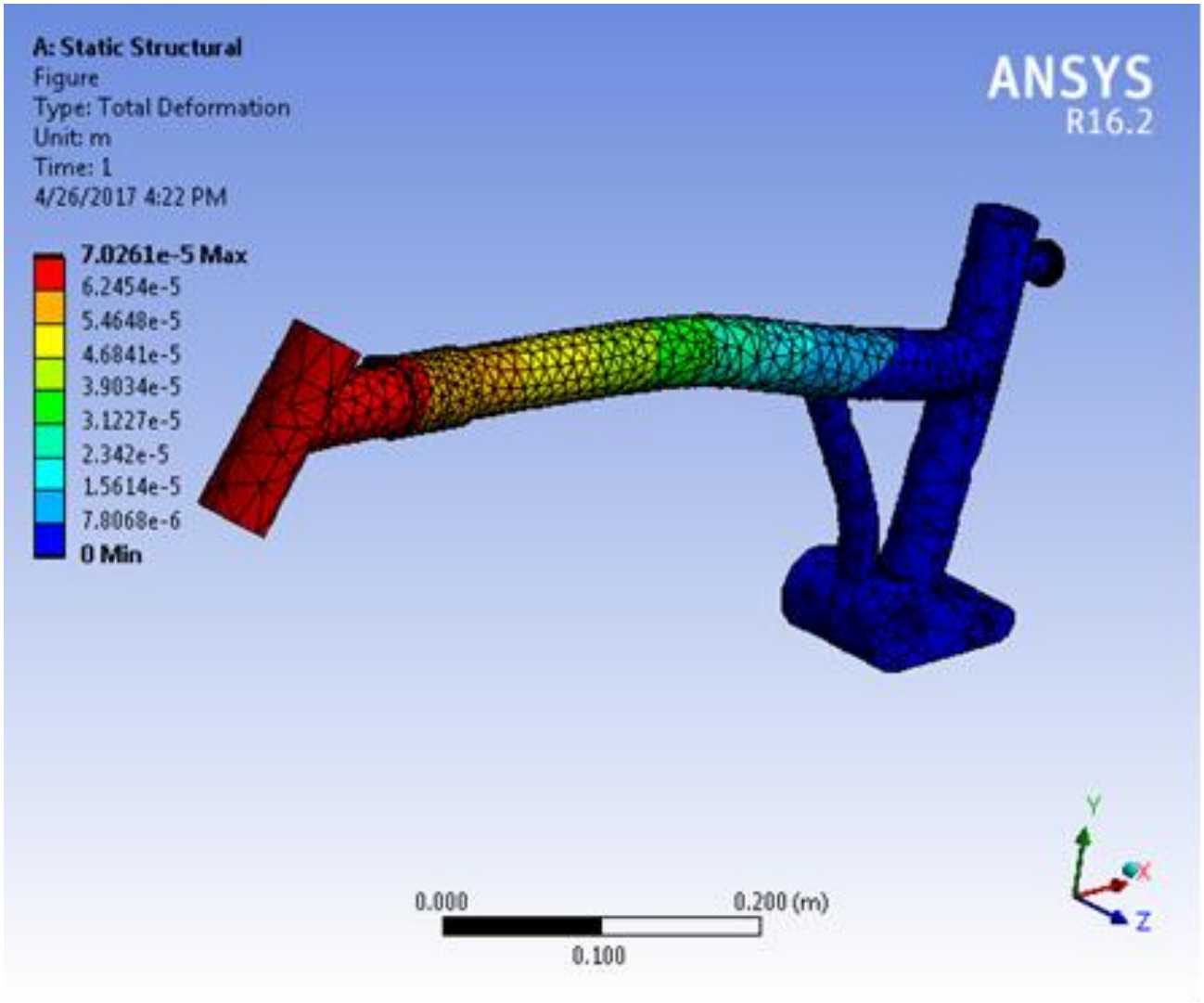
ANSYS loading



ANSYS equivalent stress result



ANSYS deformation result



Fabrication

- Once the analysis results came positive for the mild steel.
- We started fabrication of the cycle.
- Fabrication consisted of cutting, welding, and grinding of the bicycle parts.
- After fabrication we had a cycle which can be folded in 4 ways.

1st fold : Folding of front frame

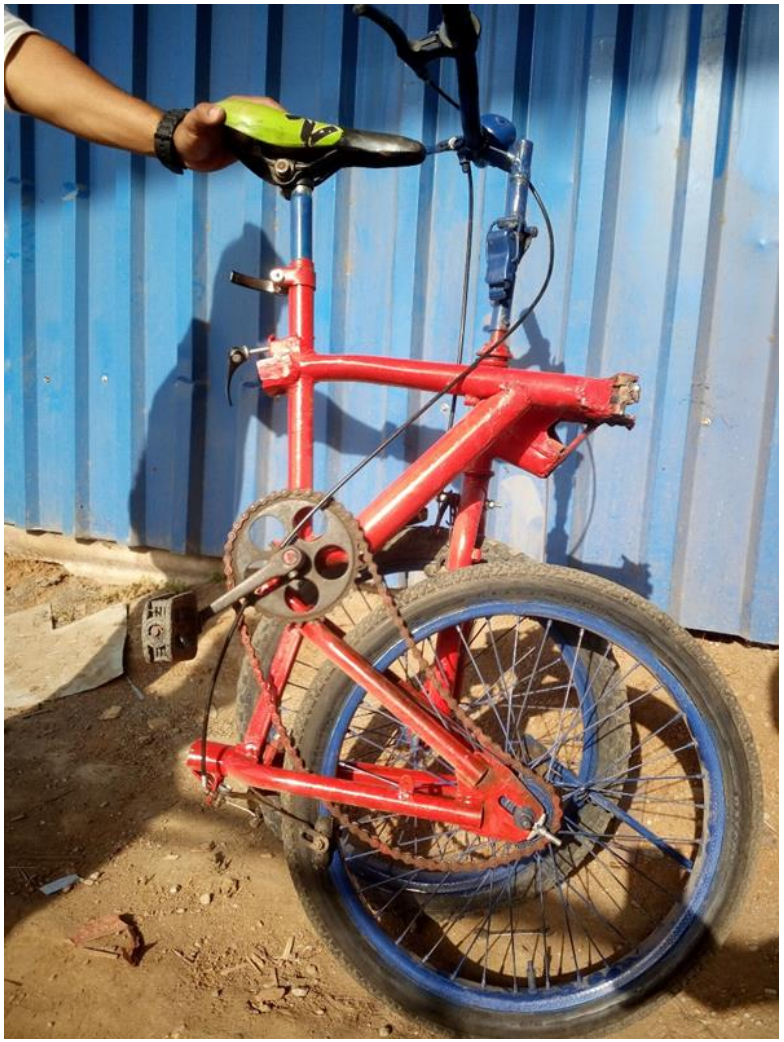
- In this fold the front member of the bicycle i.e. the handle and front fork gets turned by 180 degrees to the left side of the bicycle body, this is done by cutting the frame from 4 inches from front handle tube.
- This joint is fitted with a screw locking hinge, this permits easy locking and unlocking of the fold and thereby is rigid enough to sustain the load.

Fabricated 1st fold

2nd Fold: Folding of rear wheel assembly

- It is the most important type of fold of the bicycle. It uses a pivot fitted at the bottom of the sprocket assembly.
- This permits the rotation of the rear tire assembly in 180 degree along the axis of the larger sprocket.
- This is done by pivoting half inch below the sprocket by thus radius is manipulated by half an inch which does not affects the chain and the chain remains on both the sprockets.

Fabricated 2nd fold



3rd Fold: Adjustment of Seat

- It is the fold provided in the seat of the bicycle, it is used to raise or lower down the height of the seat according to our need.
- It is provided with a cam locking system. This reduces the overall vertical space needed for the bicycle.
- In this step of the folding bicycle, by opening of seat clamp the adjustment of seat is done as shown in figure.

Fabricated 3rd fold

4th fold: Folding of Handle

- This folds allows thee handle coloumn of the bicycle to get folded by 180 degrees.
- This is done by providing a locking and clamping hinge joint.
- This reduces the vertical height of the bicycle by 30%.
- In this step of the folding bicycle, opening of handle clamp allows the folding of handle of the folding bicycle as show in figure.

Fabricated 4th fold

Modifications

- In Modification the fabricated cycle was painted to improve its asthetics.
- The brakes and other accessories were fitted.
- Then the final finishing was carried out

Results

- The modified foldable cycle can be folded and its size was reduced upto 60%.
- It was light in weigth.
- Portability of the cycle is more.
- It is easier to carry along

Conclusion

- Our modified cycle can be for travelling the short distances for work etc.
- If some uses train as a mode of transportation, then the cycle can be carried along in the train and then from there the journey can be started using thus can save cost of travelling.
- One can easily carry it in a car and use it for adventurous rides.
- By using cycle the health and fitness of the people will be maintained.

Costing of project

SR NO	NAME OF COMPONENT	QUANTITY	PRICE
1.	Bicycle from market	1	1500/-
2.	Locks and hinges	4	800/-
3.	Accessories	-	800/-
4.	Miscellaneous	-	1000/-
5.	Painting	-	400/-
	Total		4500/-

Future Scope:-

- Use of motor and battery system for effortless ride.
- Installation of electronic gadgets.
- Material optimization by using more lighter materials.
- Cost effectiveness by mass production.

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THANK YOU