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DESIGNING THE MONOWHEEL VEHICLE

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Abstract: Today, monowheels are generally built and used for fun and entertainment purposes, though from the 1860s through to the 1930s, they were proposed for use as serious transportation. Pedal-powered monowheels were built in the late 1800s; most built in the 20th century have been motorized. I used Autodesk Inventor™ software as a flexible development platform for building this specialized mechanical design, as well as interfacing upstream and downstream applications in our future manufacturer process.

Keywords: monowheel, digital prototype, CAD

1. INTRODUCTION

The monowheel consists of an inner and an outer frame. The inner frame has three small wheels that make contact with the outer frame. The outer frame is the actual rotating wheel and has a solid rubber tire. The rider sits inside the inner frame that also contains the engine, clutch, propulsion mechanism and petrol / water tank.

2. THE DIGITAL PROTOTYPE

Because the monowheel vehicle is a self-propelled wheel, this particular case cannot be found either in the "Rolling Resistance of a Pulled Wheel" nor in the "Rolling Resistance of a Driving Wheel".

A monowheel is a one-wheeled vehicle similar to a unicycle. However, instead of sitting above the wheel, the rider sits either within it or next to it. The wheel is a ring, usually driven by smaller wheels pressing against its inner rim. Most are single-passenger vehicles, though multi-passenger models have been built.

A digital prototype is a digital simulation of a product that can be used to test form, fit, and function. The digital prototype becomes more and more complete as all associated conceptual, mechanical, and electrical design data are integrated. A complete digital prototype is a true digital simulation of the entire end product, and can be used to virtually optimize and validate a product to reduce the necessity of building expensive physical prototypes.

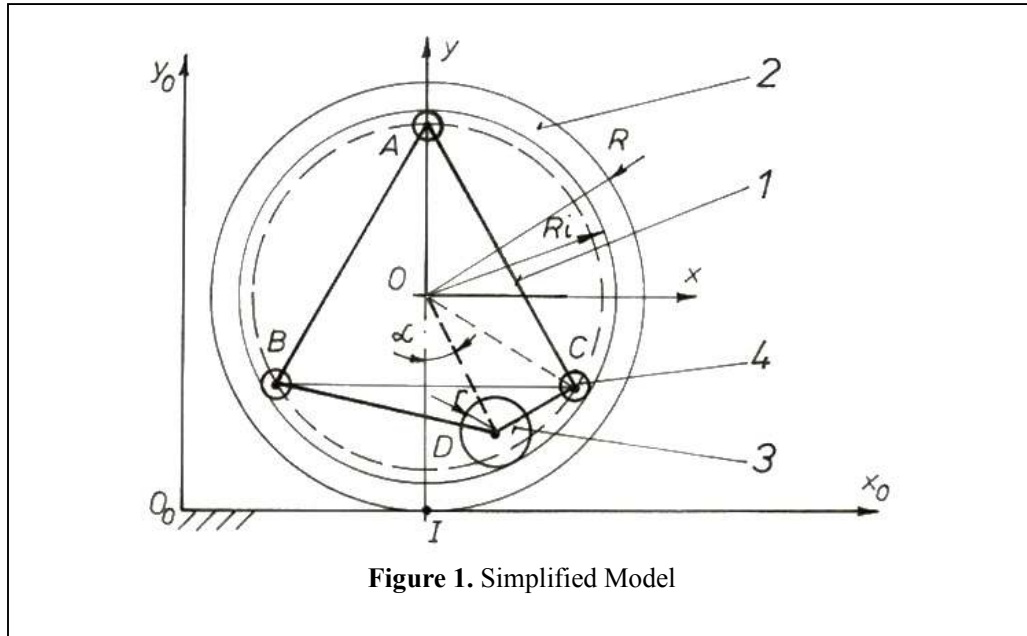
Although there has been talk about the benefits of Digital Prototyping for years, the budget for the tools required to build and test a true digital prototype has been out of reach for most manufacturing companies. Digital Prototyping solutions are usually expensive, customized installations for large enterprises. Most out-of-the-box 3D modeling applications provide only part of the functionality needed to create a complete digital prototype.

Autodesk was the software used because it provides the interoperable tools required to create a complete digital prototype from the conceptual phase of a project through manufacturing: Autodesk AliasStudio™ software; Autodesk Showcase™ software; Autodesk Inventor™ software; AutoCAD Mechanical software; AutoCAD Electrical software; Autodesk Data Management.

As we can see in the simplified model, the vehicle is composed by:

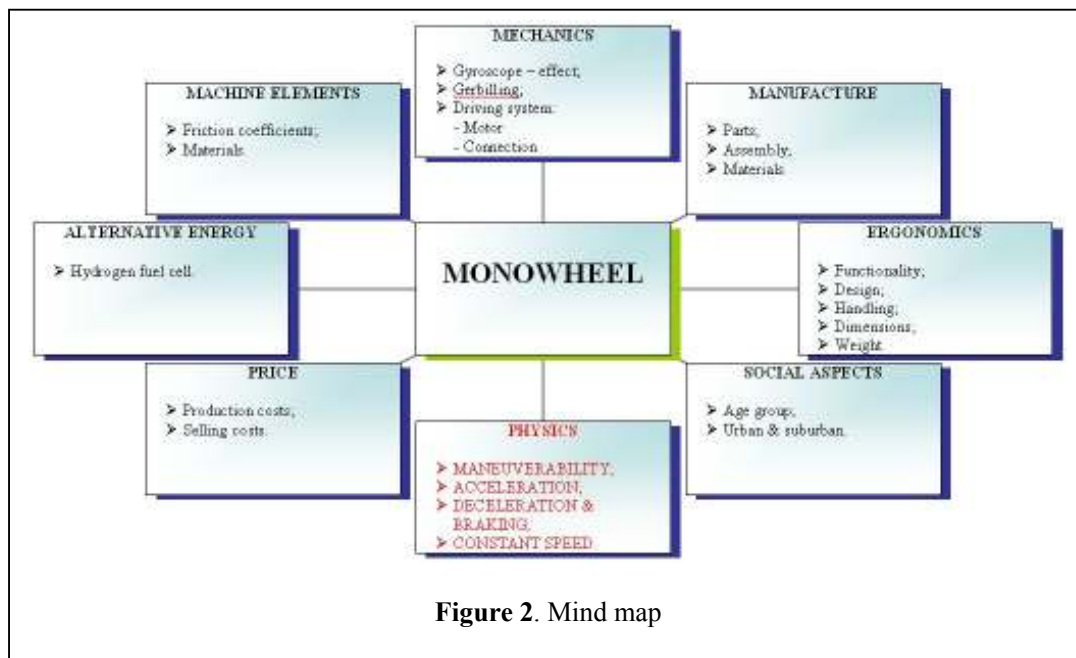
- An inner body 1, having a rigid frame and possessing a saddle and an engine;
- An outer ring 2 (the wheel), which rolls over the ground;
- A driving roller 3, which rolls inside the rim of the wheel;

Three or more guiding rollers 4, which rolls also inside the rim.



Having now this theoretical start-point, the overall research must be constantly update because world wide community interested in this vehicle is developing the idea every month. Naturally enough, there are others who have taken the concept of the monowheel, applied the latest technologies and still foresee a niche future in this genre of vehicle.

My sketches followed this path:



The history gave - the general idea; Few technological & constructive solutions were studied and then the modelling did its role.

The modelling is one important tool used to obtain essential information. We have to notice that, starting from the simplicity of the model compared to the original phenomenon, the researches made on the model, should be less relevant ones. The difference may be compensated, by replaying the study on more and more sophisticated models. This is the only way the scientific research can be done successfully.

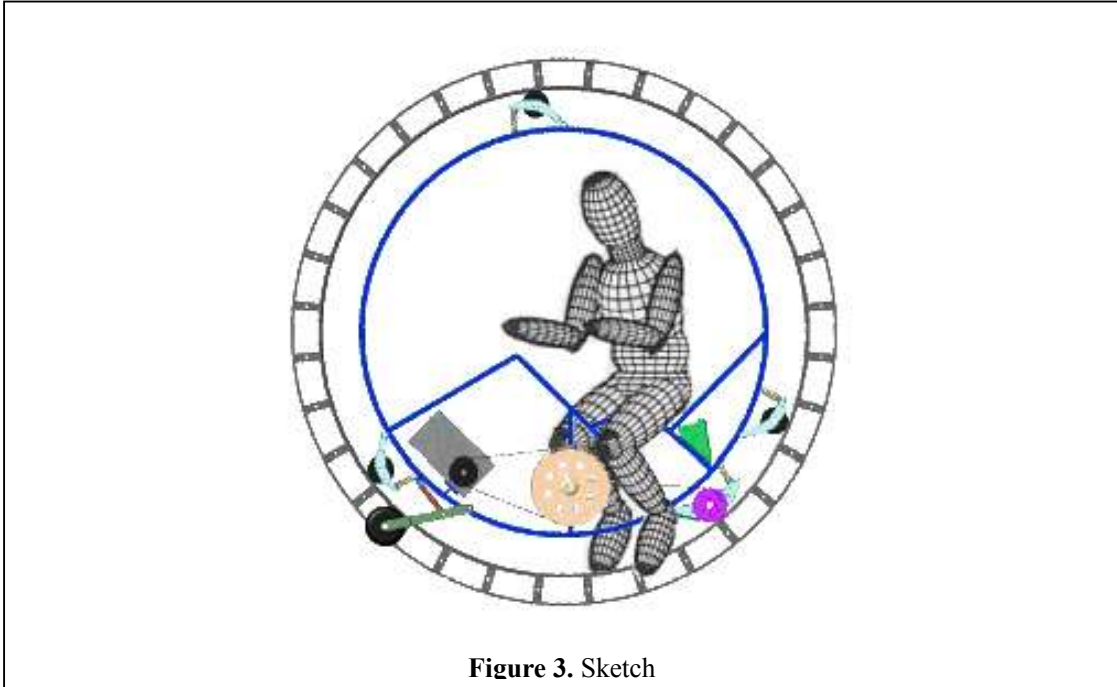


Figure 3. Sketch

The Autodesk solution for Digital Prototyping brings together design data from all phases of the product development process to create a single digital model. This single digital model simulates the complete product and gives engineers the ability to better visualize, optimize, and manage their design before producing a physical prototype.

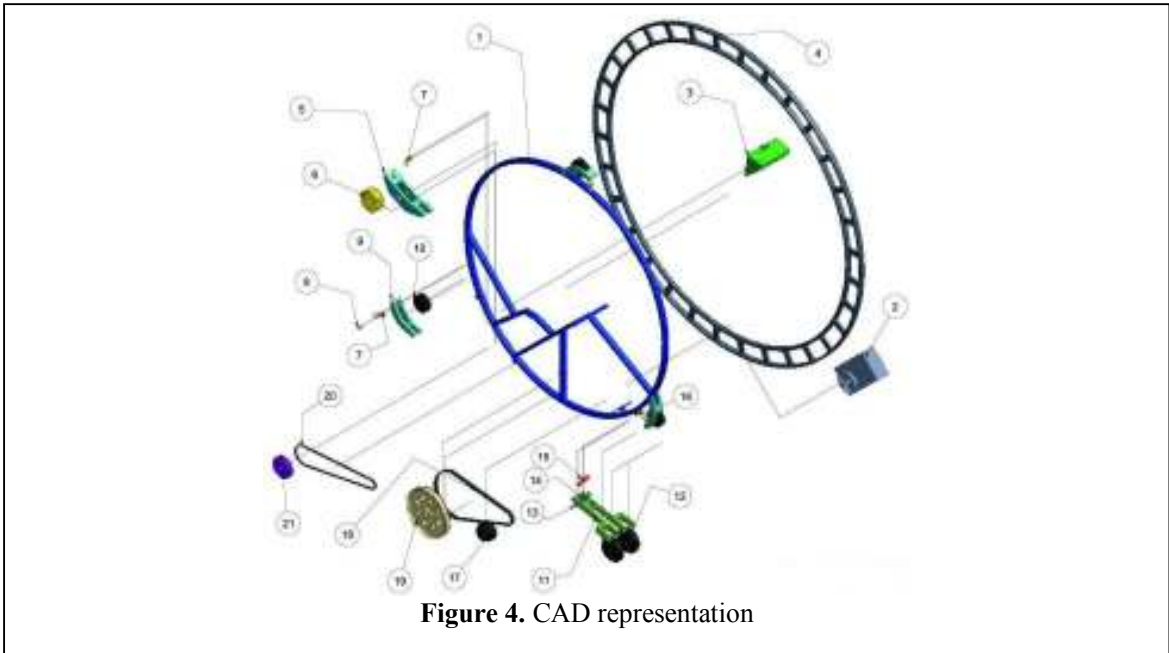


Figure 4. CAD representation

Real time concept design through virtual models starts by modeling the aesthetic aspects of the product with high fidelity surface models through a push and pull interaction. This type of interaction is critical, as industrial designer, I want to organically manipulate the model instead of using an engineering-oriented approach of manipulating model dimension.

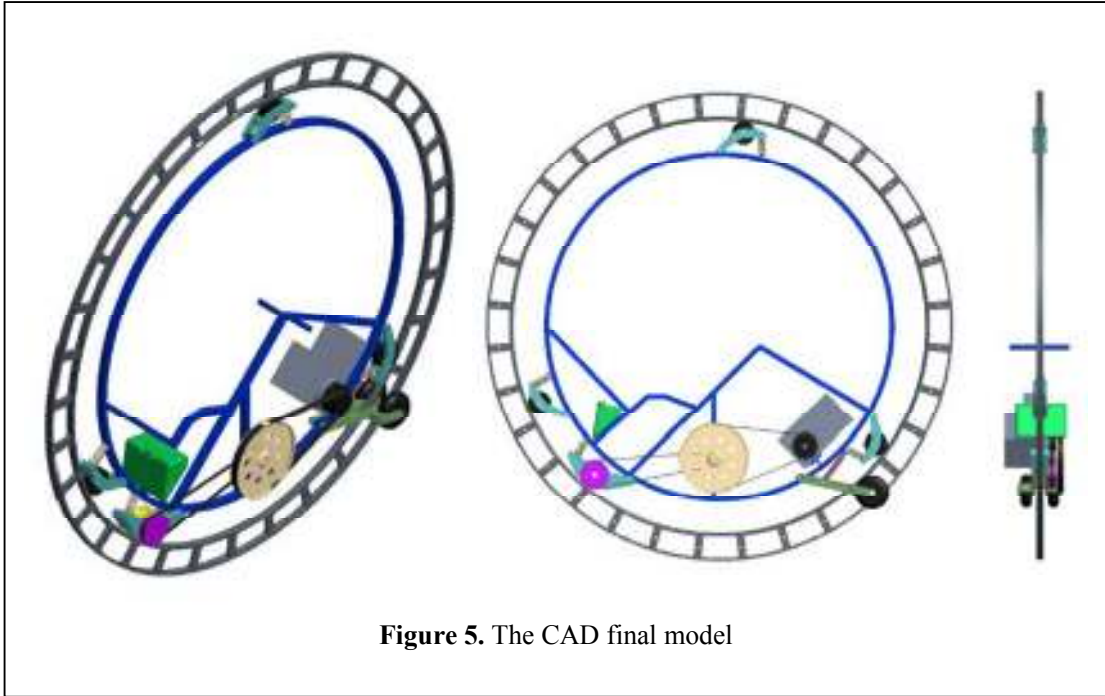


Figure 5. The CAD final model

3. CONCLUSION

The Concept is a one-wheeled recreational and commuting vehicle, aimed 18 to 45 age group, that promises a hole new experience on the road. The project intended to be an aproach of this complex subject after which some very important equations and different other characteristics resulted that define this project. All these achievements will lead to the well progress of my Ph. D. thesis.

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