

# Conceptlization of One Wheeled Motorcycle

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**Abstract**— Since, the invention of wheels in the ancient times, transportation becomes easier. In recent years competition in the automobile market is getting increase with respect to fuel economy especially for the light commercial vehicles. In present scenario, every individual has a two wheeler and they are using this even for reaching for short distances. By this conventional resources like petrol are consumed more and more. Not only the depletion of resources, it produces more environmental pollution hazards. To overcome this issue, people has enforced and encouraged for use of comparatively unconventional energy resources such as electric vehicle. A one wheeled motorcycle is fast growing vehicle for undergoing transportation. In this study, a single wheel self-balancing electrical vehicle is proposed. The concepts were design with free hand sketches and concept evaluation cane be done with the help of Pugh chart selection matrix.

**Key words:** Concept generation; self-balancing; electrical vehicles; Pugh chart, Wheel Rim, CREO, ANSYS, Static analysis

## I. INTRODUCTION

The objects of utilitarian value to people is created by the product design process. It involves the understanding of materials, processes, ergonomics, human behavior's and system. The role of the product designer is to identify the problems in the existing design and come out with the solutions that could impress the end user. The application of problem solving methodology in design supports to obtain the end results. The problem solving methodology in design consists of the following steps:

- Definition of the problem
- Gathering the information
- Generation of alternative solutions
- Evaluation of alternative
- Communication of the results.

The definition of the problem is the detailed statement of the problem faced in the existing design of the product. Gathering of information is the collection of specific and current information regarding the product from journals, patents, catalogues, handbooks and literatures published by vendors. The generation of alternative solutions depends on the creative thinking capability of a designer.

The ability to generate high quality alternative solution is vital for a successful design. The evaluation of alternative solution consists of systematic methods for selecting the best among several designs. Simulation of performance with computer models is finding wide usage. The communication of results involves a written design report details the 3D model dimensions and analysis of the product at the end of the project which should satisfy the need of the customer.

## II. CRITERIA FOR EVALUATION IN THE EXISTING DESIGN

The existing unicycle's design procedure and performance are deeply evaluated to understand the various limitations associated with it. Generally, in a typical product development process, the product is evaluated based on a specific set of design criteria. The design criteria are framed with regard to cost, functionality, safety, maintenance, durability, availability, in addition to a specific set of criteria depending upon the product being considered.

A specific set of criteria for the design of comfortable unicycle is considered and the existing unicycle's design and performance are evaluated to understand its limitations.

Depending upon the shortcomings of the existing product for the criteria considered new designs are proposed to overcome the limitations. In this work, the formulated criteria for the comfortable unicycle design and its evaluation mainly based on the driving methods , stability of drive condition, portability, ease of transportation, compactness, material used, tire size, weight, etc.. The formulated set of criteria's which overcome the shortcomings in the existing design strengthened the need for a new comfortable unicycle design.

## III. CONCEPTUAL DESIGNS

Conceptual design is the very first phase of design, in which conceptual sketches or solid models are the dominant tools and products. The conceptual design phase provides a description of the proposed system in terms of a set of integrated ideas and concepts about what it should do, behave, and look like, that will be understandable by the users in the manner intended.

### A. Concept 1

Fig. 1 shows a first concept design. In this concept, steering is connected to the frame with the help of shock absorber. In this design, as suspension is directly connected to the steering system which will cause the stability to decrease and there will be problem while taking a turn. The advantage of this design is ease of operating and manufacturing is easy. However, the disadvantage is less stability and problem no degrees of freedom for steering.

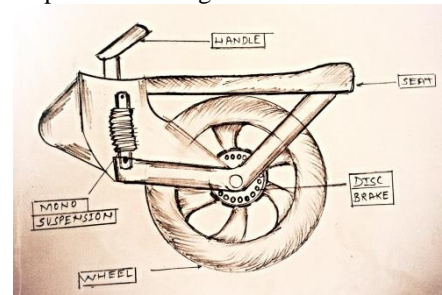


Fig. 1: Concept - 1

### B. Concept 2

Fig. 2 shows a second concept design. This type of frame will not carry heavy loads because of large overhang. Due to drop handlebar rider feel uncomfortable while riding motorcycle for short distance communications. Due to its complex frame shape it is very difficult to manufacture. The advantage of this design is ease of assembly and serviceability. However the disadvantages are the manufacturing process will be quite hard, manufacturing cost will be high and no steering stability for bike.

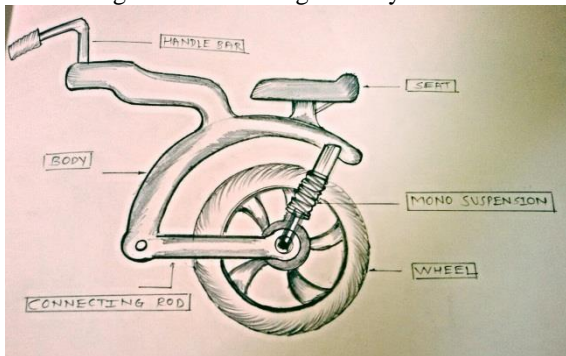


Fig. 2: Concept - 2

### C. Concept 3

Fig. 3 shows a third concept design. This concept is designed for casual riding, and have a very comfortable, upright riding position, a large comfortable seat. This can be used for short distance commuting and errands, as long as your route is fairly flat. But this type of frame will not carry heavy loads. The advantage of this design is ease of assembly and serviceability. However the disadvantages are the manufacturing process will be quite hard and manufacturing cost will be high.



Fig. 3: Concept - 3

### D. Concept 4

Fig. 4 shows a fourth concept design. This design is preferred for people who want light, high-performance chassis, but don't like the drop-handlebar riding position. Their large, padded seats and upright handlebars provide a comfortable riding position, and are best for casual riding around the neighborhood or bike paths, short-distance commuting, and errands around town. They can be ridden on paved roads, but are not as lightweight. They are ideal for paved or unpaved bike trails, but are not appropriate for rough off-road mountain bike trails. The advantage of this design is ease of assembly and serviceability. However the disadvantages are the manufacturing process will be quite hard and are not light in weight.

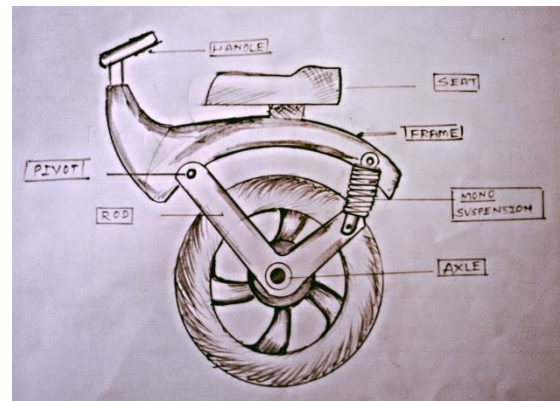


Fig. 4: Concept - 4

### E. Concept 5

Fig. 5 shows a fifth concept design. This is cantilever type of chassis. In this concept chassis is hanging at steering column end. While designing this type chassis designer has main task to make to stiffer so that it can carry higher loads. This design is preferred for people who want light, high-performance chassis, but don't like the drop-handlebar riding position. Their large, padded seats and upright handlebars provide a comfortable riding position, and are best for casual riding around the neighborhood or bike paths, short-distance commuting, and errands around town. The advantage of this design is ease of assembly and serviceability.

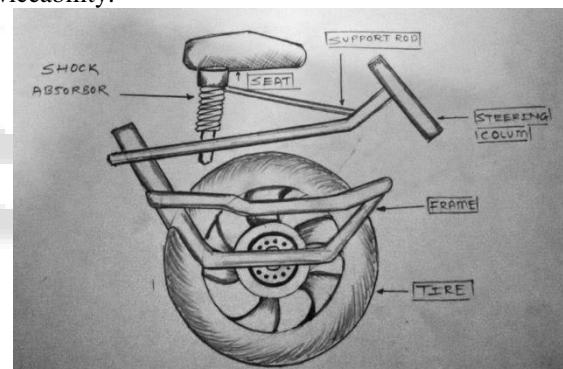


Fig. 5: Concept - 5

## IV. CONCEPT EVALUATION AND PROCESS

The word evaluation here it means both comparison and decision making regarding the ideas generated in the concept generation stage. The evaluation methods differentiate the concepts generated and list the criteria that should be met by those concepts for selecting them. It is also the convergence stage of concept development. In this way, the "best" design for our problem could be arrived.

After five concept designs have been sketch out, the next process will be evaluation process to sort out the criteria of each concept. Screening concept will be carry out in this section. At here, the process will determine which concept or design will be developed.

After discussion with other team members while keeping in mind ergonomics consideration, transmission design and suspension design we have selected the concept-5 (fig.5) for our further work.

## V. 3D MODEL GENERATION AND PROTO MAKING

After finalizing concept CAD model is generated in CREO 2.0 for further work as shown in fig. 6.

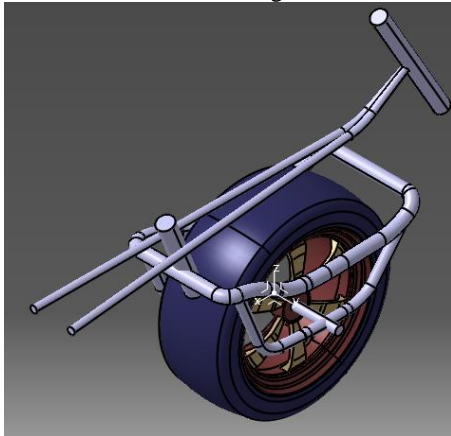


Fig. 6: CAD model

After cad model generation proto making is done with the help of PVC pipes as shown in fig. 7.



Fig. 7: Prototype model

## VI. CONCLUSION

The concepts are generated focusing on the problems in the existing design. The generated concepts are evaluated using different criteria's. The final concept assures to be a cost effective design, satisfying the customer in terms of stability and safety. The CAD model generation is done CREO 2.0. It has provided the lower assessment score thus suggesting that the design is comfortable and effective than the previous design

## VII. FUTURE WORK

In future, modelling details can be done by material selection, analysis & optimization. Once the design is optimized, the proposed design has to be fabricated.

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