DEVELOPMENT OF FOLDED-WHEEL FOR DISABLED WHEECHAIR

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"I acknowledge that have read this work
and in my view this work is adequate in term of scope and quality for award
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"TO FAMILY AND FRIEND"

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ABSTRACT

This project is a study of the problems in transportation to move a wheelchair because of the size and less folded mechanism its self also the solution for this problem. In addition to analyzing the design and practically apply the theory in product design process. Wheelchair design process, based on a problem that occurs is a wheelchair that occupied most space in the boot of the car it is because of the existing wheelchair design is limited to fold. The solution on these problems is to design the folded wheel mechanism for disabled wheelchair to optimize and save storage space. Wheelchair design process is based on the problem statement and initial sketch concepts have been developed using engineering theories. Conduct studies based on research methods and applications where the study was conducted through a process of collecting information. While the application is done during the analysis process. Once the analysis is performed and information from the study is used to develop initial concepts and sketches. Then detailed drawings based on selected concepts and sketches made using CATIA V5R20. (CAD) software. Finite Element model is develop using CATIA V5R20 and detail drawing as reference. The Finite Element model is validate and analyze to find stress, deformation and safety factor of the product.

ABSTRAK

Projek ini membincangkan kajian mengenai masalah pengangkutan untuk memindahkan sesebuah kerusi roda dan penyelesaian bagi permasalahan ini. Di samping menganalisa rekabentuk dan mengaplikasikan teori secara praktikal di dalam proses merekabentuk produk. Proses merekabentuk kerusi roda berdasarkan masalah yang berlaku iaitu kerusi roda yang menduduki kebanyakan ruang di dalam but kereta ianya adalah kerana reka bentuk kerusi roda yang sedia ada adalah terhad. Penyelesaian pada permasalah tersebut adalah dengan mereka bentuk mekanisma roda dilipat untuk kerusi roda kurang upaya bagi mengoptimumkan dan menjimatkan ruang penyimpanan. Proses merekabentuk kerusi roda dibuat berdasarkan masalah yang dihadapi dan membuat lakaran awal konsep yang telah dibangunkan menggunakan teori-teori kejuruteraan. Menjalankan kajian berdasarkan berdasarkan kaedah kajian dan aplikasi dimana kajian dijalankan melalui proses mengumpulkan maklumat. Manakala kaedah aplikasi pula dilakukan semasa proses menganalisa. Setelah maklumat dikumpulkan analisa dilakukan dan maklumat dari hasil kajian digunakan untuk membangunkan konsep dan lakaran awal. Kemudian lukisan terperinci berdasarkan konsep yang dipilih dan lakaran dibuat menggunakan perisian CATIA V5R20. (CAD). Model "Finite Element" dibangunkan menerusi software CATIA V5R20 dengan merujuk lukisan terperinci rekabentuk asal produk. Model "Finite Element" disahkan dan dianalisis untuk mendapatkan tegangan, lenturan dan factor keselamatan produk.

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σ	=	Stress
σ_Y	=	Yield strength
σ_U	=	Ultimate strength
σ_c	=	Compressive stress
σ_t	=	Tensile stress
E	=	Young's Modulus
ρ	=	Density
F	=	Force
m	=	Mass
a	=	Gravitational acceleration
M	=	Bending moment
d	=	Distance
I	=	Moment of inertia

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

A wheelchair is a wheeled mobility device in which the user sits. The device is propelled either manually by pushing the wheels with the hand or via various automated systems. Wheelchairs are used by people for whom walking is difficult or impossible due to illness, injury, or disability. People with both sitting and walking disability often need to use a wheel bench.

The earliest record of the wheelchair in England dates from the 1670s and in continental Europe this technology dates back to the German Renaissance. The first recognizable wheelchair was invented for King Philips I1 of Spain. A drawing of the King dated 1595 shows him in a chair with wheels, armrests and footrests. However, it was not able to be self-propelled. In 1783, Englishman John Dawson built the first wheelchair that was self-propelled by pushing the wheels.

The modern wheelchair began to take shape in the late 19th century to early 20 ~ century with the advent of push rims for self-propulsion in 1881. In 1900 the wooden spoke wheels are replaced by the wire spoke wheels.

The first motorized wheelchair was invented in 1918. In 1984 a young Norwegian law-student had used the first voice activated power wheelchair which enable him to attend his class without the help of an attendant

1.2 PROBLEMS STATEMENT

In Malaysia the wheelchair is normally transport using a typical car, mostly folded wheelchair would fit in the sedan car boot but it occupied most of the space in a car boot. The folded-wheels would spare more space in the boot.

1.3 AIM

This project mainly aims of design and analyze of mechanism folded-wheel for disabled wheelchair in order to reduce the storage space.

1.4 OBJECTIVES OF THE PROJECT

The main objectives these projects are to design a mechanism of folded-wheel for disabled wheelchair in order to optimize the storage space and to examine the structure of the folded-wheel mechanism in normal wheelchair function.

1.5 SCOPES OF THE PROJECT

a) To study the existing design of the folded mechanism (or develop a new mechanism) and apply for the wheel of disabled wheelchair.
b) To analyze the folded mechanism wheel of the wheelchair using Finite Element Method (FEM)
c) To study and apply suitable solid mechanics theory to validate the Finite Element of the folded wheel

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This literature review describe about the general introduction of the wheelchair.. There are many types of wheelchair exist in market place, they were designed in such many ways and purposes. Some of them were designed with well good looking and some of them just with simple design. It is not necessary to design a product with a good looking shape, but lack of purposes. This chapter also focusing on existing design of folded wheel that have been pattern, function of wheelchair and variance type of wheelchair. This literature review also explains the brief history of wheelchair and development of wheel.

2.2 WHEELCHAIR

Wheelchair is a mobility device in which the user sits. The device is propelled either manually turning the wheels by the hand or via various automated systems. Wheelchairs are used by people for whom walking is difficult or impossible due to illness like physiological or physical, injury, or disability. People with both sitting and walking disability often need to use a wheel bench. The earliest record of wheelchairs dates back to the 6th century, and was found inscribed on a stone slate in China (S.F. Simmons,et al, 2000).

2.3 TYPES OF WHEELCHAIR

Nowadays, there are many type of wheelchair that is available in the market. It is design based on different shapes and functions. Beside its main usage, wheelchair is also use for exercise activities. The types of wheelchair are manual wheelchair, electric powered wheelchair, sport wheelchair and beach wheelchair. Each type of the wheelchair has there difference system and function.

2.3.1 Manual Wheelchair

Manual wheelchairs as in Figure 2.1 are those moved by the user or an attendant. The self-propelled chairs usually have rear wheels of between 20 and 26 inches in diameter fixed to an axle and positioned so that users can move them by pushing down or pulling back the push rims. The users can therefore travel forward and backward at speeds dictated by the amount of force they are able to apply. By controlling the push rims, users can also turn left or right and negotiate small dips and rises that lie ahead. To operate manual wheelchairs successfully, however, users must have a good standard of muscular ability and coordination in their arms and shoulders.

Figure 2.1**:** Manual Wheelchair

2.3.2 Electric Powered Wheelchair

Three general styles of Electric Powered Wheel chairs (EPW) exist: rear, center, front wheel driven or four wheels driven. Each style has particular handling characteristics. EPW are also divided by seat type some models resemble manual chairs, with a sling-style seat and frame, where as others have 'captain's chair' seating like that of an automobile. EPW run the gamut from small and portable models, which can be folded or disassembled, to very large and heavy full-featured chairs

EPW may be designed specifically for indoor use, outdoor use, or both. They are generally prescribed for persons who have difficulty using a manual chair due to arm, hand, shoulder or more general disabling conditions, and do not have the leg strength to propel a manual chair with their feet.