



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

REMOTE SENSING WALKER

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Robotic and Automation) with Honours.

by

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DECLARATION

I hereby declare that this report entitled "Remote Sensing Walker" is the result of my own research except as cited in the references.

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APPROVAL

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ABSTRACT

Remote Sensing Walker (RSW) is a walking support system or assistive device that is capable of supporting people with walking difficulties such as elderly, handicapped persons and persons with leg injuries such as under rehabilitation. RSW consists of a support frame, control box, two castors and two wheels with motor attached to it. Power supply and control circuit are placed inside the control box. The brain of the RSW that is microcontroller, which is part of the control circuit, controls the movement of the two motors in which consequently controls the direction of the RSW. There are three input mechanisms of the RSW in which the user can control to move and direct the RSW that are on-board buttons, handheld remote control and photo-electric sensors. The on-board buttons and handheld remote control navigates the RSW to move in various directions that are left, right, forward, and reverse. To further enhance the capability of RSW to detect obstacle in front, the RSW is equipped with two photo-electronic sensors at the front of support frame. Immediately after an obstacle is detected, the two motors will automatically halt. The main advantage of RSW is that it can be remotely control using radio frequency remote control in which it is capable to be parked out of the way and return back to the user when the user is ready to leave. In fact, the RSW has power assisted device (motor) that increase its mobility. Furthermore, RSW is a mobility aid to encourage walking among people with walking difficulties to reduce the risk of muscle entropy, wasting or loss of muscle tissue resulting from disease or lack of use.

ABSTRAK

Remote Sensing Walker (RSW) adalah sejenis alat bantuan atau sokongan semasa berjalan dimana ianya berupaya untuk menyokong seseorang yang mengalami kesukaran untuk berjalan seperti orang tua, orang kurang upaya dan orang yang mengalami kecederaan pada kaki yang memerlukan pemulihan. RSW terdiri daripada rangka sokongan, kotak kawalan, dua 'castor' serta dua tayar yang dilengkapi dengan motor. Disamping itu, bateri dan litar kawalan pula diletakkan di dalam kotak kawalan. 'Brain' RSW ialah 'microcontroller' iaitu salah satu komponen pada litar kawalan yang mana ianya bertindak untuk mengawal pergerakan motor dan juga arah pergerakan RSW. Terdapat tiga mekanisma input pada RSW yang mana pengguna boleh mengawal pergerakan dan arah RSW dengan menggunakan butang yang terletak pada bahagian atas rangka RWS. Selain daripada itu, pengguna juga boleh menggunakan alat kawalan jauh untuk menggerakkan RWS samada ke kiri, ke kanan, ke hadapan ataupun kebelakang. Untuk meningkatkan keupayaan RSW bagi mengesan sesuatu halangan di hadapan, ianya dilengkapi dengan dua 'photo-electronic sensor' yang diletakkan dihadapan rangka sokongan yang mana sekiranya halangan dikesan, kedua-dua motor akan terhenti secara automatik. Kelebihan utama RSW ini ialah, ianya boleh dikawal pada jarak yang jauh dengan menggunakan alat kawalan jauh (Radio frequency remote control). Pengguna boleh menempatkan atau meletakkan RSW tanpa bergerak dan juga boleh mengembalikan semula kepada pengguna dengan hanya menggunakan alat kawalan jauh tersebut. Pada asasnya, RSW ini mempunyai motor yang berupaya meningkatkan mobilitinya. Tambahan pula, alat bantuan ini boleh menggalakkan aktiviti berjalan bagi mereka yang mengalami kesukaran ketika berjalan yang mana ianya dapat mengurangkan risiko 'entropy' otot semasa melakukan aktiviti tersebut.

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LIST OF ABBREVIATIONS

DC	-	Direct Current
MSC	-	Mechanical Speed Controller
ESC	-	Electronic Speed Controller
CPU	-	Central Processing Unit
PC	-	Program Counter
ALU	-	Arithmetic Logic Unit
AVR	-	Automatic Voltage Regulator
PLC	-	Programmable Logic Controller

CHAPTER 1

INTRODUCTION

Handicapped walker is a tool for disabled people who need additional support to maintain balance or stability while walking. According to Muiza, handicapped walker is available in sizes such as Pediatric (for children) or Bariatric (for overweight or obese persons). Handicapped walker is a good tool for those who are recuperating from leg or back injuries. It is also commonly used by persons who are having problems with walking or mild balancing problems. Basically, the handicapped walker has two main types; lift walkers or push walkers. Lift handicapped walkers are usually four points of ground contact with two of the points being rubber tips and the other two small rolling wheels. Beside that, push handicapped walkers have bigger tires and it has better the traction and easy to use.

Nowadays, a modern walker is popular because it is can be made adjustable in term of its height or wide which can be set according to what is comfortable for the user. Modern walker is commonly safe, more convenience and as a wheeled walking aid it has more durable parts. Beside that, modern walkers also use tubular seats, back seats and baskets with spacers and cushions, and are equipped with latches and release buttons for movement.

1.1 Problem Statement

Traditionally, a handicapped walker is picked up and placed a short distance ahead of the user. The user then walks to it and repeats the process. If the elders or handicapped person have to move using manual walker, they must raised the walker step by step where it is very difficult and requires more energy to the user. Using the remote sensing walker, the users only need to push the switch at RF remote control and on the walker frame to move in various directions that are left, right, forward, and reverse. It also provides two photo-electric sensors and ability to detect the obstacle in front. This walker is easily park or return to the user where it only need the depressing of the switch at RF remote control and it also facilitate the user to go to anywhere without inconveniencing other people.

1.2 Objectives

- i. To develop the remote sensing walker and should equipped with various types of component.
- ii. To develop the RF remote control to use with the walker.

1.3 Scope of Project

The scope of this project is to develop the walker which can be used by elders or handicapped person that can be controlled using remote sensing. This walker is suitable for general purpose which it provides a stable and mobile walking frame and is adapted to move forward or reverse and move left or right according to a users needs. This walker can be operate by using lead acid battery 12VDC (Power window motor), 10VDC (Receiver circuit) and 9VDC (Transmitter circuit). The user controls the movement of the walker by depressing a switch at RF remote control or switch at the walker frame and the speed of this walker also can be controlled. This walker has special features and easy to be carried to anywhere. For example, this walker can be used if the users want to go to indoor or outdoor environment such as cafeteria, playground or other place. If users want to put the walker somewhere, it only need to use RF remote to move the walker to certain place or parking area. This walker also can be returned to the user when signaled by RF remote control.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will present the literature reviews relevant to this project. It includes walker, mechanical structure, motor, and control circuit by transistor, electrical and electronic components, mechanical components, remote control, sensor, and programmable controller. The entire thing in this chapter must be considered to develop this project.

2.2 Walker

Walker is one device used to provide support to adult or some that recovered from leg injury or waist and others. It is also commonly used by persons having problems with walking or with mild balance problems. Commonly the walkers have two types such as lift walker and push walker (1stSenior Care, 2007).

2.2.1 Push Walker

Usually, push walkers are good for carpet area and has the big tire where it is better for movement. Push walkers have become so popular that walkers are now offered with many options. Some walkers have seats so the elders can take a break from the walking and sit for awhile. The push walkers are also more stable than the lift walkers. The reason for this is the bigger wheels and there is constant contact with the floor compare to intermittent contact with the floor when using the lift walker. Push walkers are also easily adjust to different floor surfaces .While the elder may have more contact with linoleum but when they do come in contact with carpeting it can be dangerous (1stSenior Care, 2007).



Figure 2.1: Push walker (1stSenior Care, 2007).

2.2.2 Lift Walker

Basically, lift walkers are usually four point of ground contact with two of the points is rubber tips and it can be changing the frame with a large number of height and wide adjustments. This walker has good stability and easy to use. Beside, this walker is lightweight and easy to lift (Allegro Medical, 1997).



Figure 2.2: Lift walker (Allegro Medical, 1997).

2.2.3 Powered Walker having Integrated Parallel Bars

This walker is an integrated powered walker and parallel bar to provide a stable and easy to use .This walker also to move forward according to a user need. The user can be controls the movement of this walker by depressing a switch. Beside, the user can also control the speed of this walker (Lathrop, 1996).

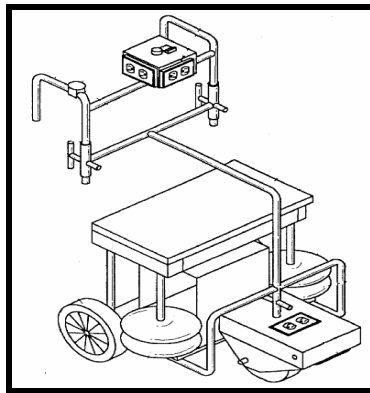


Figure 2.3: Powered walker having integrated parallel bars (Lathrop, 1996).

2.2.4 Powered Walker

This walker includes a frame assembly and has space for containing an operator in a standing position. When operators enter inside this walker, gate can be covered and opened. This gate purpose is to operator safety. This walker has a seat which can be adjustable either in horizontal or vertical direction. Beside that, this walker has a switch to control the movement either forward or reverse (Houston, and Metzger 1989).

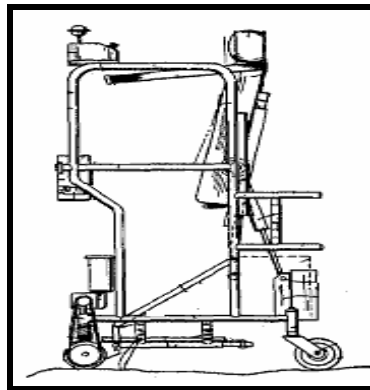


Figure 2.4: Powered walker (Houston and Metzger, 1989).

2.2.5 Comparison Types of Walker

Types of walker	Advantages	Disadvantages
Push Walker	<ul style="list-style-type: none">• Good for carpet area.• More stable.• Easily adjust to different floor surfaces.	<ul style="list-style-type: none">• Easy loss of control• Difficult to move at rugged surface.
Lift Walker	<ul style="list-style-type: none">• Lightweight and easy to lift.• Rigid dual sides brace design.	<ul style="list-style-type: none">• Not suitable for carpet area.• Not stable.

Powered Walker having Integrated Parallel Bars	<ul style="list-style-type: none"> • Can move forward according user need. • Have a switch for movement. 	<ul style="list-style-type: none"> • Difficult to press the switch. • Lack of stability.
Powered Walker	<ul style="list-style-type: none"> • Has adjustable seat. • Has a switch to control the movement either forward or reverse. 	<ul style="list-style-type: none"> • Fairly heavy. • Difficult to adjust the seat in horizontal and vertical.

2.4 Mechanical Structure (Material)

Mechanical structure is very important to develop the walker. Selection of material will influence the stability of walker. To obtain the best structure of walker, the materials that must be considered are:

2.4.1 Square Hollow Steel

Square hollow steel is lightweight and easy to weld. This steel has higher strength and easy to bend. Square hollow steel is used for construction structure, machinery, container, hall structure, offshore oil field, sea trestle, motorcar cassis, airport structure, shipbuilding, automotive parts and so on. To prevent rust, this steel must be oiled or black painted (Vortex Technologies Ltd.).