Smart Wheelchair

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Abstract— Few patients such as quadriplegics and multiple sclerosis type cannot drive normal wheelchair so they are dependent on other people or helpers to move from one place to another and in such a way they don't have the freedom of mobility. So this is the project about developing a powered wheelchair which operates through joystick or user on that wheelchair. This powered wheelchair motor control and drive system which consists of joystick and DC motors. The main signal from joystick is sent to the relays and motors are connected to the terminals of relays that will drive two dc motorsmicrostrip antenna for the purpose of satellite communications.

Key words: quadriplegic; independent; multiple sclerosis; joystick

I. INTRODUCTION

Independent mobility is a dream for every person with some or the other physical disability especially in the case of quadriplegics and multiple sclerosis. These are the patients who are paralyzed below neck. People with disabilities meet barriers of all type. We know that technology is manual wheelchair but as per survey more than 70 percent of manual wheelchair users will develop shoulder pain at some point in their life. But anyways the quadriplegic patients cannot move any of the limbs below the neck. Hence manual operated wheelchair is out of question for the quadriplegic patients. So the development of joystick operated wheelchair will solve the query about the mobility of quadriplegic patient and make them independent of mobility.

II. OBJECTIVE OF THE PROJECT

Our aim is to develop a system which will be helpful for the handicapped people to drive their wheelchair through joystick. This project is about to design a powered wheelchair with particular features that helps the quadriplegic patients and multiple sclerosis patients move independently. This wheelchair can be easily driven to desired direction with minimum effort. The user requires minimum training to use this mobility equipment.

III. METHODOLOGY

An electric wheelchair is typically driven by two individually powered wheels which rotate around a horizontal axis, and another two non-powered caster wheels, which besides rotating around a horizontal axis, also have the ability to rotate around a vertical axis. This vertical rotation axis allows the non-powered wheels to steer freely, minimizing friction during direction change. Assuming the terrain is flat and there are no obstacles, when the speed is the same on both powered wheels, the wheelchair moves in a straight line. Steering is determined by the velocity difference of the powered wheels, i.e. the wheelchair will rotate towards the wheel with the lower speed, and rotate around itself when the wheels rotate in opposite directions. The radius of curvature of the wheelchair is dependent on the wheel spacing and also on the traveled distances of each wheel.

A multimodal interface was also developed that allows driving the wheelchair with several inputs such as joystick. The joystick mapping is important, because this mapping will determine the response behavior of the wheelchair to the user manual control. For this purpose we are going to test the different joystick signals. Power is given to the rear two wheels of the wheelchair through permanent magnet DC motors and these motors are controlled through joystick.

IV. BLOCK DIAGRAM OF SMART WHEELCHAIR

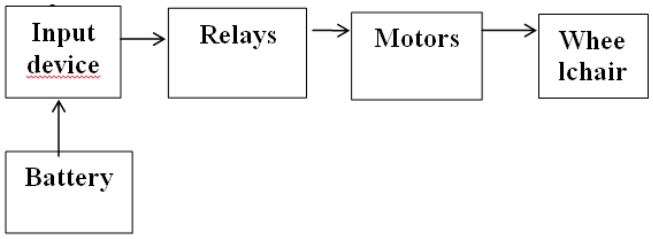

Fig. 1: Block Diagram of Smart Wheelchair

The Project aims at controlling a wheelchair by means of joystick. The above figure shows the block diagram of the control circuit.

A. Joystick:

It is used to control the direction of motor which helps for the movements of wheelchair. Control signals from joystick are given to the motor driver relays.

B. Relays:

It is used to connect the high current motors. This is because current rating of two motors is so high.

C. Motors:

The drives used in the wheelchairs are PMDC motors. Two motors are used to drive the wheelchair. They are 12V, 7.5A, 30 rpm brushed DC motors.

D. Battery:

It is used to supply the power to the motors.

V. HISTORY

Wheelchairs have evolved very little over the past 1000 years. Most of the design changes have occurred within recent decades as shown in the following outline of wheelchair history. 6th Century A.D. - Earliest recording of a wheelchair; a Chinese engraving picturing a man in a chair with three wheels (Kamenetz, 1969). 16th Century A.D. - Wheelchairs were well-developed in Europe and commonly found in drawings and literature (Kamenetz, 1969). American Civil War - The first appearance of wheelchairs in the United States. The chairs were of bulky wooden construction with two large drive wheels and two

small caster wheels (McFarland and Wilson, 1986). 1869 - The first wheelchair patent was issued in the United States (Hotchkiss, 1993). 1903 - An electrically-driven wheelchair operating on a 12-volt battery and a 3/8 horsepower motor was used to give people rides. At the time it was not used for handicapped mobility but it did pave the way for future developments (Kamenetz, 1969). 1909 - Compact wheelchairs were developed using metal tubing instead of the traditional bulky wood components (Kamenetz, 1969). World War I - The first electric wheelchairs were used for the handicapped. A battery and motor were applied to existing wheelchairs with a simple one-speed on/off switch (Kamenetz, 1969). 1937 - The patent for a wheelchair with a folding X-brace frame was issued to two engineers named Everest and Jennings. Though previous chairs had been foldable top-to-bottom, the side-to-side folding position of the cross frame allowed the drive wheels to remain in place. This basic concept is still the standard for manual wheelchairs today (Hobson, 1990). 1940 - The first patent was issued for an electric wheelchair (Hobson, 1990). 1950 - Sam Duke received a patent for a releasable add-on power drive applied to a manual wheelchair (the unit was actually permanently fitted to the chair with Ubolts) (Kamenetz, 1969). 1960's - Folding wheelchairs were commonly fitted with electric drives. The drive units were still very heavy and quite difficult to put on and take off. At that point both joystick and steering column mechanisms were available (Kamenetz, 1969). 1970's - Wheelchair frames made of aircraft quality aluminum were introduced to the market and started a revolution of ultralight wheelchairs. The technology has aided in the reduction of the overall weight of many types of wheelchairs (Hobson, 1990). 1980's - Most electric wheelchairs on the market were still bulky, heavy, and required a special vehicle for transportation. The power components of the chair were integrated into the frame which has been strengthened to support them (Hobson, 1990). 1990's - The popular electric wheelchairs on the market are foldable though they require removal of at least the legrests and batteries. The Americans with Disabilities Act (ADA) and a growing awareness for the rights of the disabled have greatly improved research and design efforts in the assistive technology industry. Interest has also increased in this area due to the current trend toward the "graying of America" as the average age of Americans increases (COMSIS, 1988).

VI. CONCLUSION

Joystick operated wheelchair is the modified version of the manual wheelchair .It is operated on the command given by the patient (i.e. commands such as forward, left, right, stop,etc).The wheelchair does not require any person to move it as it is automated with motors .Such kind of wheelchair are very less observed in India as compared to the other countries(USA, Europe, China, etc.).Hence this wheelchair provides the need of the quadriplegic patients and make them independent for mobility at reasonable rate.

VII. FUTURE SCOPE

By making advanced and partial modifications, this project can be used in acoustic control of vehicles' braking systems thus reducing risk of accidents. This project can be done by using soft computing on MATLAB for efficient output. We can also add the GSM/GPS system to the present module so that it can help anyone to track if any accident occurs as the patients would not be in a condition to call someone.

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