Voice Controlled Wheel Chair

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Abstract— The technology and science has achieved many new heights but still the mankind is left physically disabled at some time in their lives. In the view of present scenario in India among the total population of the country around 27.1% are the sufferer from the disability of the movement. An important aspect of the paper is to integrate persons with disabilities in the society so that they can actively participate in society, be a part of a society and lead a normal life. Therefore in the present work an attempt has been made to provide better maneuverability with the help of a Voice Controlled Wheelchair. The main aim of the paper is to focus on the movement by a voice command. The simple words like Go, Back, Left, Right and Stop are used. The controller decodes the maneuvering commands by speech-recognition techniques and transmits these commands to the Wheelchair motors to affect the desired motion.

Key words: DC-Motor, Arduino, BT-Module, Battery, Ultrasonic Sensor, Wheelchair

I. INTRODUCTION

The advancement and development of technology has always proved to be the sole reason for causing a positive influence on the various aspects of the lives of a human being. In this paper the attempt is to relate the technological advancement along with the human requirements, for a better life. The idea of the project is to control a wheel chair with a human voice. The project is specially designed for those who are physically challenged and cannot use their hand to drag their wheel chairs. In this project the BT-Module is used as voice recognition module to recognize the voice of the user for controlling the directions of the wheel chair as per the requirements. The prototype has been designed and implemented in a manner to yield a cost effective product.

The strong belief, that the project might prove to be a better choice in terms of operation and may provide a better help to the user. The motorized wheel chairs are available in the society in various forms including hand driven, brain mapping and other technological features. Out of these quite are more costly and sometimes the circuitry is more complex and cumbersome. The voice controlled wheelchair can prove out to be a better option in comparison of other available options in terms of cost and effectiveness. The main emphasis is certainly to concentrate on improving the wheelchairs features by including certain possible changes to mark its superiority.

II. OBJECTIVES OF THE WORK

The Numerous studies across the globe has shown that effective action to enhance the capacity of the elderly and people with disabilities, not only makes their daily life convenient, but their mental health, mental state also has a profound impact. In earlier manual wheelchair, the command was transferred to a hand to make wheel forward, which requires physical exertion, and is not suitable for those who are too weak and physically handicapped. Then they invented the electric wheelchair, which generally includes a precursor wheelchair, front and rear wheel drive motor, joystick and motor drive, the drive motor powered by a battery, driving the rear wheels forward, the person sitting in a wheelchair only pressing the joystick , the user can achieve the movements forward, backward and around the corner. There is more manual wheelchair as compared to electric wheelchair. The electric wheelchair has made great progress, but there are still some problems. The objective of the work is to achieve a model that can help the user in more efficient manner with almost no possible stresses on the user. The further consideration includes the possibilities available to make the product more useful and effective with the help of using basic circuits and controller interfacing. .

III. PROBLEM IDENTIFICATION AND PROPOSED SOLUTION

The challenge is to maintain standard performance while using limited computation and memory resources. Researches and advancements in the field of wheelchair control system are still going on. Many people with disabilities do not have the skill essential to control a joystick on an electrical wheelchair. This can be a great drawback for the user who is permanently unable to move any of the arms or legs.

They can use their wheelchair easier only using voice commands. In the proposed project, the main idea of using voice controlled technology for controlling the motion of the wheelchair is to prove that it can be an exclusive solution for severely disabled. The purpose of the project is to implement a speech recognition system to recognize the input words from the user

IV. BLOCK DIAGRAM

1) Firstly we install the Arduino IDE software in order to program the Arduino board.
2) We connect all the components as per the circuit diagram.
3) Once the circuit is completed, we connect the Arduino board to the software with the help of an usb cable.
4) As the programming is completed as per the requirement we upload the program to the Arduino board.
5) The Arduino board is now connected to 9volts supply.

6) As the power supply is connected BT-Module gets activated.
7) Now we connect the BT-Module to the microphone with the help of an Android app.
8) Once the connection is successful we can now give the commands in form of voices.
9) As we give commands the Arduino controls the motor movements with the help of IC-L293.

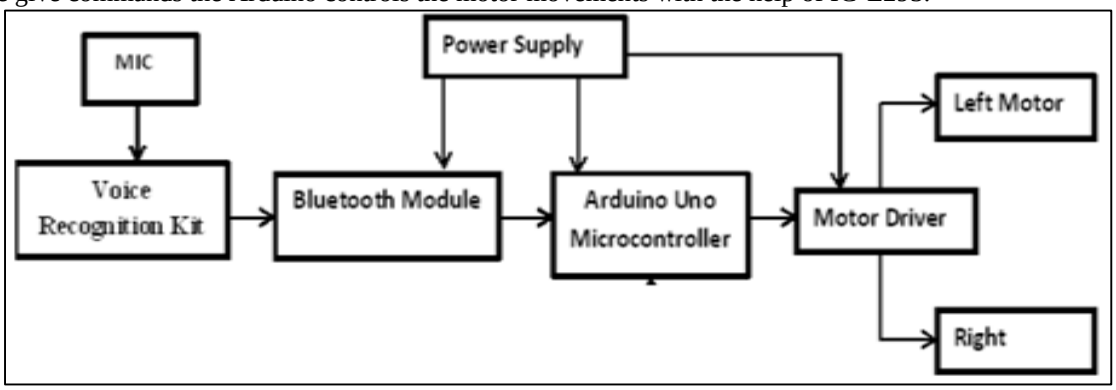

Fig. 1: Block Diagram

V. CALCULATION

Torque = force * distance

$$\text{Force} = \mu\frac{Mg}{2}$$

μ = Coefficient of friction.

- It is ratio between the force resisting motion between the objects and the normal or perpendicular force pushing them together.
- The static coefficient of friction is 0.8 and rotational coefficient of friction is 0.6 for rubber to concrete.

A. At Starting

Mass = 80kg
g = 9.8 m/s^2
μ_s = static friction = 0.8
R = 0.3m = Radius of wheel

$$T_s = \mu_s \frac{Mg}{2} R$$

$$T_s = \frac{0.8*80*9.8*0.3}{2}$$

T_s= 94.05 Nm.

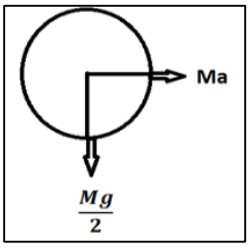

Fig. 2: Force Action

B. At Running

Mass = 80kg
g = 9.8 m/s^2
μ_R = Rotational friction coefficient = 0.6
R = 0.3m Radius of wheel

$$T_R = \mu_R \frac{Mg}{2} R$$

$$T_R = \frac{0.6*80*9.8*0.3}{2}$$

T_R= 70.56 Nm

1) So, Total Torque of wheelchair at starting and running.
2) T_s total = T_{s1} + T_{s2} = 94.08 + 94.08
3) T_s Total = 188.16 Nm
4) T_R Total = T_{R1}+T_{R2} = 70.56 +70.56 → T_R total = 141.12 Nm.

C. Speed calculation of wheelchair

We take a speed of wheelchair is $1^{m}/_{S}$
RPM to $^{m}/_{S}$

$$V_s = \pi D N_s$$

D = diameter of wheelchair
N_S= speed in rps of wheel

$$N_s = \frac{1}{3.14*0.6}$$

N_s= 0.53rps N = 0.53*60

N = 31.84rpm.

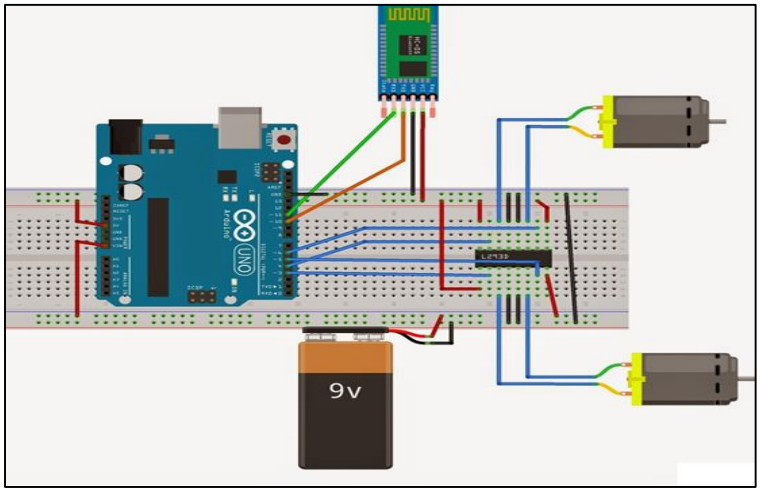

Fig. 3: Main Circuit Diagram

DIRECTION	ARDUINO INPUT (TWO INPUT)		MOTOR 1 (M1) (TWO WIRES)		MOTOR 2 (M2) (TWO WIRES)		DIRECTION OF MOTOR
LEFT	0	0	H	L	L	H	M1(Back) & M2(Front)
FRONT	0	1	L	H	L	H	M1(Front) & M2(Front)
BACK	1	0	H	L	H	L	M1(Back) & M2(Back)
RIGHT	1	1	L	H	H	L	M1(Front) & M2(Back)

Table 1: Logic Table

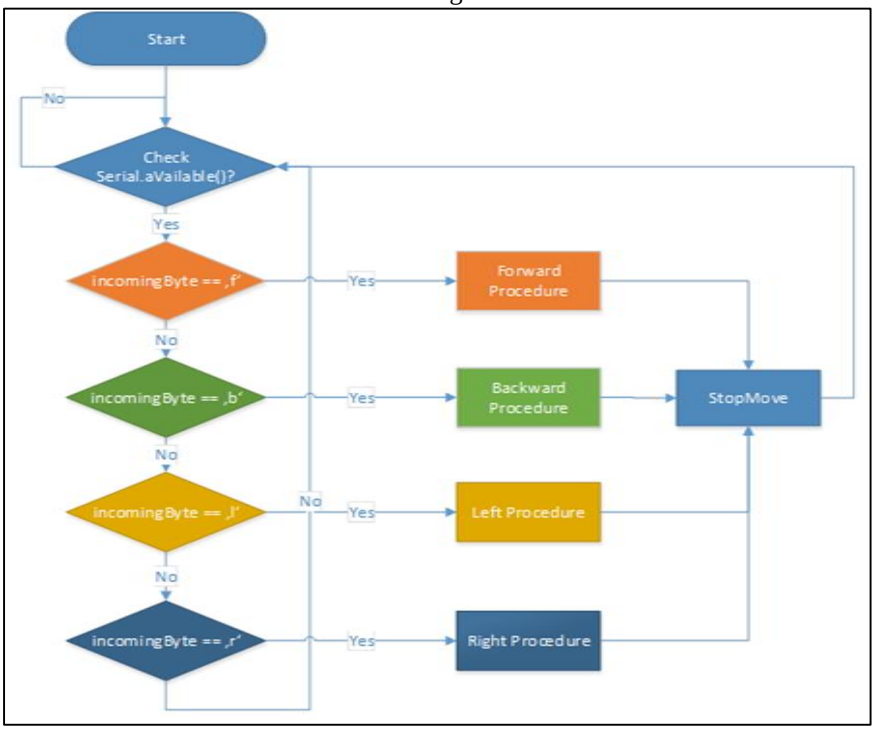

Fig. 4: Flowchart

VI. CONCLUSION

Thus with this project it can be concluded that how the technological advancement can be used to serve the society in a better and more capable form by helping them with basic needs and requirements. Thus it can be further considered the various problem that are faced by the user in the real world and can be tried to improve the product's working abilities and capabilities.

The current system is possible to help the user with better ease and comfort but still there are some possibilities that can make it more feasible to eradicate all the shortcoming faced by a manual wheel chair. The project can be made more realistic and practical for the user's need

VII. ADVANTAGE

1) It is user friendly.
2) Less hardware requirements.
3) It easily recognizes the human voice.
4) Less physical stress on the user.
5) Economical.
6) There is no specific requirement of the helper to drive the chair.
7) It provides easy movements at a comfortable speed.

VIII. DISADVANTAGE

1) Person must have clear pronunciation.
2) There is no provision for climbing stairs.

IX. FUTURE SCOPE

1) The automatic voice control robot utilizes a simple voice app that recognizes voice commands. We need to eliminate noise and detect only the required speech signals.
2) Once our main motto of voice control is achieved we are working on the feature of obstacle detection.
3) We would like to implement multimodal approach to it.
4) We would like to focus on stair case climbing possibilities.
5) We would like to consider the current government's initiative of Sugamya Bharat Abhiyan to enrol this product to help serve the society better.

X. SIMULATION

Fig. 4: Arduino Serial Monitor

XI. PROGRESS TILL NOW

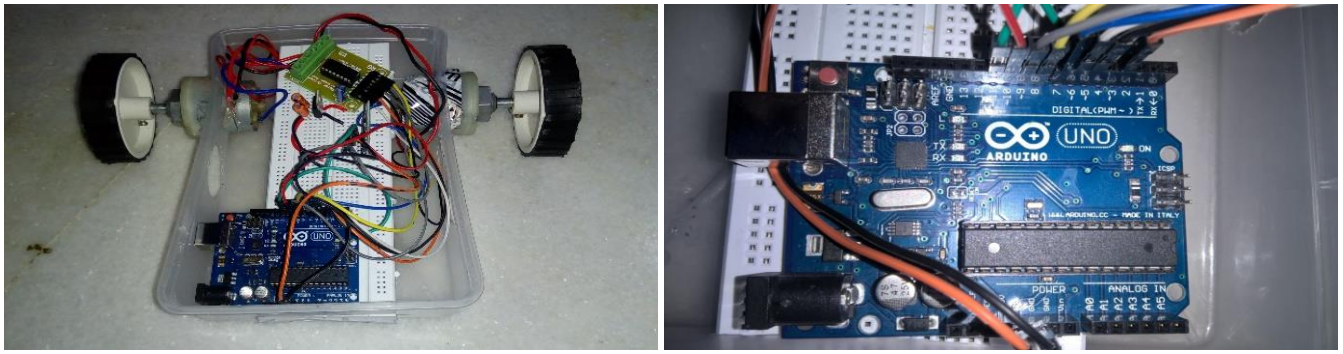

Fig. 5: Progress till Now

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