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AUTOMATED WHEELCHAIR

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ABSTRACT: Automated Wheelchair is a matrix keypad-controlled device designed to have self-mobility with the help of the user command. This reduces the user's human effort and force to drive the wheels of the wheelchair. Furthermore, it also provides an opportunity for visually or physically impaired persons to move from one place to another. The automated wheelchair has gained a lot of interest in recent times. These devices are useful, especially in transportation from one place to another. The automated wheelchair can also be used in old-age homes where old-age persons have difficulty in their movements. The devices serve as a boon for those who have lost their mobility.
Different types of automated wheelchairs have been developed in the past but new generations of wheelchairs are being developed and used that feature the use of artificial intelligence and hence leave little to think about to the user who uses the wheelchair. The project also aims to build a similar wheelchair that would have a sort of intelligence and hence helps the user with his/her movement

KEYWORDS: Matrix Keypad, Linear Actuators, Automated

I.INTRODUCTION

Though the recent developments of science and technology have drastically changed have not been able to benefit from this development. In particular, handicapped people with limited mobility still live miserable lives.The introduction of automated wheelchairs has profoundly impacted the quality of life for individuals with disabilities. By promoting greater independence, these devices empower users to participate more actively in social, educational, and professional settings. The ability to navigate various environments, including indoor spaces, outdoor terrains, and public transportation, expands opportunities for engagement and promotes inclusivity. Furthermore, automated wheelchairs can alleviate physical strain and fatigue, reducing the risk of musculoskeletal issues for both users and caregivers.An automated wheelchair aims to provide aid to those handicapped and physically challenged persons by providing them with some sort of mobility that would greatly help them. An automated wheelchair consists of a major controller unit that allows the user to provide input in the form of a matrix keypad. The controller unit then synthesizes the command and takes the required action to move the wheelchair to the particular position.

It has navigational controls which are usually implemented by a 4X5 matrix keypad mounted on the armrest rather than manual operation. In summary, it is a bed convertible/reclinable wheelchair with navigational control using an Arduino microcontroller.

Thispaper aims to explore the design, features, and benefits of automated wheelchairs, highlighting their impact on the quality of life for individuals with disabilities. Additionally, we will discuss the underlying technologies, challenges, and future prospects of automated wheelchairs, shedding light on the ongoing advancements in this dynamic field.

II.PROBLEM STATEMENT

Present-day society demands people to be independent, irrespective of their natural challenges, mentally or physically. Physically impaired people must rely on someone for fulfilling their minor needs. The probability of them, going and interacting with the outside world is very minimal, unless they are provided with modern moving tools such as a Wheelchair. There are two possibilities of either using manual driven or electric powered driven wheelchairs. The former solution is only for the people who have disability in lower limbs and long-term usage poses further health problems. Additionally, the efficiency of the manual driven wheelchairs is merely 10-20%.

The main problem of the wheelchair is that cannot be used by disabled person, so the type of artificial aid needed by a disabled person in order to move about depends, to a large extent, on the level of his incapacity. This project is thus aimed at the development of more sophisticated control scheme for electric-powered wheelchair.

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III.BLOCK DIAGRAM

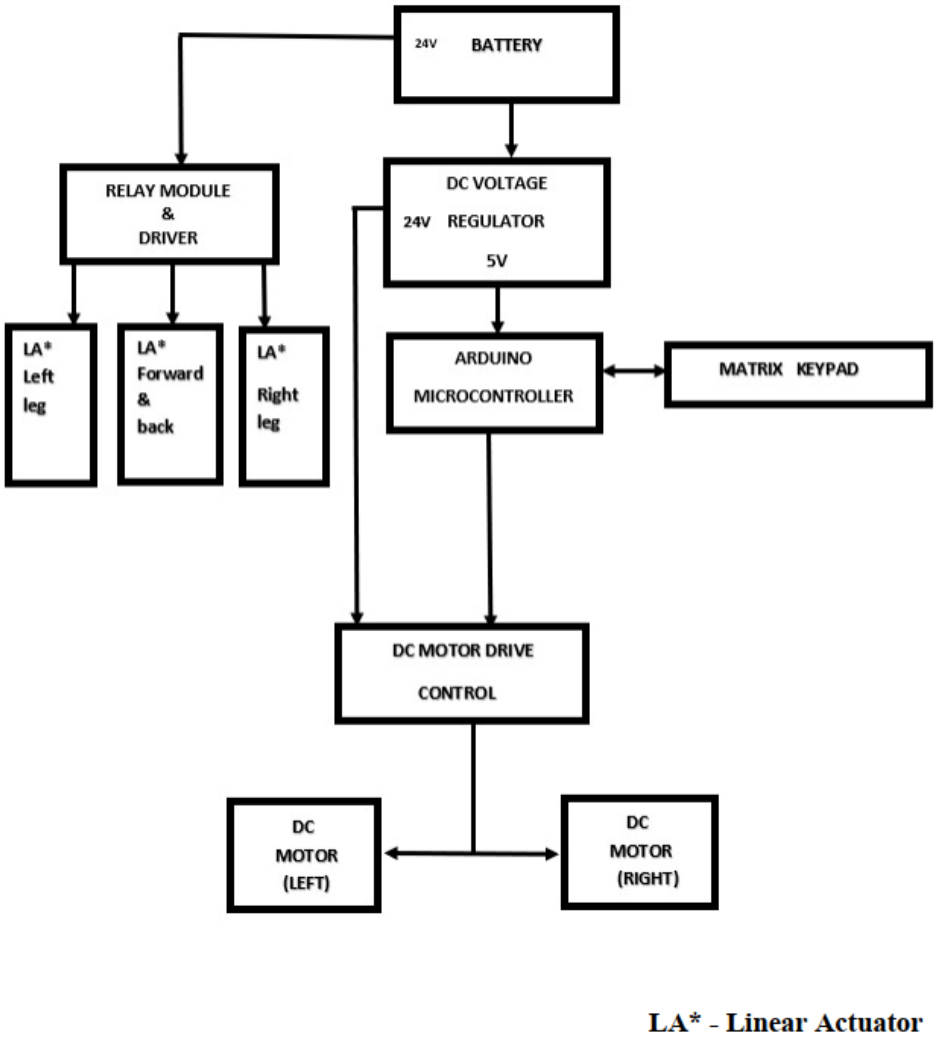

Fig. 1 Block Diagram

IV. RESULT AND DISCUSSION

The automatic wheelchair developed in this project successfully integrates two DC motors for basicmovement, linear actuators for reclining operation, a matrix keypad for local control. The wheelchairprovides enhanced mobility, comfort, and control flexibility for individuals with mobility impairments.The project demonstrates the successful integration of various components and technologies to create afunctionaland user-friendly automatic wheelchairsystem.

- In the fig 1, it shows that with the increase in voltage of the motor, the speed also increases proportionally. By using these values, we can set limits to the RPM of the motor so that the speed of the wheel chair will be comfortable for the user.

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VOLTAGE(volts)	SPEED(rpm)	CURRENT(amps)
1.2	4.5	0.63
3.1	13.8	0.8
5	23.5	0.89
7.2	34.7	0.96
10.2	50.5	1.1
12.5	62.3	1.16
13.8	68.8	1.07
15	74.4	1.2
18.1	90.4	1.28
20	100.9	1.3
22	111	1.32
24	121	1.32

Fig. 1 PMDC Motor Readings

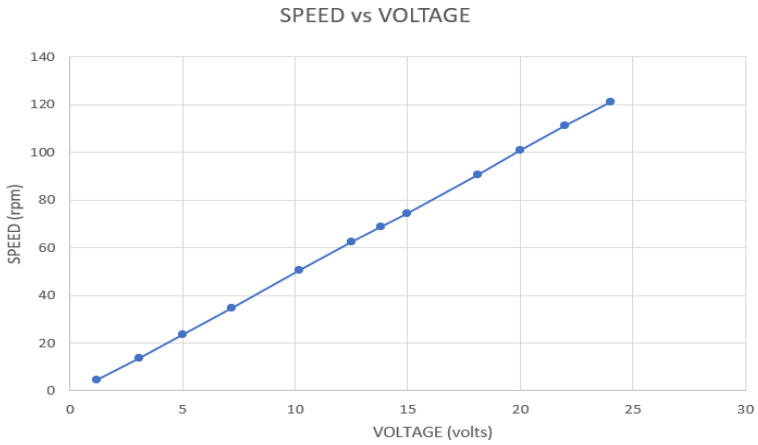

Fig. 2 Graph of Speed vs Voltage of the Motor

- In the fig 2, it shows the graph of Speed vs Voltage of the Motor. We can observe that there is a linear output.

SL.NO	KEY.NO	FUNCTION
1	**1**	Leg linear actuator moves upwards
2	**4**	Leg linear actuator moves downwards
3	**3**	Back linear actuator moves upwards
4	**6**	Back linear actuator moves downwards
5	➡	Wheel chair moves to right side
6	⬅	Wheel chair moves to left side
7	⬆	Wheel chair moves forward
8	⬇	Wheel chair moves backward
9	**7**	Stationary left movement of wheel chair
10	**9**	Stationary right movement of wheel chair
11	**ENT**	Wheel chair movement stop

Fig.3 Matrix Keypad Configurations

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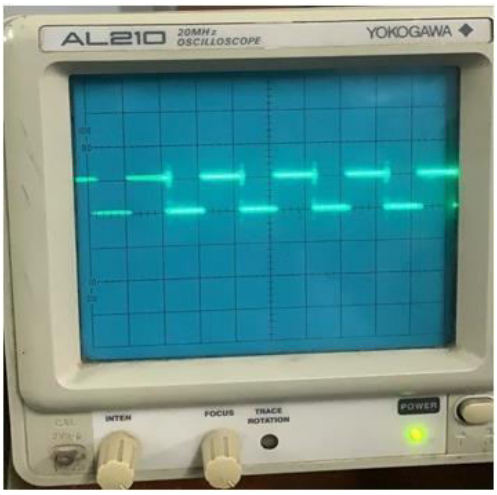
In Fig 3, the 4x5 matrix keypad interface isintegrated into the wheelchair's control panel orarmrest. It serves as a user-friendly input mechanism that allows individuals with limited mobility ordexterity to operate and control the wheelchair. The matrix keypad interface enables various functionalities and commands to be assigned to different buttons. For instance, the numeric buttons canbeutilized forbasicmovement commands, such asforward, backward, left, andright shown in the figure above.

Fig. 4 Keypad Matrix Interfaced with Wheelchair

In Fig. 4, we can observe that the keypad matrix sits on the armrest of the wheelchair, and the movements of the wheelchair such as forward, reverse, left, and right are controlled using the keypad as well as the linear actuator controls such as leg rest movements and backrest movements.



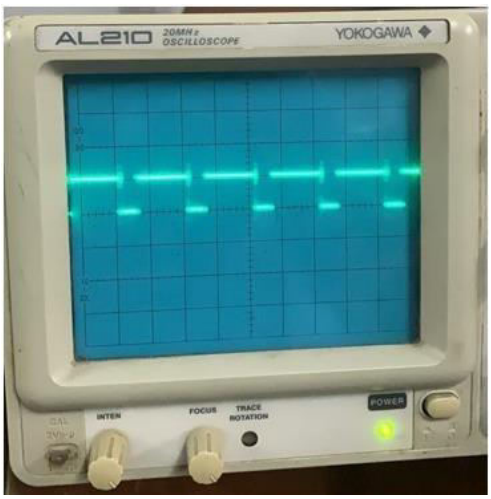


Fig. 5 & 6 PWM Variations observed on CRO

To generate varying PWM (Pulse Width Modulation) signals using an Arduino, you can utilize theanalogWrite()function.Thisfunctionallowsyoutocontroltheoutputofadigitalpinwithavariabledutycycle, which in

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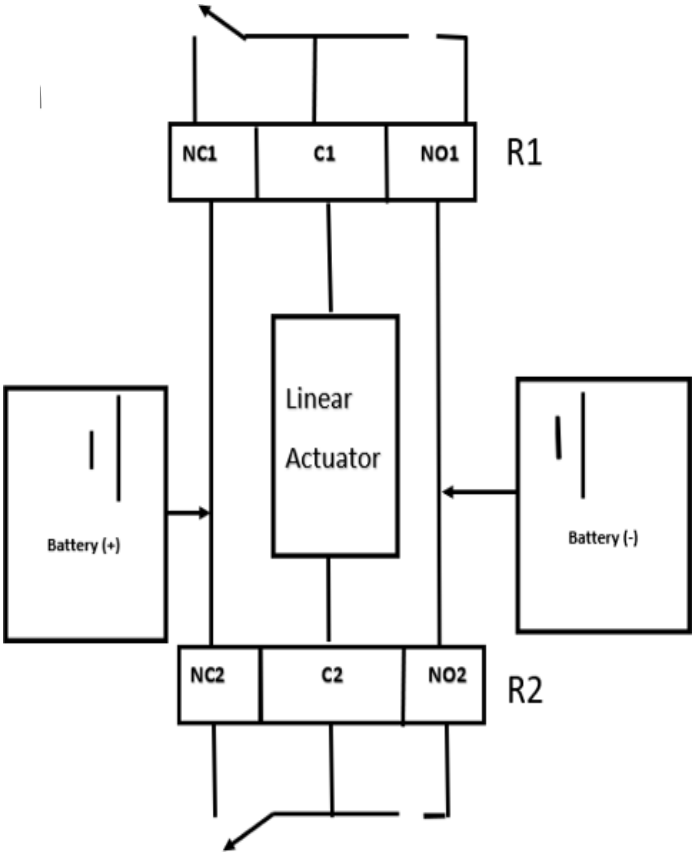
turn controls the average voltage level. The duty Cycle variable ranges from 0 to 255,controlling the pulse width proportionally. By adjusting the delay between duty cycle changes, you cancontrolthespeed of thetransition which can be seen in Fig. 5&6.



ControlSide:

1) Connectthe5V supplyto theVccandGND pins ontherelay board.

2) Connectthe Inxpin totheArduino pinthatyouwant touseto activatetherelay

The8-relayboardhavediodesbesidetherelays(D1,D2,D3…)thattellyouwhichINpincorrespondstowhichrelay.The2-relayboard,theIN1isthetoprelay,theIN2isthebottomrelay(topandbottombasedonthe GND,Inx,and Vccpins beingon theleft). The 4-relay board isclearly labeled.

3) Therelaysareactivatedwhen thecorresponding Inxpin isconnected toGND.

Relayside:

4) The center screw terminal is the common (COM) connection. The top connection is the NormallyClosed(NC) connection, and the bottom istheNormally Open (NO) connection.

5) If you have no connections to the Inx pins, the relay will be connected between NC and COM. If youhave 5V applied to the Inx pin, the relay will be connected between NC and COM. Only if you connecttheInx pin to GND, will the relayswitch to connect NO and COM.

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V.CONCLUSION

Through this comprehensive exploration, it becomes evident that automated wheelchairs have the potential to significantly enhance the mobility, independence, and overall well-being of individuals with disabilities. By combining cutting-edge technologies with user-centric design principles, these assistive devices offer a glimpse into a future where mobility challenges are overcome with greater ease, empowering individuals to lead more fulfilling lives.

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