

Review of Conventional and Advance Wheelchair

Prof. Nikhil V. Bhende¹ Durgeshpratap S. Singh² Yogesh P. Wadekar³ Nikhil R. Jambhulkar⁴

¹Guide ^{2,3,4}Student
^{1,2,3,4}J.D.C.O.E.M, Nagpur.

Abstract— This review paper studies the conventional and advanced wheelchair. There are various types of wheelchair. The need of wheelchair and its modification is elaborated in this paper. There are some essential components in the wheelchair and modified parts which give ease to the patient but researchers always try to modify the existing models for more comfort. So this paper highlights the work of such modifications in wheelchair. The literatures are reviewed which includes the use of electricity, manual work, biometric signal, mechanical arrangement for the modification of wheelchair.

Key words: Wheelchair Review, Conventional Wheelchair, Wheelchair Modifications

I. INTRODUCTION

The wheelchair is a device or machine which plays prominent role in daily life for those people who are unable to move from one to another point i.e. from one location to another location.

Now days everyone needs a medium to transport from one place to another. Normal people can move using various mediums (like legs, bicycle, bike, cars, etc). But there are people who are the patients of polio or other drastic disease who cannot move an inch. So they are dependent on mediums (like tricycle, wheelchair, walker, walker with roller, handicap stick, etc). In daily life transportation is playing very important role from ancient time. In history any path is covered by own legs, for our daily needs and requirement i.e. hunting. Day by day new vehicles with variety of models are coming into market. New vehicle with new feather are coming to give easy path for handicap person.

A. Classification of Wheelchair:

Wheelchairs are classified on the basis of power sources i.e. manual power, solar power, and electric power.

1) Manually Powered Wheelchairs:

Manual wheelchairs are driven by manual power with the help of push rim. Push rim is simple accessory, which is present beside both the wheels. Main motto of that is to apply push force by patient for required motion. This kind of wheelchair is again classified into

- 1) Foldable wheelchair.
- 2) Non-foldable wheelchair.

The first model is based on non- foldable, But for those region where the path of movement is complicated. For that foldable model came into exist. One issue was also faced by handicapped person that is during nature call or excretion process, for that with or without commode design is manufactured.

2) Electric Powered Wheelchair:

Electrical powered wheelchairs runs with electric power and operation of chair depend upon the instruction given by the patient hand or head or another way. Using an electrical wheelchair leads to a large amount of independence for

persons with a physical disability who can neither walk nor operate a mechanical wheelchair alone.

The controlling is done by voice, accelerometer, gearbox arrangement, lever operated, solar power operated, etc. Electricity is the medium depending upon that wheelchair can be controlled, Accelerometer operated wheelchair is also use electricity as power, there is use transmitter and receiver .Transmitter is controlled by hand or brain, according to that receiver perform its task like accelerometer voice controlling present.



Fig. 1: Electric Powered Wheelchair

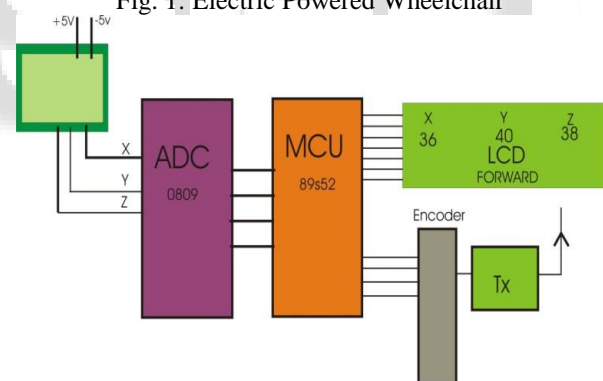


Fig. 2: Block diagram (Accelerometer)

Advance manual operated wheelchair is also in market, (like lever operated, gear operated, chain-sprocket, etc.) This type of wheelchair easy to work because, there is work or effort required is less than manual wheelchair.

B. Components of Wheelchair:

There are different component are present i.e. push arm, backrest, push rim, foot rest, caster wheel, wheel, frame, etc. Push arm are the handle provided for another person which give direction to the wheelchair, backrest is provided for proper sitting arrangement. Footrest names give present for safety of foot. Wheel gives less friction between surface and tires. This is the simple detail about old model. This is basic requirement for any model of wheelchair, the advance wheelchair having same component as like conventional, But new thing is also added which give more comfort for user.

II. LITERATURE STUDY

A. Sukhmeet Kaur and Hem Chand Vashist (1) [2013]:

An accelerometer device (ADXL330) based transmitter is fitted either on persons head or hand. Based on the head or hand movements the transmitter will generate command signals which will be received by receiver fitted on the back of the chair. This receiver after receiving signal will drive the motor fitted to the wheel chair. The ADXL330 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs, all on a single monolithic IC. The wheel chair can be driven in any of the four directions i.e. left, right, forward, back.

B. Ali A. Abed (2) [2015]:

There is all controlling is done by patients. The direction and velocity of the chair are controlled by pre-defined Arabic voice commands. The whole machine is mainly work on programmable microprocessor or sensors .The speaker dependent, isolated word recognition system (IWRs) for a definite utterance of Arabic words to suit the patient's requirements has been programmed and successfully demonstrated. The technique of speech signal processing for extraction of sound parameters, noise removal, intensity and normalization of time , and features matching etc. have been done with the speech processor HM2007that being embedded efficiently in real time.

C. Snehlata Yadav and Poonam Sheoran (3) [2016]:

There is focus on upgraded controlling system (HCI and HMI). There is vast scope in that controlling method and there is research going on to develop reliable, low cost and easy to use device. Out of all methods HCL (Human computer Interface) and HMI (Human Machine Interface) are future scope method and very effective method. There is use both bio and non- bio signal as a medium of control. There is study of various methods for control the vehicle (like EMG, EEG, EOG, Tongue control, Touch screen control etc.)

D. Achutha Tamraparni and Yashwanth Dasappagari (4) [2016]:

The principle of mechanical advantage is being employed here. The main purpose is that to make a device, which works without external assistance. An attempt is made to address these challenges by providing a hand-lever and altering the C.G of the system. With suitable pivots at different levels the C.G of the system is shifted to a higher position away from the original C.G which helps paraplegics to climb over an inclined surface. First, when the wheelchair is propelled by applying force at the top end of the levers i.e. away from the pivots, a greater torque is obtained which facilitates movement on non-smooth terrains. Second, when the wheelchair is propelled by applying force at the lower end of the levers i.e. closer to the pivots, the levers can be moved over a greater angle and hence facilitate traversing at a higher speed.

E. P. Swapna, Dr. B. Sharmila and Y. Dharshan (5) [2016]:

There is total focus on electricity operated wheelchair and use of joystick for controlling point of view. Joystick controller based mobility aid wheelchair has been designed

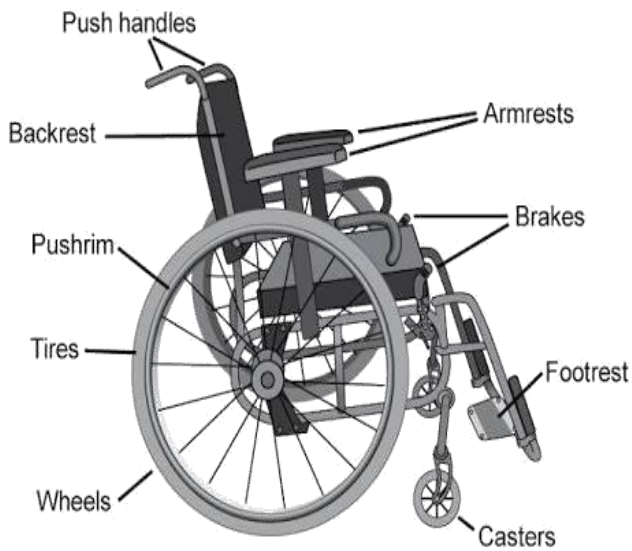


Fig. 3: Conventional wheelchair

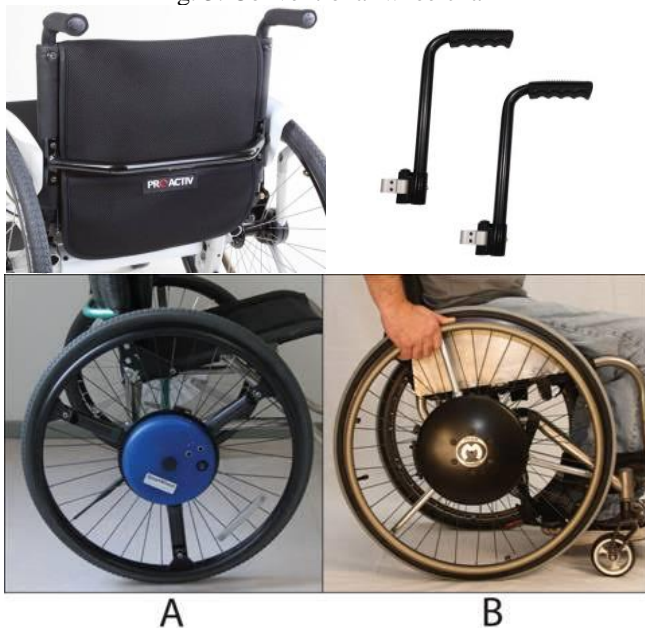


Fig. 3: Part of Wheelchair

C. Price Comparison of Different Wheelchairs in India:

When thinking about the financially backward disabled people, the first thing comes in mind is the price of wheelchair. There are various types of wheelchair available in the market but the problem is some provide comfort and have high price while some have low price but cannot provide that comfort or ease of motion. The following graph shows the variation of price of wheelchairs in India.

Sr. No.	Type Of Wheelchair	Price In India (Rs.)
1.	Manual Wheelchair	6,000-10,000
2.	Powered Wheelchair	30,000-1,40,000
3.	Sports Wheelchair	35,000-40,000
4.	Commode Wheelchair	6,000-10,000
5.	Reclining Wheelchair	8,000-14000

Table 1:

for the all possible direction of movements like left, right, straight and back. The whole system takes power from lead batteries, which are rechargeable, harmless and light in weight. there is main work on D C geared motor and application of GPS and GSM system for localization of path also a mobile application with the help of MIT application developer has been developed for the convenience of the care taker in order to know the position of the person in wheelchair through Google maps.

F. Arvind Prasad, Snehal Shah, Priyanka Ruparelia and Ashish Sawant (6) [2013]:

This paper discusses on renewable energy sources, the usage of wheelchairs based on renewable energy systems. The renewable energy systems which are discussed in this paper are batteries and solar panels. There is conversion one form of energy into another form (like light energy into electrical energy by the help of solar panel.) It also gives a report on the efficiency and durability of batteries and solar panels.

G. Nirmal TM (7) [2014]:

There is application of eyes, voice, and joystick. It monitors the room conditions like temperature, humidity, fire etc., for the controlling purpose of wheelchair by patient. Handicap person ones the wheelchair will help to have food/medicines and other needy things which can only done by his hand can be done using robotic hand. Also it checks the body conditions of the user and according to unnecessary changes in his heart and brain conditions. According to user wish the wheelchair can be made in to a semi sleeper bed.

H. Rakhi A. Kalantri and D.K Chitre (8)[2013] :

This project concern with Automatic wheelchair basically works on the principle of acceleration, one acceleration sensor, provides two axis, acceleration sensors whose output varies according to acceleration applied to it. The goal of that project is to design and develop a system that allows the user to robustly interact with the wheelchair at different levels of the control and sensing. A dependent-user recognition using Head movements and infrared sensor integrated with wheelchair. Wheelchair can be driven using acceleration sensor and Head Movements with the possibility of avoiding obstacles.

FUTURE SCOPE

The main motto of the research is to minimize the cost of wheelchair but giving the essential features in it. The essential need of the operator is to move the wheelchair with ease in forward, backward and side directions. So it can be achieved by adding chain sprocket and lever mechanism in the wheelchair. In this arrangement there will be two levers attached by means of chain sprocket mechanism to both the wheels of the wheelchair. The main function of the lever mechanism is to reduce the force required for more load. So it will give ease to operate the wheelchair.

III. CONCLUSION

These are the various types of wheelchairs available in the market. Some have moderate cost and some have high cost. But these extra modified wheelchairs are not affordable by people who have financially low background. The comparison of wheelchairs and their respective price in the

market has been discussed in the above introduction. So it is concluded that the above researches are good and they made comfortable wheelchairs by giving various facilities but they are costly.

REFERENCES

- [1] Sukhmeet Kaur and Hem Chand Vashist ,Automation of Wheelchair Using Mems Accelerometer (Adx1330) with 80s52 microcontroller, ISSN 2231-1297,Volume 3,(2013), pp227-232 .
- [2] Ali A. Abed, Design of Controlled Smart Wheelchair with (IWRS), Processor HM2007, International Journal of Computer Application, Volume 131, (2015), pp 0975-8887.
- [3] Snehlata Yadav and Poonam Sheoran ,Smart wheelchair with application of HCL, HMI operating signal EEG, EOG ,or EMG, International Journal of Innovative and Emerging Research in Engineering, Volume3, (2016), e-ISSN: 2394-3343,p-ISSN :2394-5494.
- [4] Achutha Tamraparni and Yashwanth Dasappagari, Design and Fabrication of Lever Propelled Alternating Center of gravity Wheelchair, International Journal of Emerging Technology and Advanced Engineering, Vol.6 (2016) ISSN 2250-2459, ISO 9001:2008
- [5] P. Swapna, Dr. B. Sharmila and Y. Dharshan, Electric Wheelchair For Physically Challenged, International Research Journal of Engineering and Technology, Vol. 03, 2016, e-ISSN:2395-0056, p-ISSN:2395-0072.
- [6] Arvind Prasad, Snehal Shah, Priyanka Ruparelia and Ashish Sawant, Powered Wheelchairs, International Journal of Scientific & Technology Research, Vol. 2, 2013, ISSN: 2277-8616.
- [7] Nirmal TM, Wheelchair for Physically and Mentally Disabled Persons, International Journal of Electrical and Electronics Research, Vol. 2, 2014, ISSN: 2348-6988.
- [8] Rakhi A. Kalantri and D. K. Chitre, Automatic Wheelchair Using Gesture Recognition, International Journal of Engineering and Innovative Technology, Vol. 2, 2014, ISSN: 2277-3754