International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.01, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

SMART AUTOMATIC TWO WHEELER ASSIST SYSTEM FOR PHYSICALLY HANDICAPPED

Jamage Dnyandeo D.[1],Itnal Samarth S.[2],Gawali Rohit J.[3]

[1,2,3]*Mechanical, Bharati Vidyapeeth's College of Engineering, Kolhapur(India)*

ABSTRACT

The Currently existing solutions for two wheelers of physically handicapped people require heavy modifications to the existing vehicle to add support wheels which not only add for the updated maintenance cost for the physically handicapped people but also reduce the fuel economy of the vehicle. This project proposes the concept of smart two wheeler assist system. The project involves development of such a system which can automatically retract the support wheels based on the speed of the vehicle. This is done by continuously monitoring the speed of the vehicle and retracting the support wheels when the vehicle attains sufficient speed to balance itself.

***Keywords*: *Retract, Support, Wheels, Balance, Smart etc*.**

I.INTRODUCTION

The term Disability covers impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure. An activity limitation is a difficulty encountered by an individual in executing a task or action. However participation restriction is a problem experienced by individual involvement in life situations. Disability is caused by impairments to various subsystems of the body – these can be broadly classified under the following categories. Any impairment which limits physical function of limbs or damage of limbs or organs is a physical disability. Mobility impairment is a category of disability that includes people with varying types of physical disabilities. This type of disability includes upper limb disability, lower limb disability, manual dexterity and disability in co-ordination with different organs of the body. Disability in mobility can either be a congenital or acquired with age problem. This problem could also be the consequence of some disease. Physical disability is also termed as handicap, when physically challenged people come across social cultural or physical barriers which prevent their access to different system in the day to day life which are available for other common people.

Day today movement is one such task. People who have become disabled and can no longer walk or cannot walk without difficulty may be interested in getting a mobility scooter. There are many ways to make transportation easier for people with disabilities. For those who may wish to drive themselves,standard production vehicles can be specially modified to enable the disabled person to drive the vehicle safely. Alternatively, sometimes new vehicles can be bought that do not require any modifications, although these may need to be Limitations of retrofitted scooter. These scooters are not manufactured by original manufacturing companies (OEMs) but are being produced at outside workshops without any supervision of designers and sometimes imported from overseas. Sometimes a vehicle needs to be modified to enable a disabled person to be

a passenger. The modification usually involves modifying the two wheelers by addition of two support wheels which can help the physically disabled people travel using these two wheelers. However this call for increased maintenance as well as the reduction in fuel economy as the four wheels are on the ground all the time.

This project proposes the concept of Smart assistive technology for people with physically disabled. The proposed system retracts the wheels form the ground, thereby reducing the maintenance cost of four wheels as well as increases the fuel economy.

II.CURRENT RESEARCH AND LITERATURE REVIEW

The current research work on this particular topic was broadly studied by referring to the research work carried out by number of research scholars and their findings were thoroughly studied to arrive at the main objective of the research work. The following research work was studied before laying the objectives of our research.

B. Sathish Kumar, Vinod K. Banthia ,Alok Kumar Ray worked on DESIGN OF THREE WHEELER VEHICLE FOR PHYSICALLY CHALLENGED PEOPLE. According to them In today's world, transportation has become one of the prime requirements of people for moving self or goods from one place to another. We have even come across people travelling for more than 200 km every day for reaching their work place. Mobility has thus become an essential part of our lives with many development and improvements happening in this field. Because of the changing lifestyle of today's world, there is a huge reduction in the level of interactions within the people group. In these conditions it becomes more difficult for physically challenged people to commute and to perform their day to day activities like working, education, shopping etc. as they have to constantly depend on others for getting assistance to alight and board the vehicle. In this project.a feasible design solution in form of a user friendly three wheeler vehicle, which allows physically challenged people to commute on their own and perform their activities without anyone's assistance, has been proposed. The activity was started with customer survey and market study. The questionnaire was framed keeping the needs of physically challenged people in mind. The major inputs received from this study were related to ingress\egress issues, ergonomics, carrying wheel chair and utility space. Considering these inputs from the survey, two concepts, namely - Chariot and Sholay, were generated. Using Pugh matrix Sholay concept was finalised for carrying out the detail design. Layout and detail design was carried using CATIA. The finalised model was analysed to validate for stiffness and Ergonomics. Ergonomics study using Jack software was carried out considering the 5th and 95th percentile manikins to take care of the ergonomic issues. On finalising the design, prototype building activity was initiated. A full scale working prototype model was manufactured for physical validation of the design function. Outcome of this project is the solution of transport for physically challenged community using which they can commute and lead an independent and normal life.

Vishal Upadhyay worked on DESIGN OF SCOOTER FOR PHYSICALLY HANDICAPPED WITH FOLDABLE HOOD. In present scenario, transportation is one of the major requirements of the people for transportation of goods or self from one place to a different place. For a physically disabled or a debilitated person, transportation is a major hindrance and so the mobility of physically disabled people is among the great concern of the human civilization. It is really very hard to realize the problems and sorrows of a physically disabled or debilitated person who is dependent on others or is confined on a wheel chair with a limited

mobility. In India, the contemporarily modified scooters used by the physically disabled people for transportation are not ergonomic and do not provide protection from adverse weather conditions which can be more dangerous for physically disabled people compared to the normal person while driving. It is very risky and uncomfortable to drive such modified scooters during the rain or in other adverse weather conditions. It is also difficult for physically disabled person to ride the three wheel scooter for a longer duration. This project focuses at providing a feasible design solution in form of a user friendly three wheel scooter, which allows physically challenged or debilitated person with partial disability to commute themselves and perform their activities without anyone's assistance. Problems were identified by the survey regarding the dimensions. Major issues like seat height, ground clearance etc, were utilized to develop the concepts and its selection. Then the detailed design of the selected concept was carried out using CATIA. The designed scooter will be ergonomically suiting disabled person in comparison to the conventionally modified scooters used by them. The improved design of the scooter was also incorporated with a foldable hood which will provide protection to the rider from adverse weather conditions and dust.

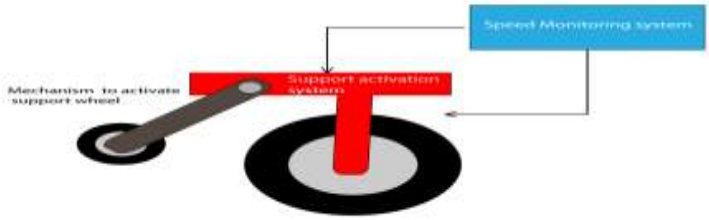
E.S.Esakkiraj ,S.Neeraj , M.MohammedMubeen Ali , N.Habeeb Mohamed , E.Daranidaran worked on Modification of the Two Wheeler Vehicle for Physically Challenged Persons. According to them, People with disability in their legs are able to drive a physically challenged vehicle designed with dummy rear axle. It is not possible for a person with disability in their hands to drive such a vehicle as the vehicle's control system is present in the hands. For a hand disabled person driving a vehicle is possible by legs will be possible if the entire vehicle's control is transferred to legs. The leg-operated vehicle is fabricated by using simple mechanisms for steering, acceleration and braking which will enable the person to drive the vehicle.

Pravinkumar Singh, AbhishekJaswal ,Saurabh Chand , Ali Abdullah , Rishi Chakraborty worked on Design and Fabrication of Self Balancing Two Wheeler. Their paper describes the design and fabrication of Self Balancing two wheeler. The Self balancing two wheeler is based on the principle of Segway knows when you are learning forward. To maintain balance, it turns the wheels at just the right speed, so you move forward. The Self balancing two wheeler is an intelligent vehicle which uses gyroscopic sensors detects the motion of rider, so that he can accelerate, brake or steer the vehicle. This self balancing is absolutely ecofriendly mode of transport which causes zero pollution.

Sagar Pradip, Walhekar Snehal et al worked on Automatic Side Stand Retrieve System. According to them, Automobiles are having important role as it reduces human effort and time mostly bikes. Even if they are helpful there are some sad events like accidents due to careless of rider. Most of accidents occur due to forgetting to lift side stand. To overcome this problem many advance measure have taken, but they are useless. So, for that it should be implemented practically in all types of bikes. This system "Automatic Side-Stand Retrieve System" is designed based on the working principle of bikes. As all bikes transmit power with the help of chain drive, so this setup is kept in between chain drive. Paper is giving mechanism for side retrieve system.

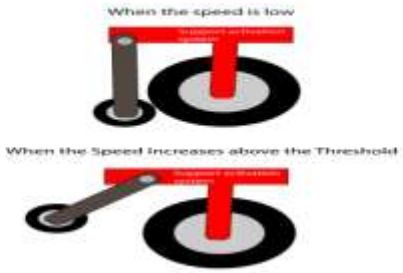
III.WORKING METHODOLOGY

The figure below shows the line diagram of the working principle of the system. The entire working principle can be understood by the state diagrams of the systems



As shown in the figure above the project consists of development of a working model of the proposed system on a frame. The frame consists of wheels which can be rotated by the prime mover which is an electric motor in our case. When the wheel starts rotating i.e. when the speed of the vehicle starts increasing, the speed is monitored continuously by a smart system. When the necessary speed is achieved by the vehicle to balance itself, the two supporting wheels are automatically retracted. Further when the speed of the vehicle drops below certain limit the support wheels are lowered which can help the physically disabled person. Thus this can not only reduce the maintenance cost of operation of four wheel system but also increase the fuel economy of vehicles of physically handicapped people.

The figure below shows the different states of the vehicle.



IV.DESIGN CONSIDERATIONS

Design consists of application of scientific principles, technical information and for development of new or improved machine or mechanism to perform a specific function with maximum economy & efficiency. Hence a careful design approach has to be adopted. The total design work has been split up into part.

1. System design
2. Mechanical design

System design mainly concerns the various physical constrains and ergonomics, space requirement, arrangement of various components on main frame at system, man and machine interactions, no. of controls, working environment of machine chances of failure safety measures to be provided, servicing aid, ease of maintenance, scope of improvement, weight of machine from ground level, total weight of machine and a lots more.

The mechanical design has directly norms with the system design. Hence the foremost job is to control the physical parameter, so that the distinction obtained after mechanical design can be well fitted into that. In system design we mainly concentrated on the following parameters.

1. Arrangement of various components:

Keeping into view the space restrictions the components should be laid such that their easy removal or servicing is possible. More over every component should be easily seen none should be hidden. Every possible space is utilized in component arrangement.

2. Component of system:

As already state the system should be compact enough so that it can be accommodated at a corner of room. All the moving parts should be well closed and compact. A compact system design is given a high weighted structure which is desired man machine interaction.

The friendliness of machine with the operator that is operating is an important criterion of design. It is the application of anatomical and psychological Principles to solve problems arising from man-machine relationship.

3. Chance of Failure:

The losses occurred by owner in any failure is an important criteria of design. Factor of safety while doing mechanical design is kept high so that there are less chances of failure.

4. Servicing Facility:

The layout of component of component should be such that easy servicing is possible. Especially those component which require frequents can be easily disassembled.

5. Scope of Improvement:

Arrangement should be provided to expand the scope of work in future. Such as to convert the machine motor operated, the system can be easily configured to required one. The die & punch can be changed if required for other shapes of notches etc.

6. Weight of Machine:

The total weight depends upon the selection of material components as well as dimension of components.

V.CALCULATIONS

Torque and Power Calculations:

No. of teeth on the wheel sprocket Z1=65 teeth

No. of teeth on the motor sprocket, Z2= 7 teeth

Gear ratio Z1/Z2= 9.28:1

Speed of the motor S2=2750

After reduction, Speed of the wheel S1= 2750/9.28 S1=296RPM

The Angular to Linear Velocity formula : $v = r \times \omega$

Where:

v: Linear velocity, in m/s

r: Radius, in meter

ω: Angular velocity, in rad/s

We know the RPM

Therefore

$$\omega = \text{RPM} * 2\pi/60$$

$$\omega = 30.997 \text{ rad/s}$$

The radius of the wheel is given by

r = 0.1778 mtr

The RPM to Linear Velocity formula is:

$v = r * \omega$

V= 0.1778 * 30.997

v: Linear velocity, in m/s

r: Radius, in meter

RPM: Angular velocity, in RPM (Rounds per Minute)

Substituting the above parameters

We get

V=5.51 m/s

Therefore the machine travels at 19.836 km/hr

VI.ADVANTAGES AND DISADVANTAGES

Advantages:

1) Helps handicapped people to drive freely as the machinehas retraction mechanism

2) reduces Wear and tear of tyres

3) Increases fuel economy as the wheels retract from the ground

4) The system becomes compact

Disadvantages:

1) Requires some additional cost

VII.CONCLUSION

From the proposed concept we can conclude that the developed solution can be used to make transportation easier for people with disabilities. It can also help to reduce the maintenance cost of four wheels on two wheeler

vehicle and to increases the fuel economy. Further the modular approach makes it fit for making the system economical which can be implemented on real world scale.

REFERENCES

[1] V. Subrahmanyam, B. Anjani Kumar, K. Naresh[1] " Fabrication Of Tri- Wheeled Electric Vehicle To Aid Disabled" International Journal of Technology Enhancements And Emerging Engineering Research, VOL 3, ISSUE 04 23 ISSN 2347-4289.

[2] B. Sathish Kumar, Vinod K. Banthia, [2] "Design of Three Wheeler Vehicle For Physically Challenged People". SASTECH Journal Volume 12, Issue 1, April 2013

[3] E.S.Esakkiraj, S. Neeraj, Mohammed Mubeen Ali [3] "Modification of the Two Wheeler Vehicle for Physically Challenged Persons" International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 3, March 2015

[4] Deepan,Suresh.Dand Arjunraj.P [4], " New Clutch Actuated System for Two-Wheeler" International Journal of Multidisciplinary and Current Research ISSN: 2321-3124 Accepted 15 January 2014, Available online 10February2014,Vol.2(Jan/Feb2014issue)