A Review on Design and Fabrication of Mobility Scooter

Rohan R Gadkar, Viral B, Vishal R Kalgutkar, Shridhar P Rathod.

Students, Dept of Mechanical Engg, Alva's institute of engineering and technology.

ABSTRACT

The basic aim behind our project is to make an environmentally friendly portable automobile which would be easy to handle by both the sexes and would emit 0% emission. We have used D.C motor as our main power source due to which there is no emission at all and also the problem of fuel consumption is solved. Also keeping in mind, the parking problems now days, we decided to make a tri-scooter which can be folded easily, so after the use one can fold the tri-scooter and can carry it along with him/her. Our design allows users to easily transport the tri-scooter using less space when it is "folded" into a compact size. We have made this design with our own innovative ideas and by referring some books and websites. The versatility of a folding mobile scooter is also appropriate for air travel and inadequate storage and at places where bike theft is a significant concern. A review, guided we design to concentrated on power, economy, ease and comfort of riding and low maintenance cost. Also, need to concentrate on ergonomics factor to give the user a comfortable ride.

1. INTRODUCTION:

All developed countries in the world show an increase in the number of older people. As older people start to have difficulty in walking many choose to use a mobility scooter to help them move around. Benefitting from improved design, mobility scooters are becoming an increasingly popular mobility device and are a common sight on many streets. Many older people have difficulty in walking and the percentage of people in this group rises with age [1]. Depending on the reasons behind the difficulty, as people begin to struggle to walk, they have a range of options open to them which can be used alone or in combination.

They can walk less often, walk less far, take more frequent rest breaks while walking, use public or private transport, use mobility aid for stability such as a walker or a cane, or use a mobility device instead of walking such as a wheel chair or a mobility scooter. In developed countries with an ageing population, mobility is one of the major concerns for older adults who are unable to drive their cars anymore. Some may be healthy seniors who are semi-ambulatory or they may be persons with disabilities [3]. Research indicates that the use of mobility scooters become a preferred mode choice to maintain 'automobility'. Along with increasing age, decreasing mobility, increasing muscle weakness and impaired reflexes often follow.

As a result, older people can find themselves both with poorer walking skills, but also unable to drive a standard car. Fortunately, many different vehicles are available to resolve these situations, allowing those unable to drive a standard car to participate in routine activities and transport themselves around regardless. These vehicles include mobility scooters, also known as motorized mobility scooters (MMS), powered wheelchairs and electric bicycles, and are all primarily used by older people as an instrument to increase their mobility. Mobility scooters are three- or four-wheeled vehicles, powered by an electric motor.

2. REVIEW ON DESIGN AND SELECTION OF MATERIAL:

The main aim of Sachin T. Achari et al in paper [1] is to design a portable automobile which should be very easy to carry as well as easy to handle by both the sexes with equal ease. The aim was also that it should be environmentally friendly and should be non-polluting.

Blais Daniel et al in paper [2] have taken into account the problems faced by the ageing people in today's society. In developed countries with an ageing population, mobility is one of the major concerns for older adults who are unable

to drive their cars anymore. This paper will discuss the research methodology, the results of the survey and the conclusions and recommendations. The purpose of the study was to analyse and assess the environment for three- and four-wheel mobility scooters, and to identify future needs for user safety.

Ziming Qi et al in paper [3] presents a novel steering control method for 4-Wheel Independent Drive and Independent Steering (4-WIDIS) electric mobility scooter for disabled people and elderlies, in which steering of all four wheels are coordinated to minimise the turning radius of the scooter to zero. A full-scale prototype is built for experiment on mobility pathway, which demonstrated the manoeuvrability advantage of such steering control in a scooter application.

Hans Andersen et al in paper [4] have describe the design and development of an autonomous personal mobility scooter that was used in public trials during the 2016 MIT Open House, for the purpose of raising public awareness and interest about autonomous vehicles. The scooter is intended to work cooperatively with other classes of autonomous vehicles such as road cars and golf cars to improve the efficacy of Mobility on- Demand transportation solutions.

Ryan W et al in paper [5] have systematically reviewed the impact of powered mobility devices have on engagement in independent occupations for adults with acquired mobility limitations. Drawing conclusions from this research is problematic due to varying methodological quality.

As older people start to have difficulty in walking many choose to use a mobility scooter to help them move around. Benefitting from improved design, mobility scooters are becoming an increasingly popular mobility device and area common sight on many streets. Roselle Thoreau et al [6] have taken this problem into consideration.

Masataka Hirai et al in paper [7] describes a development of a robot scooter platform for intelligent personal mobility robot. Recently, a lot of personal mobility has been used by aged and handicapped people. Intelligent mobility robot provides safer and more convenient transfer service such as driving support and automatic transfer. It is necessary to develop a platform equipped with sensors, electronic devices and intelligent navigation functions.

Yuuji Sakayanagi et al in paper [8] describe about the wireless power transmitting system for a traveling mobility scooter based on magnetic resonance has been developed. In this paper, an overview of the system will be presented. Large square coils are set up on the road surface where a mobility scooter with a small coil and no battery is traveling. The power source is a Class E amplifier operating at 13.56MHz with an output power of 150W. Power is selectively supplied to the coil upon which the vehicle is passing at the moment; vehicle position is detected by ultrasonic sensors. A system to automatically control the transmitting output power was developed, because it is necessary to supply a constant voltage to the scooter. The overall power efficiency when the power receiving coil is inside the area delimited by the transmitting coil is 47%.

Oliver Zirn et al in paper [9] the authors have shown how the foldable ultralight electric vehicles (E-ULV) are a promising key component for future sustainable traffic chains for urban regions with mountainous topography. While typical E-Bikes are hard to use in the rush-hour of metropolitan public transport association vehicles, these – actually not available – E-ULV are a real innovation for the “last miles”. This paper presents electric drive add-on kits for foldable scooters and very light foldable bikes as well as their possible cost in case of a market launch. The E-ULV had been tested in small fleets on public roads and turned out shift car kilometres to the public transport system effectively.

Nima Toosizadeh et al in paper [10] have summarized the results from clinical studies regarding the enhancement of MMS driver safety with a primary focus on improving driving skills/performance using clinical approaches. We addressed three main objectives: to identify and summarize any available evidence (strong, moderate, or weak evidence based on the quality of studies) regarding improved driving skills/performance following training/intervention; to identify types of driving skills/performance that might be improved by training/intervention, and to identify the use of technology in improving MMS performance or training procedure.

The authors of paper [11] have informed us about how the Government is committed to helping people who have mobility difficulties to get around. This is so that people can remain active members of the community and maintain their independence. Traditionally, mobility scooters and powered wheelchairs have been used by those with mobility difficulties; as the population ages, more elderly people are likely to use mobility scooters, which are considerably less expensive than powered wheelchairs.

W. Ben Mortenson et al in paper [12] have described about mobility scooters. Mobility scooters are three- or four-wheeled power mobility devices regularly used by people who have difficulty ambulating. They also differ from power wheelchairs in terms of their driving controls, programmability, seating, and mounting method. Given their

growing popularity and anecdotal concerns around their use, a scoping review was undertaken to identify empirical research about mobility scooters and to analyse their study design and purpose.

3 GAPS IDENTIFIED BASED ON RIVIEW:

The mobility scooter requires accessories and mountings for its better safety and improved performance as follows:

1. Compact foldable design
2. Feather weight structure
3. Sustainable power source
4. Need speedometer for safety and economical operating range with respect to battery discharge characteristics.
5. Need accelerator mechanism for speed control.
6. Rear mirrors and headlamps can be used.
7. Optimization of boot space.

The future design of mobility vehicle is to be made up of advanced material frame, the suitable strength to weight ratio can be increased by incorporating suitable non-ferrous material. Cost of the vehicle needs to be optimized for better affordability for the target group of old aged community.

4. CONCLUSION:

In formulating the recommendations for a mobility scooter definition, it became obvious that flexibility for future developments should be incorporated. New technologies, a change in user demographics and new energy sources may influence new designs. Definitions should be based on performance specifications rather than prescriptive specifications to keep the door open for future developments. In terms of user experience most users felt their scooter has had a positive impact upon their lives and perceive their scooter in a positive light. Their scooter meets their needs by enabling them to independently achieve their desired activities.

It is clear that matching the mobility device to the individual and training the individual to use their mobility device is important. However, neither of these occur regularly. The impacts of scooter usage on functional health is less clear. The relationships between frequency length of use to physical functionality and capabilities has not been investigated. Where mobility scooter data does exist, it is most often inseparable from wheelchair data, particularly electronic wheelchair data. Given the different physical capabilities of their users this is unhelpful. The two works that focus solely on mobility scooters and physical health impacts investigate different aspects of physical health have different limitations and reach different conclusions.

By incorporating the above gaps identified based on reviews as stated in preceding section expected to optimize design of modern mobility scooter.

5. REFERENCES:

1.Design and Fabrication Of Foldable Tri-Scooter (2014) Sachin T. Achari, Nikhil P. Tambe, Sanket D. Nalawade, Aqib L. Nevrekar.

2.Mobility Scooters For An Ageing Society (2012) Blais Daniel, Rutenberg Uwe, Suen Ling.

3.Design of All Wheel Coordinated Steering for Electric Mobility Scooter Based on the method of 4-Wheel Independent Drive and Independent Steering Electric Vehicles (2016). Ziming Qi, Kuang Ma, Kun-Hsien Lee & Nicholas Sargeant.

4.Autonomous Personal Mobility Scooter for Multi-Class Mobility-on-Demand Service (2016) Hans Andersen1, You Hong Eng, Wei Kang Leong.

5.A systematic review of the impact of powered mobility devices on older adults' activity engagement (2013). Ryan W. Fomiatti, Janet E. Richmond, Lois K. Moir, Jeannine L. Millsteed.

6.The impact of mobility scooters on their users. Does their usage help or hinder?:A state of the art review (2015).RoselleThoreau.

7.Development of an Intelligent Mobility Scooter (2012). Masataka Hirai, Tetsuo Tomizawa, Satoshi Muramatsu, Masanori Sato, Shunsuke Kudoh, Takashi Suehiro.

8.WIRELESS POWER TRANSMISSION FOR A TRAVELING MOBILITY SCOOTER (2010). Yuuji Sakayanagi Shota Togawa Kenta Konagaya Yoshihiko Kuwahara.

9.Foldable Electrified Ultralight Vehicles as Key Component for Sustainable Traffic Chains (2013). Oliver Zirn, Markus Rüther.

10.Motorized Mobility Scooters: The Use of Training/Intervention and Technology for Improving Driving Skills in Aging Adults – A Mini-Review (2013). Nima Toosizadeh, Matthew Bunting, Carol Howe, Jane Mohler, Jonathan Sprinkle, Bijan Najafi.

11.Mobility scooters and powered wheelchairs on the road - some guidance for users (2015). Department for Transport, London.

12.Scoping review of mobility scooter-related research studies (2016). W. Ben Mortenson, Jenny Kim.