International Journal of Technology and Emerging Sciences (IJTES)

www.mapscipub.com

Volume 02 || Issue 01 || Jan 2022 || pp. 1-4 E-ISSN: 2583-1925

Domotics wheelchair: A novel approach for assisting Dyspraxia patients

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Abstract - *Studies from a wide spectrum of time have shown that people from all age diversities can be at an advantage pivotly from the availability of a source of independency that can be experienced with mobility. Whereas the subject case of people with disabilities can be substantially satisfied by the help of either the traditionally used technologies, manually used technologies or through the power smart wheelchairs, an important division of the people with disabled/challenged community is the obstacle of using the wheelchair for moving from a certain point to another independently.*

Looking towards people's experiences regarding this, researchers around the globe have used the combination of technologies and infrastructure that was originally being created for the mobile robots and all those new combinational techniques were then put into the creation of what we call smart wheelchairs nowadays. In regards with people of higher age group (adults) the independency in mobility is an important as well essential aspect with respect to self-esteem and derives a significant role in the term we popularly known as "aging in place". Like the wheels being an essential unit of a wheelchair, the mindset or mental health is an equally essential unit of a human body it should be considered too and keeping the aspect of mental health of the patient in coverage the independency of being able to move around being disabled can impact the mentality of the person suffering in a positive way. If for example we consider a case of an elderly human being and how they can see it difficult to use their physical strength to move around with the wheelchair, following that there may be a possibility of them cutting down their consumption of food and fluids , especially fluids so as to cut down wheeling themselves to the washroom which is directly affecting their health and to an added point of view of older people being on medications it is absolutely important for them to have their meals and fluid intakes properly and in this case the usage of an electronically automated wheelchair comes in place checking all the essential boxes.

Considering another perspective in our point of view, generally disabled people need someone by their side for moving them around most precisely called as caretakers as they cannot use their physical strength to do so the feature of using buttons to move around cuts down their physical labor as well as a push to their mental health as now they have controls on their movements quiet similarly they had before being on the wheelchair.

The thought of adding the controls of home automation features in this wheelchair was solely based on how the person who is disabled will feel on being introduced to have some normality they had when they were without the wheelchair , the happiness and relief they would feel in their heart and the positive impact that they will have on their mental health knowing they do not need a caretaker every time around them how they can easily move around and switch on/off the switches (fan and light) when they are entering or leaving the room like they used to . A healthy mindset, the will and the belief that the will get better truly provides an important role in any patients recovery regardless of age. These are the aspects that were kept in consideration behind the structure, designing, and assembly of our domotics wheelchair.

***Key Words*:** Domotics, Motor, Rechargeable battery, Wheel chair,

1. INTRODUCTION

Considering the ratio of people experiencing physical disabilities for whom smart wheelchairs can be a much needed help also need some modifications. While it is a definite relief for some patients that they don't have to move around lugging their own self but an added problem of the physical labour definitely does not goes unseen. As we all are well known by the fact that we cannot put tetraplegia patients or for that case any patient with disabilities in position where they have to use their own physical strength. Therefore the construction of smart wheelchair or electronically controlled wheelchair comes into the frame. We see this process for an option to the term assisted way of living. Every family wants their suffering family member to be in comfort but not all can stay at home 24/7 or neither can they afford someone to be around all the time. Hence this wheelchair is an definite source for checking all the boxes while keeping the patient at utmost comfort. To an added benefit moving around using buttons, switching lights and fan on/off on their health would definitely give a push towards positivity in terms of mental health. The use of RF modules and digitized circuits are being put to use so as to achieve these features.

An additional feature is that Traditional wheelchair has a lot of limitations once we compare it to smart wheel chair.

Traditional wheelchair requires a lot of physical efforts for its movement Plus it very hectic for user to use it efficiently. Freedom is major element which is snatched away while using traditional wheelchair. On the other hand smart wheel is much more reliable, efficient, easy to use and user friendly.

Yes, there are some limitations even in smart wheel chair but it's advantages overshadows it's disadvantages.

1) Manual mode: We can give the order or command to the wheelchair through hand gloves if disability is not a major issue. But in this case people will suffer fear of collision and injury on body parts and for overcome on that we keep ourselves attentive. Due to this people will not be afraid and travel their self, one place to another.

2) Autonomous mode: In autonomous mode, the wheelchair moves on one path which is already given as an input to reach to the destination. It means, the user can relax throughout the journey while the system is working. However, the choice liberty of the user seems to be snatched. It may happen when the wheelchair starts to move as per the system's instructions, the older age group people or the impaired person baffled.

3) Semi-autonomous category comes under manual and autonomous, which give pliability to users to move around. To prevent collision monitoring these can help, by battery, the DC motors, and the controlling circuits based hand glows. This Wheelchair is economical and convenient. The battery powered wheelchair will help the physical disabled people an ample amount in their day to day movements. This advanced model will help the effectual in the inferior areas as well as in the civil areas.

1.1 Main Components:

Geared Motor

Mechanism of a geared motor is to provide variation in speed of the motor and also have capabilities to provide high torque at lower speed. Gear motor is usually a combination of gearbox and an electric motor.

When we use gearbox in an electric motor it also increases its ability to pull more weight.

A Gear motor may be AC or DC motor.

Generally there are two types of gear motor

- Right angle motor
- Inline gear motor

The technology commonly used in

Gear motor design is Worm, spur and planetary gear technology.

RF module

It can be derived as combination of receiver and transmitter. Radio signals are transmitted or received with the help of RF module between two devices. Most of the Electronic devices emits radio frequency energy. Bluetooth is a Type of RF module.

Encoder HT12D

Encoder is a device which converts data signal into coded message.

HT12D is a 2^{12} series decoder Integrated Circuit. This Type of decoders are generally used for remote control applications. Some of the examples of such applications are security systems, burglar alarm. It converts the serial input into parallel outputs.

Decoder HT12E

It is a reverse of encoder. It reads the coded message and finds its original data signal.

HT12E is a 2^{12} series encoder Integrated Circuit. This Type of encoders are generally used for remote control applications. Some of the examples of such applications are security systems, burglar alarm. It converts the parallel inputs into serial output.

L293D Motor driver

L293D is a primary motor driver integrated chip . Its allow us to drive a DC motor in both direction forward and backward Speed regulation of the motor is also a function of L293D Motor Driver.

The L293D is a 16 pin IC. There are 2 OUTPUT pins, 2 INPUT pins, and 1 ENABLE pin for driving each motor.

Rechargeable Battery

As the name suggests a battery that can be used over the time by recharging it through an electrical source. It can also be discharged into a load and we can recharge it back so as to put it to use several times. It's also called as an accumulator as it stores energy and it does so putting itself through a reversible electrochemical reaction.

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Block Diagram:

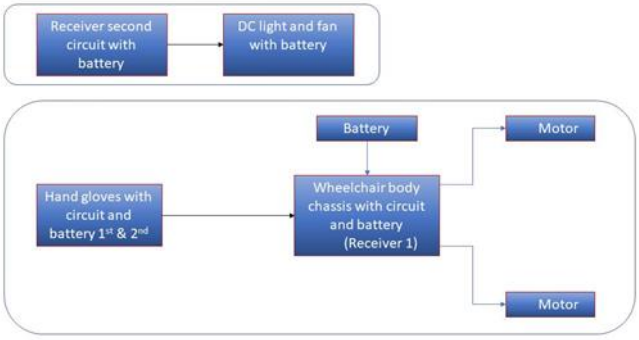

Figure: Block diagram

2. CONCLUSIONS

The Domotics Chair is able to move independently as it is coordinating well with the circuits implemented on the gloves. The chair will be working totally on integrated circuits, digital circuits and the transistors. Home automation feature is the new add on which takes the functioning of the chair on the next level. The lights and fans can be switched ON/OFF as it is proposed.

The Domotics Chair makes the interaction between the human and the technology smooth and easy to use. The expenses of the overall project are modest.

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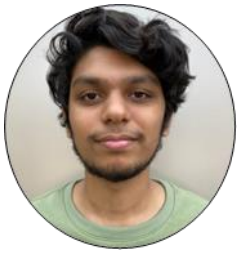
BIOGRAPHIES

Ritik Wankhede, a student from Yeshwantrao Chavan college of engineering, follows a practical approach in all spheres of life. He is hard-working and goal oriented. Primarily focus on details and like to be proficient in his work. Also is more interested in research on new and creative themes of the electronic area.



Siddharth Rao from Yeshwantrao Chavan college of engineering has been working and developing a biomedical project with RF modules and circuits. He like to find the logical and simplified solution for the task assigned. He is creative, hardworking, and innovative.

Chhayangi Sonekar, currently pursuing Electronics Engineer from Yeshwantrao College of Engineering located in Nagpur. she has been working and developing a biomedical project with RF modules and circuits and will be interning in Wavteq as an Analytical searcher.

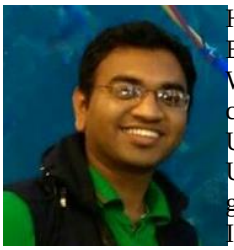
Yashsvi, a final year engineering student of Yeshwantrao Chavan College of Engineering situated in Nagpur, Maharashtra. Being an electronics student she did broaden her spectrum with her work in different fields. Working and developing a biomedical project with RF module and digital circuits and interning with PrepBytes as their campus business manager are some tasks to handle but she's all open to the challenges and lessons she learned during the process and it was all worth it.

Uttara Dhoble, a final year student of Electronics Engineering department from Yeshwantrao Chavhan College of Engineering, Nagpur. Is a fresher, analyst, and painter. Research in biomedical instrumentation is her new interest hence is looking forward to doing an internship in the research field. Apart from that, she pursued an internship in business analytics which take her professional experience to the next step. she is adaptive, likes to take challenges to learn new notions.

Er. Ankita Ghavghave, working as a 5G Network developer at Nokia Solution and Networks, Banglore, India, has a meritorious career. she graduated with honors from Yeshwantrao Chavan College of Engineering, Nagpur with an Electronics stream. Ankita was Branch topper during her graduation and was awarded a Gold medal. she was vice president of YCCE SB(IEEE). With all the challenging journey she loves to conquer it and gain the wisdom that comes along.

Dr. Shubhangi Rathkanthiwar, Dean, International Relations, YCCE, Nagpur, and Professor in EE Department, with many scholarly ideas in her mind, has 4 granted patents, 6 books, 110 research papers, 2 books published in Germany, 5 book chapters, and more than 450 newspaper column articles to her credit. She is the recipient of many awards including the 'global excellence award', 'Best Scientist Award', 'Best Paper Award', 'Best Teacher', 'Shikshak-Ratna' and 'Shiksha Ratn award' with 29

literary awards. She organized several workshops on 'Creativity and Innovations in Engg.', 'Intellectual Property Rights' and 'Engg. without borders' which has resulted in the filing of many patent applications by her students. Due to her strong commitments, hard work, honesty, and reliability, the Nominee excels in quality and provides outstanding solutions to the community.



Er. Mayuresh Dawoo, working as Hardware Engineer at Schweitzer Engineering Laboratories, Pullman, Washington, USA has meritorious career. He did his masters from University of Florida, USA. He was University topper during his graduation in Nagpur University, India

Dr. Prajakta Warjukar is working as Assistant Professor in Biochemistry department in DMMC Nagpur, India. She has 12 research articles to her credit. As a Quality Manager of Diagnostic Molecular laboratory, DMMC and as an Incharge of Biochemistry section of Central clinical Laboratory,DMMC, Nagpur, she has a significant contribution in research and development.