A SMART WHEELCHAIR FOR PHYSICALLY HANDICAPPED

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ABSTRACT:

The main aim of this project is to design a real time wheel chair can be controlled with multiple methods. This wheel chair consists of joystick, Android Bluetooth and MEMS technologies for controlling the directions of the wheel chair. Wheel chair movement can be controlled in Forward, Reverse, Left, Right and stop direction. To control the wheel chair by hand movement using joystick. Joystick is a simple device with four direction movement. It can be made to produce an analog voltage which is processed by the microcontroller to produce the corresponding digital output with the help of inbuilt ADC. To control the wheel chair using voice commands using Bluetooth technology. In this project we are using HC-05 Bluetooth module to receives the voice commands from android voice app.Wheel chair movement can be controlled in Forward, Reverse, Left, Right and stop direction.. To control the wheel chair using voice commands using Bluetooth technology. In this project we are using HC-05 Bluetooth module to receives the voice commands from android voice app.Digital output data is format as 16-bit twos complement and is accessible through either an It measures the static acceleration of gravity in tilt-sensing applications.Arduino will continuously read the data from HC-05 Bluetooth module, mems and joystick. Based on the received command Arduino will control the direction (like left, right, front, back and stop) of the wheel chair through relays.

1.INTRODUCTION:

The attachable wheelchair automator is an innovative device designed to provide power assistance to manual wheelchairs, allowing users to navigate inclines and uneven terrain with ease. The device attaches to the frame of the user's existing wheelchair and is powered by a rechargeable battery, providing several hours of continuous use. It is controlled using an intuitive joystick and is versatile enough to be used on a variety of surfaces. The device is lightweight, easy to install, and can be easily removed when not needed, making it a practical and convenient solution for wheelchair users. The attachable wheelchair automator has the potential to significantly improve the quality of life for wheelchair users by providing greater independence and mobility, while also reducing the risk of injuries associated with navigating difficult terrain.The device is designed to be compatible with most manual wheelchairs and can be easily attached

to the frame without requiring any modifications to the chair itself. This makes it an affordable and accessible option for wheelchair users who may not be able to afford a traditional power wheelchair or who prefer the flexibility of a manual chair.The attachable wheelchair automator uses a motorized system to provide power assistance to the wheels. The system is designed to be lightweight and efficient, and can be controlled using a simple joystick. The user can adjust the speed and direction of the chair as needed, allowing them to navigate obstacles and inclines with ease.The device is powered by a rechargeable battery, which provides several hours of continuous use. The battery can be easily removed for charging and the device is designed to be energy-efficient, helping to extend the battery life.Overall, the attachable wheelchair automator is a promising innovation in the mobility aid industry that has the potential to improve the quality of life for wheelchair users.

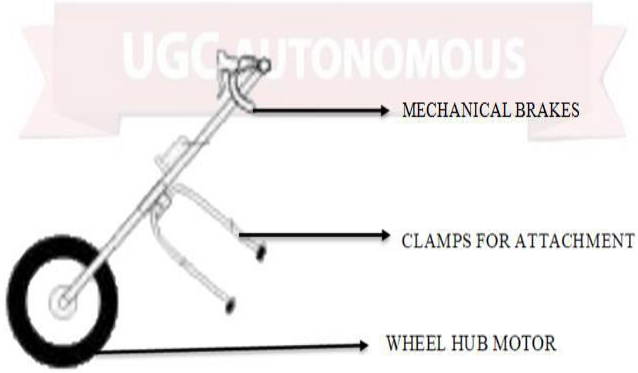

Fig. 1.1 Basic Structure Of AWA

1.1 Three Wheel European Chair :

Three-wheel European wheelchairs, also known as tricycles or trikes, are specialized mobility devices that cater to individuals with limited mobility. These wheelchairs deviate from the conventional four-wheel design and instead feature three wheels. Their distinctive configuration offers several advantages, particularly in terms of maneuverability and stability. The presence of a single back wheel and two front wheels ensures better weight distribution, minimizing the risk of tipping over. Additionally, these wheelchairs boast a compact design and a reduced turning radius, enabling users to navigate through narrow spaces with ease. Furthermore, they are specifically designed to perform well in outdoor environments, making them an ideal choice for individuals seeking enhanced mobility and independence.

2.LITERATURE SURVEY:

"Based on the literature survey on attachable wheelchair automator, we can conclude that these devices are a promising technology that can significantly enhance the mobility and independence of

wheelchair users. However, their effectiveness depends on various factors, including the user's physical ability, wheelchair type, and environmental conditions. Safety is also a critical consideration, and devices must be designed and tested to ensure they meet safety standards, and users must receive proper training on their use. Cost and accessibility are significant barriers to their widespread adoption, and efforts are needed to develop affordable and user-friendly devices".

3. METHODOLOGY:

The methodology for developing an attachable wheelchair automator involves several key steps. First, the objectives and scope of the project are clearly defined. This includes identifying the specific tasks or functions the automator should be capable of performing and any limitations or constraints it needs to consider. Next, extensive research is conducted on existing wheelchair automation technologies. This research helps to gain a deep understanding of the features, mechanisms, and components used in similar products. By analyzing these existing solutions, valuable insights can be gathered, and potential areas for improvement or innovation can be identified.

3.1.Operational Process Overview :

It begins with defining the design specifications and requirements, followed by the selection and procurement of necessary components such as batteries,controllers, motors, and accelerators.

Once the research phase is complete, the conceptualization and design stage begin. Based on the insights gained and the defined objectives, various conceptual designs are developed. These designs incorporate the desired functionalities and address any specific requirements or challenges identified earlier. The design phase also involves considering the practical aspects of the attachable automator, such as its size, weight, and compatibility with different wheelchair models. Once a final design is chosen, the development process begins. This includes prototyping and iterative testing to validate the design and functionality. During this stage, adjustments and improvements are made based on user feedback and performance evaluations. After successful prototyping and testing, the manufacturing and production phase takes place. High-quality materials are selected, and production processes are established to ensure the efficient and reliable manufacturing of the attachable automator. Finally, the product undergoes rigorous quality assurance and compliance testing to meet safety standards and regulatory requirements. Once all tests are passed, the attachable wheelchair automator is ready for distribution and use, providing enhanced mobility and independence to wheelchair users. The assembly process overview showcases the step-by-step construction of the device. Mechanical and electrical components are integrated, including the installation of the motor

for wheelchair propulsion. The power source and wiring are established, connecting the battery to the system. Safety mechanisms and features are incorporated to ensure user protection.Thorough testing and quality assurance are conducted to verify proper functionality. Finally, the flowchart concludes with the final assembly and finishing touches, resulting in a fully operational attachable wheelchair auto.

3.2 SYSTEM ANALYSIS AND DESIGN:

A proposed system for an intelligent and advanced wheelchair with voice command and head movement sensor will help handicapped persons become independent and this system could be wireless wheelchair system with a voice command by user to perform any movement.It include the followingfeatures:

1.Voice Recognition Module is Utilizes advanced speech recognition algorithms to accurately interpret voice commands from the user.

2. Head Movement Sensorintegrates sensors capable of detecting subtle head movements, allowing users to control the wheelchair's direction, speed, and other functionalities.

3. Wireless Connectivity is used to enables seamless communication between the wheelchair and other devices, such as smartphones, tablets, or home automation systems, for remote control and data sharing.

4. Obstacle Detection and Avoidance incorporates a combination of sensors, such as ultrasonic, lidar, or computer vision, to detect obstacles in the wheelchair's path and autonomously navigate around them.

5. Gesture Recognition utilizes cameras or specialized sensors to recognize hand gestures, providing an alternative control method for users who may have limited mobility or prefer gesture-based interaction.

6. Intelligent Navigation System employs algorithms for efficient path planning, taking into account factors like terrain, obstacles, and user preferences to optimize navigation in various environments.

7. Customizable User Interface offers a user-friendly interface that can be personalized to accommodate individual preferences, including adjustable control sensitivity, voice feedback options, and customizable commands.

8. Safety Features includes built-in safety mechanisms such as automatic braking, collision avoidance, and emergency stop buttons to ensure user safety at all times.

9. Smart Health Monitoring integrates sensors to monitor vital signs and health parameters of the user, providing alerts or notifications in case of emergencies or changes in health status.

10. Modular Design adopts a modular approach to allow for easy customization, upgrades, and maintenance, ensuring scalability and adaptability to evolving user needs and technological advancements.

By incorporating these features into a unified system, the proposed intelligent wheelchair aims to enhance mobility, independence, and overall quality of life for individuals with mobility impairments. Additionally, ongoing research and development efforts can further refine and improve the system's capabilities to better serve its users.

Fig 3.1: Proposed system wheel chair

3.2 WORKING PRINCIPLE:

The working mechanism of a voice-controlled smart wheelchair integrates both hardware and software components to provide mobility assistance to users with limited mobility. Below is an overview of how such a system typically operates.

Voice Recognition: The system begins with voice recognition technology that listens to and interprets the verbal commands given by the user. This involves capturing audio signals using a microphone and processing them to identify specific keywords or phrases that correspond to wheelchair movements, such as "forward," "backward," "left," and "right."

Speech Processing: Once the voice commands are captured, they are processed using speech recognition algorithms. These algorithms convert the spoken words into text, which can then be analyzed and categorized to determine the intended action. Advanced natural language processing (NLP) techniques may also be employed to improve the accuracy and robustness of the command recognition system.

Command Execution: After recognizing and interpreting the user's voice commands, the system translates these commands into control signals that can be sent to the wheelchair's motors or actuators. Depending on the specific hardware configuration, these control signals may instruct the wheelchair to move in a certain direction, adjust its speed, or stop completely. The control mechanism should be designed to ensure smooth and precise movement while considering safety aspects to prevent collisions or accidents.

Safety Features: Safety is a critical aspect of voice-controlled smart wheelchairs. The system should incorporate various safety features, such as obstacle detection sensors, emergency stop buttons, and collision avoidance algorithms, to protect the user and the wheelchair from potential hazards. These safety mechanisms work in conjunction with the voice control system to ensure that the wheelchair operates safely in various environments and conditions.

User Interface: In addition to voice commands, the wheelchair may also include a user-friendly interface, such as a touchscreen display or mobile application, that allows the user to customize settings, monitor battery life, and receive feedback about the wheelchair's status. This interface serves as an alternative control method and provides additional functionality to enhance the user experience.Integration and Testing: The final step in developing a voice-controlled smart wheelchair involves integrating all the hardware and software components into a cohesive system and conducting extensive testing to validate its performance, reliability, and safety. This includes testing the voice recognition accuracy, evaluating the responsiveness of the control mechanism, and assessing the effectiveness of the safety features in real-world scenarios.In conclusion, a voice-controlled smart wheelchair offers a promising solution to improve mobility and independence for individuals with disabilities. By leveraging advanced voice recognition technology, robust control algorithms, and comprehensive safety features, these innovative devices can provide users with greater freedom and autonomy in navigating their surroundings.

4.RESULTS& CONCLUSION

The project "**Advanced and Intelligent wheel chair control system for leg amputees using Joystick, MEMS accelerometer and android voice commands**" was designed wheel chair can be operated with multiple methods.

1.A joystick, is an input device consisting of a stick that pivots on a base and reports its angle or direction to the device it is controlling.

2.The Wheelchair operates with head movement, taking motion as an input signal for the movement of wheelchair in a particular direction. An MEMS sensor is used to track these motions. This sensor is fitted to top of the cap, so user should wear this cap on head. The variations are trapped and those signals are fed as inputs to the micro-controller. Now based on these variations the micro-controller is programmed to take decisions which in turn control the movement of wheelchair. If person tilt his head in right or left direction above, chair will move in right or left direction.

3. HC-05 Bluetooth module is interfaced to the microcontroller which receive the signals from android Bluetooth application. When the user gives the voice command, this data received by hc-05 Bluetooth module and same as given to the microcontroller. Based on the received command microcontroller will control the direction of the wheel.

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

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