Modular Open Source Smart Wheelchair

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There is a small fraction of the world in need of smart wheelchairs, and among them there is a great range of functionality necessary. While a paraplegic may only want assistive steering and GPS, a quadriplegic may need an assistive robotic arm to help with their daily lives. As any product which sufficiently caters to a certain disability would appeal to only a fraction of the already small target demographic, it is hard for companies to efficiently bring smart features to market. Our proposed solution provides open source, modular designs, in turn enabling greater accessibility and variety to the smart features wheelchair users need/desire.

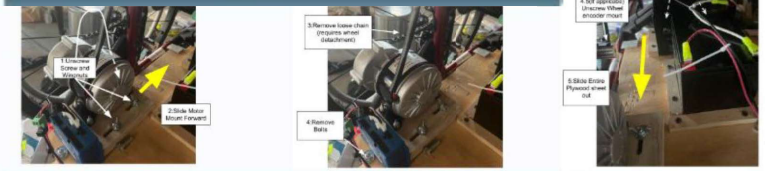
BACKGROUND

Intended population: Users with accessibility issues and creative developers!

- Fully customizable wheelchair
- Different modules for users with different needs
- Open source to encourage collaboration and accessibility for all
- Modules so far: motorization, object detection, different user inputs, robotic arm
- Controlled by NVIDIA Jetson Nano
- More modules can be developed in the future to make the wheelchair further customizable

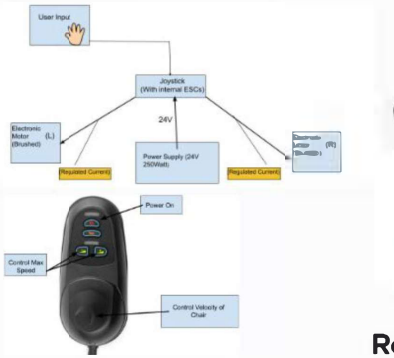
User inputs:

Modular Motor Mounting

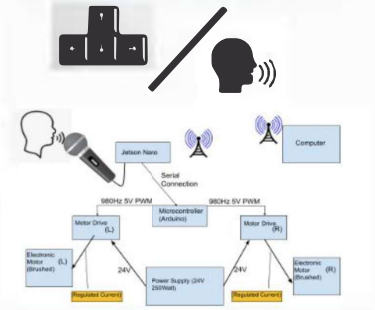


System Diagrams

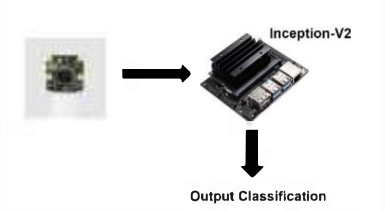
Joystick:



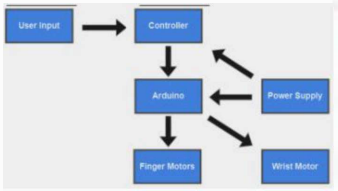
Remote/ Voice Control:



Object Detection:



Robotic Arm:



Object Detection

- Jetson Nano and camera working with COCO dataset (80 common objects)
- Model: Inception-V2
- Following data captured:
- Operated at 20 fps
- ~80% accuracy with real-time camera data

CONCLUSION

- Multiple user inputs
- Accurate and fast object detection
- Strong robotic arm
- Open source via GitHub website
- Successfully created three user inputs, object detection and robotic arm
- Smooth acceleration and motor function for both wheelchair and arm

FURTHER RECOMMENDATIONS

- **LiDAR and ROS**: For automatic navigation
- **Motor Gusset :** Allows higher torque outputs
- **Eye/Brain sensing:** Additional user inputs
- **Mobility of Arm:** Allow arm to move horizontally independently or with wheelchair

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