

MTE 481 - Design Project

Object Avoidance and Navigation for Powered Wheelchairs

Iain Peet Rowan Head-Marsden Jordan Valentin

October 3, 2011

Introduction



Need Statement

Powered wheelchairs can improve the mobility of the physically handicapped, but alertness and control are required for safe operation. Additional assistive technology is needed in order to afford the same benefits to the more severely disabled.

Objectives & Constraints

- ▶ Improve the safety of powered wheelchairs, for the occupant and for nearby pedestrians.
- ▶ Make powered wheelchairs accessible to people who would otherwise be denied due to safety concerns.
- ▶ Assist wheelchair users with difficult tasks, such as precise positioning and movement in constrained spaces.
- ▶ Avoid requiring a specialized, controlled operating environment.
- ▶ It must be possible to integrate with existing wheelchairs.

Criteria

- ▶ Risk of human harm.
- ▶ Tolerance of human error.
- ▶ Robustness against physical damage.
- ▶ Ability to operate in a variety of environments.
- ▶ Price.
- ▶ Electrical power consumption.

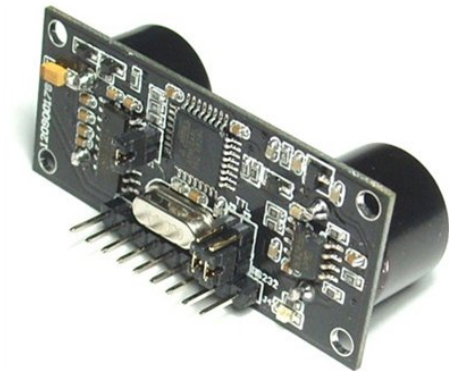
Design Concept

- ▶ Use sensor(s) as inputs to a computer-controlled system.
- ▶ Take user input into this system.
- ▶ Combine the user input and sensor readings to determine output to motor controllers.
- ▶ Produce collision-free movement of chair (whether by warnings, automated avoidance, etc.)

Stereo Vision



Ultrasonic



Infra-Red

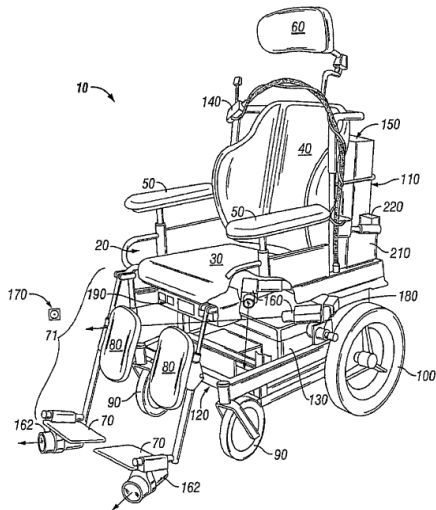


LIDAR



Patent Search

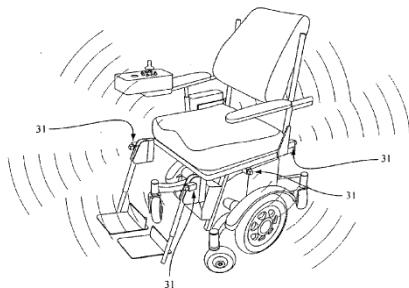
“Computer controlled power wheelchair navigation system”



- ▶ Patent No. US 7,383,107 B2 (June 3, 2008)

Patent Search

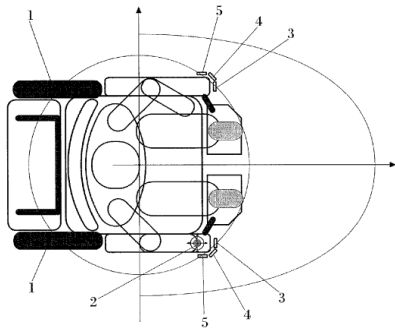
“Powered Wheelchair”



- ▶ Patent No. US 2010/0082182 A1 (April 1, 2010)

Patent Search

“Wheelchair and method for correcting the guidance of a wheelchair”



- Patent No. US 2011/0130940 A1 (June 2, 2011)