

Objective

Autonomous Shopping Cart

- Follows the human while shopping
- Detect and prevent obstacle collision
- User friendly
- Economical

Design Requirements

- Robotics
 - **Goal: Follow Human**
 - Motors range in value from [-500, 500]
 - Center of human target: find x/z displacement & target's radius
 - PID: x & z displacement to find motor output
 - Send motor commands to iRoomba \rightarrow pyCreate2 framework

Sensors

- Goal: Avoid Obstacles
- Ultrasonic sensors + Arduino NewPing Library
- Center of human target: find x/z displacement & target's radius
- Distance < certain threshold, send command to Raspberry Pi to stop iRoomba to stop & path plan
- Image Processing
 - Goal: Detect Human using OpenCV/Python
 - Blur + eroding/dilating \rightarrow minimize noise
 - Threshold on color
 - Minimum Enclosed Circle

Challenges

- Detecting all three types of turns
- Identifying proper placement of sensors
- Minimizing jerking from iRoomba
- Identifying correct target human

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| | Back Ser Activate | nsor id? |
| | Yes | No |
| Stop Moto | rs (| Set Mo legative PID o |
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Carti-B: An Autonomous Shopping Cart

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Prototype





Design Flowchart









Future Work

- Improve Image Processing
 - Use more powerful processor + use neural networks to strengthen algorithm & not have to rely on as many targets
- Improve Robotics
 - Use a faster robot with a greater weight load limit that can turn and move forward at the same time
- Improve Sensors/Path Planning
 - Be able to map the environment better
- **Overall Improvements**
 - Lessen changes for user \rightarrow use target smaller than jacket
 - Implement more logic for when human is lost
 - Mount an actual shopping cart