Control Module/Interface for Service Robots

Senior Design Team 315

Department of Electrical and Computer Engineering

Team Introduction

Brendan Laney

Project Manager

Software Engineer – Control Logic

Diego Guedez

Software Engineer – Imaging

Jerry Jean-Pierre

Software Engineer – Control Logic

Jossue Arzeta

Software Engineer – Control Logic

Kyle Crawford

Applications Engineer

Scope of Presentation

- Project Recap
- Preliminary Results
- Future Works

Project Recap

- Design a control module which enables a motorized system to semi-autonomously follow a person
- Object detection
  - Identify user between other people/objects
  - Determine distance to user and other people/objects
- Motor controller based on user and environment

Project Components

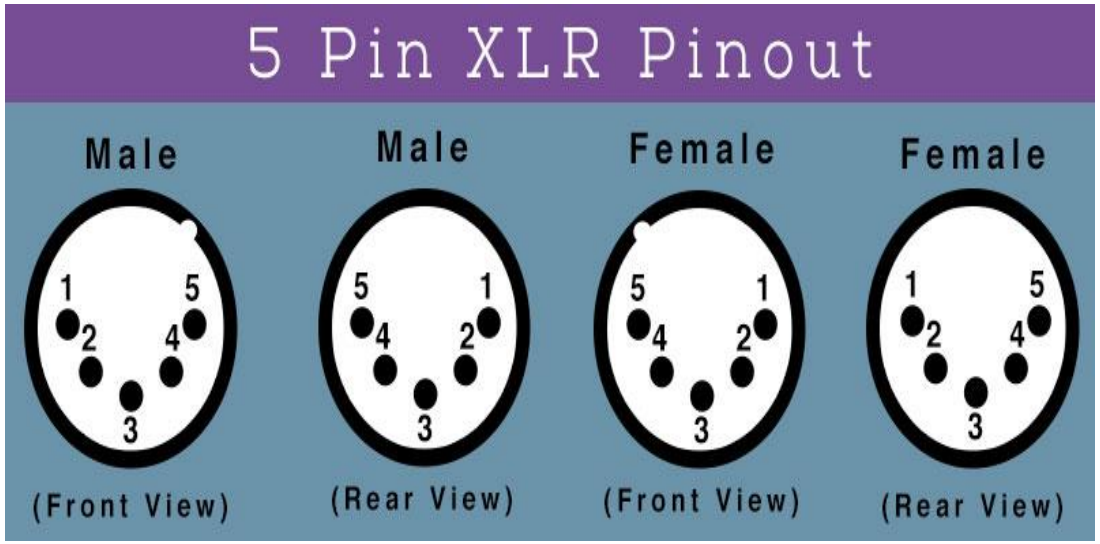
- Use a wheelchair (Quantum 6400Z) as our motorized system
  - Motors to move around
  - Battery system to power our control module
- Intel NUC for our microprocessor
- Intel RealSense Depth Camera for image processing

Connections/Testing of Wheelchair

- Connect to the joystick from the motors

Connections/Testing of Wheelchair

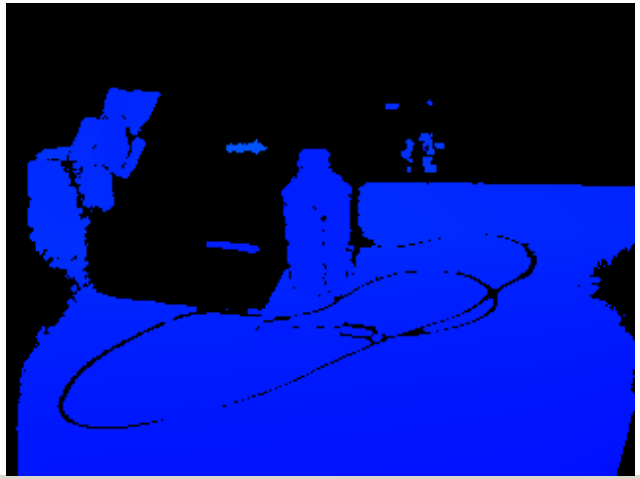
- Charging connection pins to charge battery



- Pin 1: Shield (Common)
- Pin 2: DMX 1 Negative
- Pin 3: DMX 1 Positive
- Pin 4: DMX 2 Negative
- Pin 5: DMX 2 Positive

Object Detection / Camera Status

- Able to detect faces
- Able to gather depth data

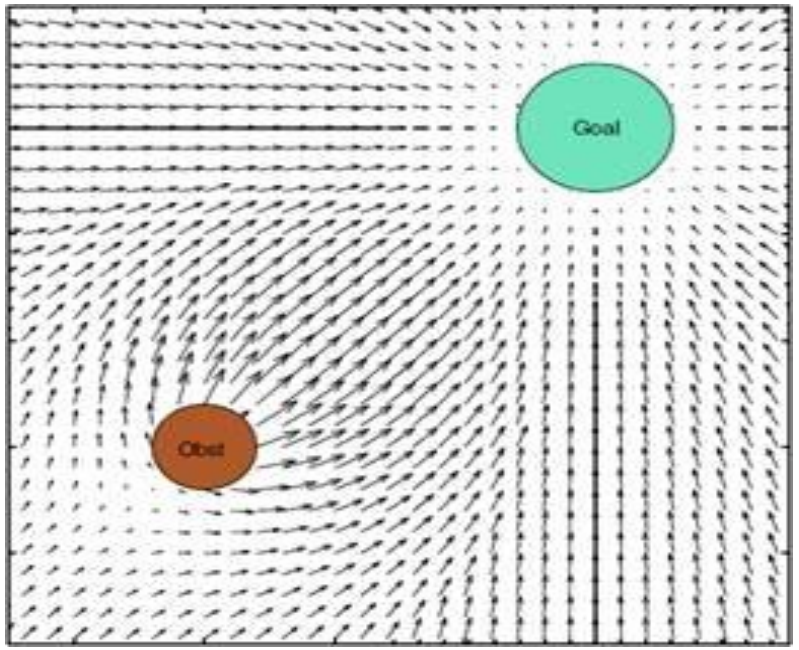


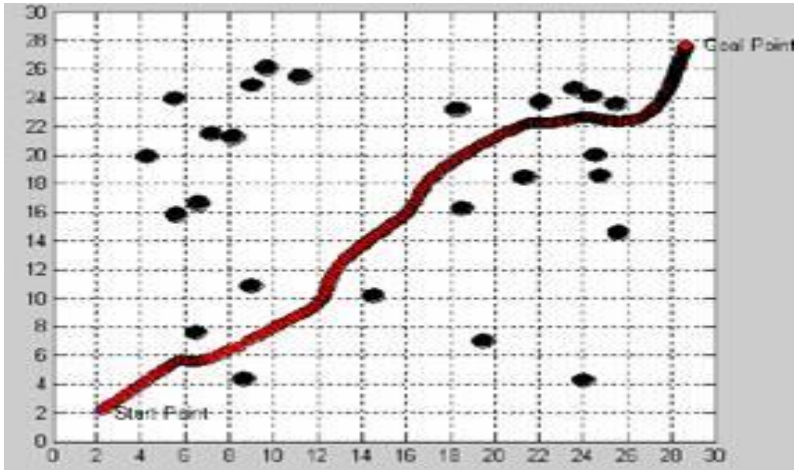
Pathfinding

- Robot will follow person via Bluetooth connection
- Receive obstacle detection feedback
- Make its way towards user
- Will use potential fields for obstacle avoidance

Potential Fields

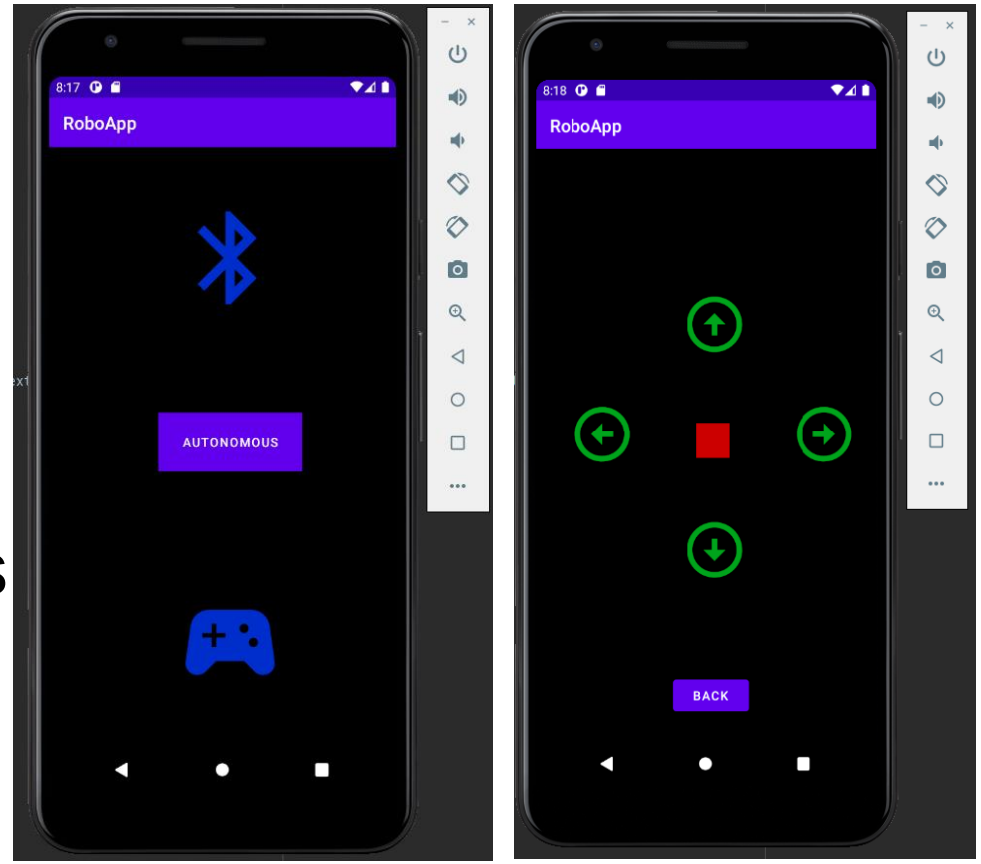
- Moves towards lowest potential area (Bluetooth connection attracts)
- Avoids high potential area (obstacles repulse)





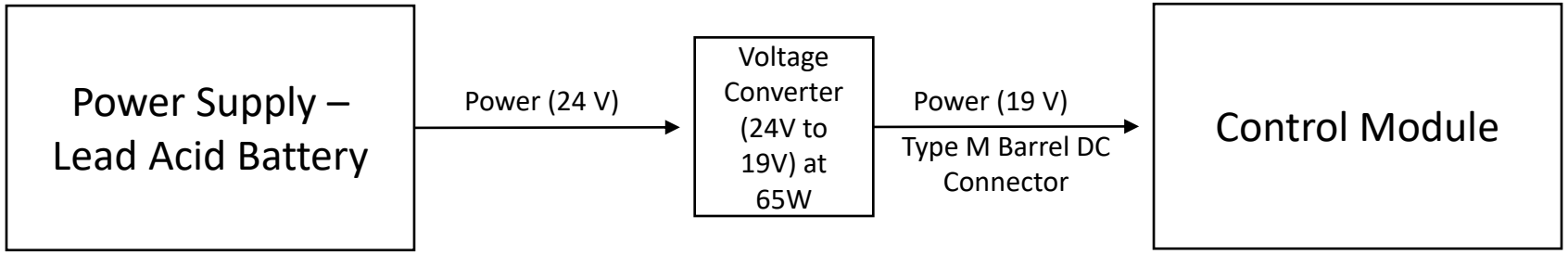
App Connection

- Currently Android only
  - Apple in future
- Bluetooth capable
- Controls mode of the robot
- Can be used to send manual commands



Robot Power

- Charging method to recharge the two wheelchair batteries
- Method to convert battery power to power for control module with the proper connection

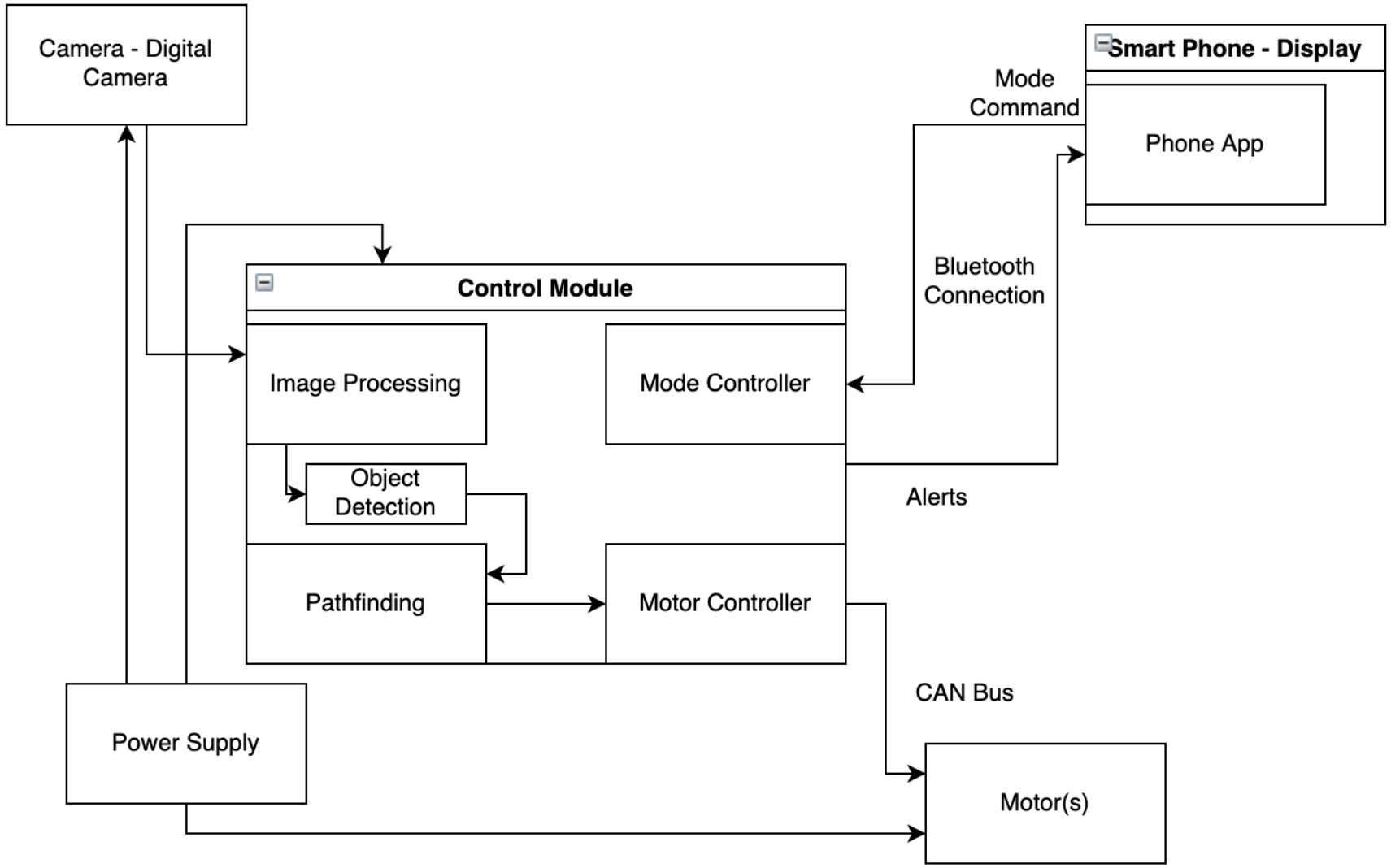


Future Works

- Charge wheelchair batteries and power control module
- CAN Protocol to move motors (speed and direction)
- Run commands with Bluetooth connection between mobile app and control module
- Test wheelchair operation with control module attached
- Calibration module to identify user from other people

Questions

TASK	ASSIGNED TO	PROGRESS	START	END
Connections and Testing of Wheelchair				
Joystick connections to the motors	Jerry	0%	2/4/22	2/10/22
Charging connection pins to charge battery	Brendan/Ivan	0%	2/4/22	2/10/22
Testing Wheelchair functionality/ Create test form document	Kyle	0%	2/4/22	2/10/22
		0%		
Connect Camera with object detection				
Have camera reccognize user	Brendan, Ivan, Kyle	0%	2/4/22	2/10/22
Detect distance from objects	Diego	0%	2/4/22	2/10/22
Detect objects other than the user	Jerry, Diego	0%	2/4/22	2/10/22
Have camera focus on user	Ivan	0%	2/4/22	2/10/22
Detect distance from user	Diego	0%	2/4/22	2/10/22
Interface module with CAN protocol and move motors				
Connect to motors with control module	Jerry	0%	2/11/22	2/21/22
Adjust motor speed based on distance from camera	Ivan	0%	2/11/22	2/21/22
Adjust motor direction based on distance from camera	Brendan	0%	2/11/22	2/21/22
Connect Mobile App with Control Module va BT	Kyle	0%	2/11/22	2/21/22


Camera - Digital Camera
Smart Phone - Display
Mode Command
Phone App
Bluetooth Connection
Control Module
Image Processing
Mode Controller
Object Detection
Alerts
Pathfinding
Motor Controller
CAN Bus
Power Supply
Motor(s)