The Joe–Kart
BME 4900 Final Presentation

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Overview

- Introduction
- Project Design
  - Specifications
  - Subunits
- Progress Through First Semester
- Work to be Completed
- Division of Labor
- Status of Budget
- Acknowledgements
The Client

Joey Toce

- 6 years old
- 42 inches tall
- 35lbs
- Suffers from Mixed-Type Quadriplegic Cerebral Palsy with a second diagnosis of Global Apraxia
- Lives in Southington, CT
Project Overview

Purpose
- To design and build a modified vehicle which Joey can operate given his limited motor control
- Provide an alternate source of recreational mobility
- Increase time outdoors and out of wheelchair
- Teaching tool for motor control development
- Have fun!
Specifications

- Battery Operated
  - Motor
  - Steering
  - Braking

- Dual Controls
  - Dashboard
  - Remote

- Adjustable Custom Seat
  - Trunk Support
  - Leg Straps
  - Head Restraint

- Kill Switch Override

- Roll Cage

- Left Hand Oriented
Project Design

Subunits
- Mechanical Systems
  - Chassis
  - Seats and Harness
  - Steering
  - Braking
  - Transmission

Electrical
- Batteries
- Control Box
- Feedback systems
- Control Systems
- Methods of Control
**Chassis**

- 2 seat chassis acquired from Northern Tool
- Stripped and modified
  - Will not use seat, rear wheels, or steering linkage
  - Installing transmission box and differential rear axle
  - Installing rack and pinion system for steering
  - Installing disc brake
Seats and Harness
- Standard bucket seat for passenger
- Custom Seat for Joey
  - Head and neck support
  - Trunk support
  - Velcro leg straps
  - On adjustable track
  - 5 point harness
Steering

- Dayton 1L469 Gear Motor will power rack and pinion system
- Rack and pinion connected to modified stock tie rods to turn wheels

Dayton 1L469 Gear Motor

Wheel Bracket Assembly
Braking

- Dayton 1L474 Gear Motor will operate braking system
  - Comet DC series mechanical brake caliper
  - 10” brake disc
Transmission

- Electric C40-300 Magmotor will power differential axle through gear reduction system
- Preliminary 7.5:1 gear ratio
  - Two step reduction; 2.5:1 then 3:1
Electronics

- Batteries
  - 4 12V deep cycle marine batteries
    - 2 in series to power 24V Magmotor
    - 1 to power braking system
    - 1 to power steering system

- Control Box
  - Housing for wires and electric components
  - Shields components from environment
Feedback systems

- Will be implemented to gauge degree of steering and braking
- Celesco CLP series linear potentiometers
  - 4” stroke length for braking system
  - 6” stroke length for steering system
  - Provide variable voltage as feedback mechanism

Celesco CLP series linear potentiometer
Electronics

Control Systems

- Motor Controllers will take PWM input from receiver and drive motors for steering, braking, and transmission accordingly
  - IFI Victor 883 Motor Controller for steering and braking
  - 4QD–300 regenerative speed controller for transmission

IFI Victor 883

4QD–300
Methods of Control

- Dashboard
  - 2 push buttons: start and stop
  - Sliding potentiometer for steering

- Remote
  - Dual single axis thumb sticks: acceleration and steering
  - Kill switch override
  - Always overpower dashboard controls
  - Donated by Miratron, Inc.
Progress Through First Semester

- **Acquired:**
  - Chassis
  - Speed controllers
  - All motors
  - Rear axle and wheels
  - Linear potentiometers

- **Learned design software**
  - CAD
  - PCB design and Multisim
  - C Programming

- **Designed:**
  - Transmission box
  - Adjustable seat tracks
Work to be Completed

- Purchase the remaining components
- Fabricate transmission box
- Install:
  - Differential axle
  - Steering system
  - Braking system
  - Seats
  - Dashboard controls
- Configure electronics
- Test and revise all systems
Division of Labor

- Morgan:
  - Remote and receiver
  - Dashboard controls
  - Seat
- Mike
  - Steering system
  - Braking system
- Marek
  - Transmission system
  - Chassis modifications
Starting Budget: $3,000
Purchased: ~1,500
- Chassis – $607.07
- IFI Motor Controllers – $295.30
- 1 Celesco Linear Potentiometer – $298.00
- 11” Rack and Pinion – $110.87
- Disc Brake and Caliper – $149.98

Donations:
- C40–300 Magmotor, 4QD–300 Speed controller, 1 Celesco linear potentiometer, differential axle, rear wheels, Dayton gear motors
- Donations Valued at approximately $2,000

Remaining Budget ~ $1,500
Acknowledgments

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QUESTIONS???