Quad Squad: Steerable Walker Project

Members: Myia Dickens, Justin Lin, Jeremy Jiang, Dylan Salcido
Sponsors: Dr. Michael McCarthy and Kevin Chen
Team Goals and Purpose

The goal of this project is to design, build, and test a steerable mechanical walker.

Requirements:

- one drive motor and one steering motor
- RC control to define forward and backward movement and left and right turn to steer
- four legged design (eventually a six legged design)
- a demonstration of its movement around a circle or in figure-eight in both directions
Team Organization

Organizational Roles

Manager: Myia

- Design: Justin
- Manufacturing: Dylan
- Documentation: Myia
- Website and Powerpoint: Jeremy
- Testing: Dylan and Justin

Technical Roles

- Electrical
  - Myia
- Chassis
  - Justin
  - Dylan
  - Jeremy
- Drive System

Schedule (Tentative)
1. Team Organization and Goals
2. Technical Roles and Design Concepts
3. Solidworks design for Subsystem Prototypes
4. Identify parts list and fabricate parts for subsystems
5. Assembly of subsystem prototypes
6. Define A-Walker Prototype
7. Purchase and fabricate parts of the A-Walker
8. Define B-Walker Prototype
9. Purchase and fabricate parts of the B-Walker
10. Demonstration

Myia Dickens
Electrical

Parts for the electrical were pre-chosen by Dr. Brandon Tsuge from the Bored Robot

Motors have been wired and we are moving towards proportional control

Electrical Flow Chart

- RC Controller transmits signal
- RC Receiver connected to Arduino sends signal
- Arduino sends PWM signal to motor driver
- Motor moves
- Motor Driver sends signal to encoder

Myia Dickens
Drive System

Drive Train Linkage Designs:

Max: 5.43 in
Min: 4.17 in

Dylan Salcido
Drive System: Right Angle Bevel

Servo City Model

Dylan Salcido
Drive System

Worm Gear for right angle power transmission

https://www.servocity.com/worm-gears/#worm-gear-sets

Worm Gear Box in Drive train:

https://www.amazon.com/Gearartisan-Self-Locking-Reversible-Reduction-Electric/dp/B07YBXTR2P/ref=sr_1_30?dchild=1&gclid=EAIaIQobChMI3OJsk5gB3gIVZrD4Ch1sw0HwDAEYAiABEgKvD_BwE&gclsrc=aw.ds&hvpaid=431880177572&hvadid=503159205765&hvdev=c&hvlocphy=9031590&hvnetw=g&hvqmt=b&hvrand=17028767408214729399596&hvadid=5241839547&hvpos=157700728&hvrefid=worm%2Bdrive%2Bgearbox&hvsource=viral&hvadid=49625197878&hvdev=c&hvnetw=g&hvqmt=b&hvrand=16245175703&hvadid=0&hvdev=c&hvnetw=g&hvqmt=b&hvrand=182034111

Rating Voltage: DC 12V
Reduction Ratio: 1:32
No-Load Speed: 2500RPM
Rated Torque: 2kg.cm
Rated Current: 1400/1260mA (Positive Rotation / Negative Rotation)
Error: ±10%
D Shaped Output Shaft Size: 8.15mm (0.31" x 0.59") (D*L)
Gearbox Size: 58.1 x 40.11 x 36mm (2.29" x 1.58" x 1.42") (L*W*H)
Motor Size: 31 x 57.2mm (1.22" x 2.25") (D*L)
Mounting Hole Size: M4 (not included)
Main Material: Metal, Electronic component
Wire Length: 20cm
## Chassis

### Concept Selection for hinge design

<table>
<thead>
<tr>
<th>Goal</th>
<th>Weight</th>
<th>Cross Linkage Hinge Design</th>
<th>Vertical Hinge Design</th>
<th>Horizontal Hinge Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Integrity</td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td>0.9</td>
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<tr>
<td>Easy to assemble</td>
<td>0.15</td>
<td>0.3</td>
<td>0.15</td>
<td>0.3</td>
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<tr>
<td>Ease of manufacturing</td>
<td>0.15</td>
<td>0.3</td>
<td>0.15</td>
<td>0.3</td>
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<tr>
<td>Functional with steering mechanism</td>
<td>0.2</td>
<td>0.4</td>
<td>N/A</td>
<td>0.6</td>
</tr>
<tr>
<td>Interior space for installment of electronics and gears</td>
<td>0.2</td>
<td>0.4</td>
<td>N/A</td>
<td>0.6</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Points</th>
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<td>2</td>
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<table>
<thead>
<tr>
<th>Ranking 1-3</th>
</tr>
</thead>
</table>

**Leg mechanism**: were created using the provided geogebra template made by project advisor, Kevin.

**Solid Work Model**: Incorporate hinge concept designs in solid work models for subsystem prototype.

**Mock Model**: Cardboard model of hinge to chassis assembly were made to test and verify for design feasibility and to estimate the size of the steerable walker.

Justin Lin
Summary:

Upcoming Goals:

Week 6 and 7: Finalize the subsystem and create the design for the A-Walker

Week 8 and 9: Evaluate A-Walker performance to determine B-Walker Design

10th Week: Demonstration

Possible Future Work:

Six Legged Walker, Stride Adjustment, Position Sensors, Autonomous operation