P1 Brainstorming Presentation

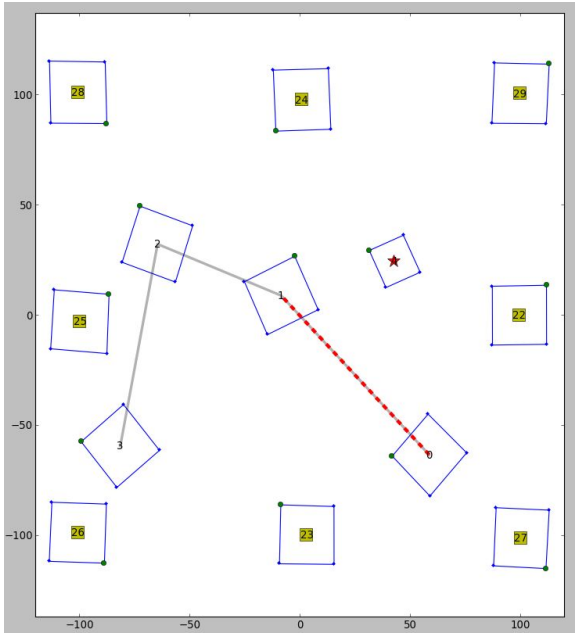
Green Team
Anvitha Paruchuri, Michael Dobrowolski, Paul Reggentin, Shariq Lalani

Overview

- Task
- Resources and Background Material
- Designs
  - Design #1
  - Design #2
  - Design #3
- Risks and Mitigation
- Team Member and Skills
- Workplan

Task

- Build a robot that can reach a sequence of waypoints in 2m x 2m arena that is covered by 8 2D bar-codes(tags)
- While the robot moves the laser pointer should be oriented along the positive Y axis and projecting a dot on the wall
- The task should be completed in 15 minutes



Pass/Fail Requirement

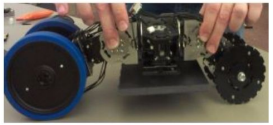
- Robot should stay in the arena
- The final waypoint should be reached in 15 min
- Laser always stays in the positive Y direction

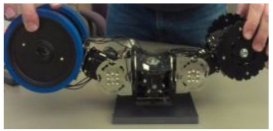
Caveats

- After the first waypoint, the robot should be completely autonomous
- The non active waypoints can be moved
- Robot location is defined by only one tag
- Noisy sensing data
- Robot tag cannot leave the arena

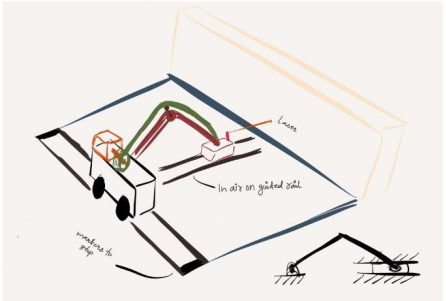
Resources and Background Materials

- 2014 Blue Team

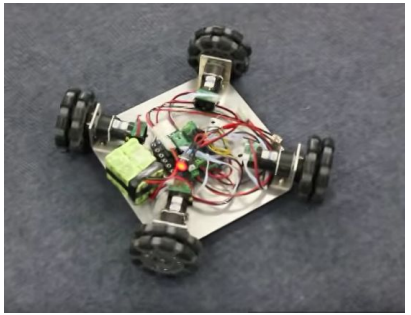




- 2014 Maize Team

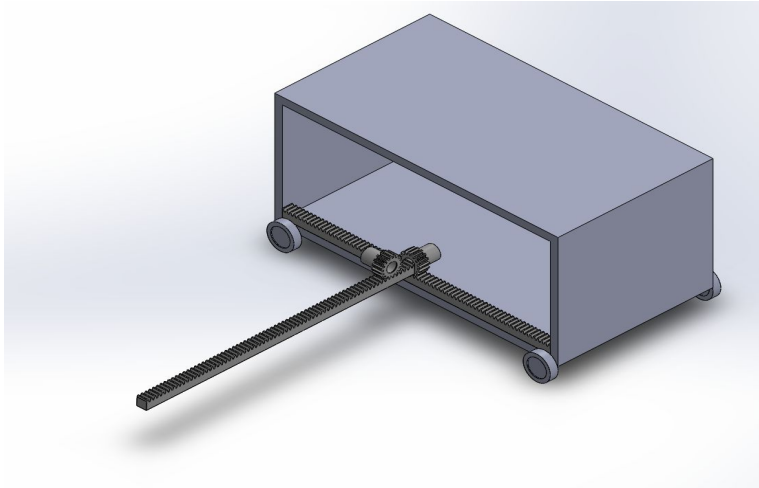


- Video of Holonomic Robot using Omni Wheels



Design #1: Concept

- Main body is box shaped with 2 rack and pinion gear mechanisms
- 4 motor design
  - One for each wheel on main body
  - One for rack and pinion which moves tag along y axis
  - One for rack and pinion which moves along x axis
- Based on 2016 Green Team Design

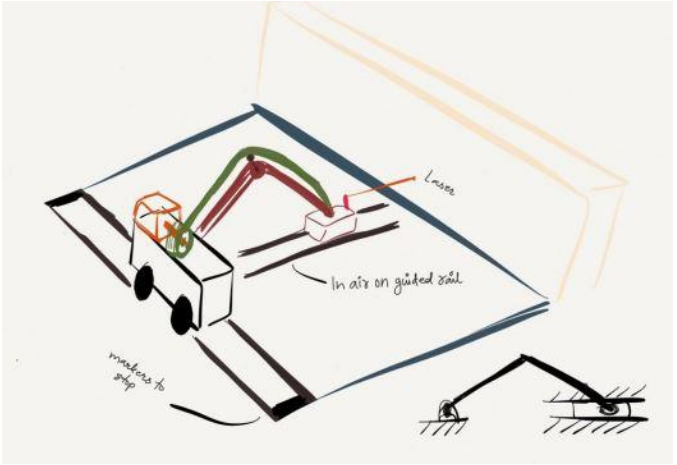


Design #1: Pros and Cons

- Pros:
  - No need to orient laser
  - Simple coding
  - Only requires motion in one direction for main body
  - No need to determine position of waypoints
- Cons:
  - Most difficult mechanical design

Design #2: Concept

- Uses slider crank mechanism
- Laser attached on main body
- 4 motor design
  - 2 motors for main body front/back wheels
  - 2 motors for wheels on smaller box attached to arm

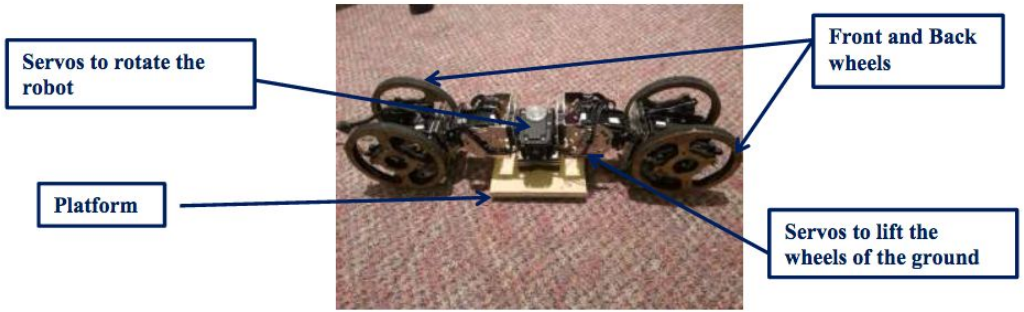


Design #2: Pros and Cons

- Pros:
  - Easy coding
  - No need to determine position of waypoints
  - Simplistic design
  - No need to control orientation of laser
  - Only requires motion in one direction for main body
- Cons:
  - Bulky mechanical design
  - Complex assembly compared to third design

Design #3: Concept

- Robot that turns and moves separately
- 5 motor design
  - 2 motors drive wheels
  - 2 motors lift wheels when turning
  - 1 motor rotates the wheel chassis to turn
- Based on 2014 Blue Team Design



Design #3: Pros and Cons

- Pros
  - No need to control orientation of laser
  - Optimized for straight-line motion along waypoint lines
  - Rotation allows searching for waypoint lines without moving
- Cons
  - Wheeled motion is liable to drift error
  - No way to correct if laser alignment is changed
  - Small adjustments in position are difficult and time-consuming
  - Central platform must remain flat
    - Must calibrate leg lifting motors to one another to prevent platform tilt

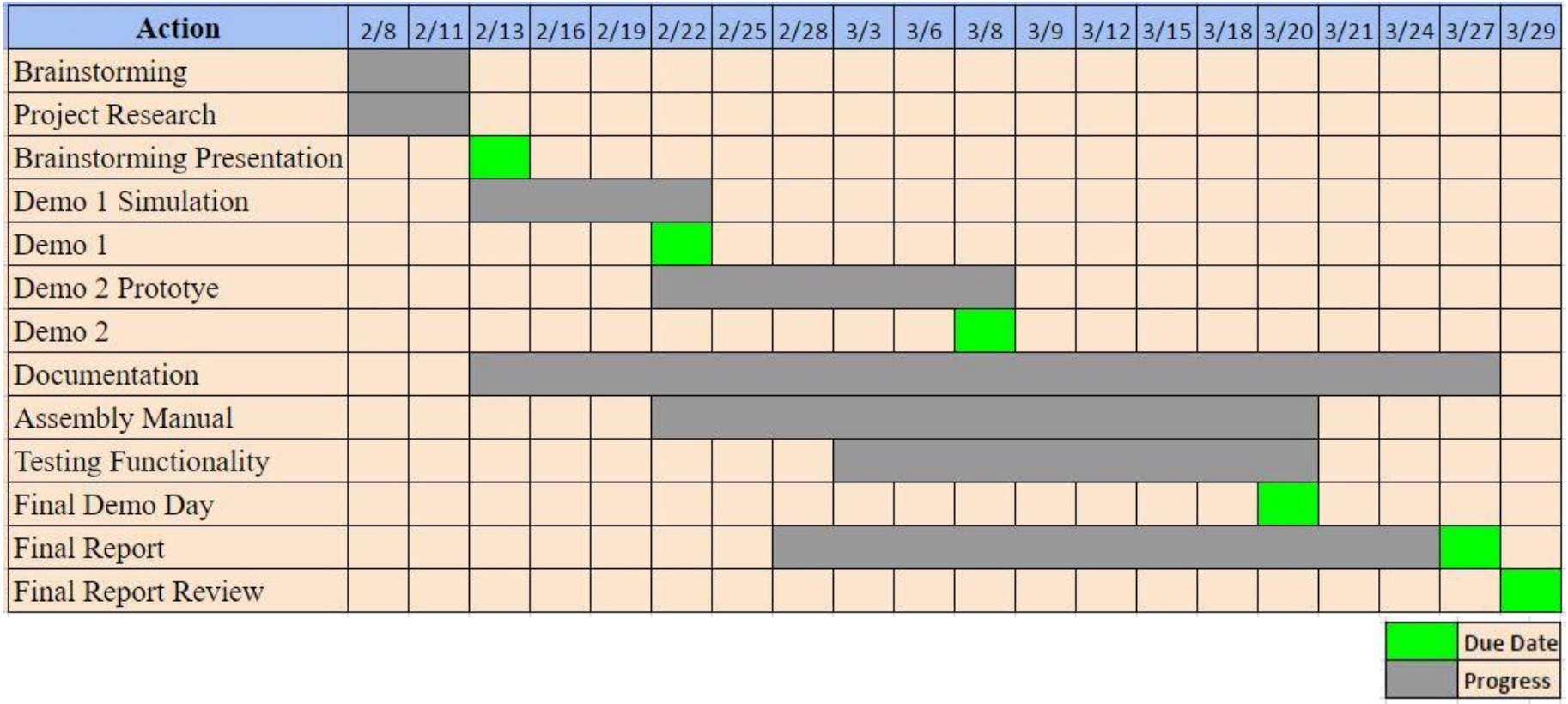
Risks and Mitigation

- Time constraints
  - A group chat will be used to keep in frequent contact. This will allow group members to stay up to date on the project even if a meeting is missed. This will help us to keep on top of the project and finish with adequate time.
- Bugs in software
  - Possible bugs:
    - Miss tag
    - Laser points wrong way
  - Code will have to be completed early in order to extensively test for bugs
- Mechanical Failures
  - Stress tests and frequent testing will help us mitigate physical failures

Team Members and Skills

- Anvitha Paruchuri (CSE)
  - Programming
- Michael Dobrowolski (CSE)
  - Programming
- Paul Reggentin (EE)
  - Signal Processing
  - System Analysis
- Shariq Lalani

Workplan


Action
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Brainstorming
Project Research
Brainstorming Presentation
Demo 1 Simulation
Demo 1
Demo 2 Prototye
Demo 2
Documentation
Assembly Manual
Testing Functionality
Final Demo Day
Final Report
Final Report Review
Due Date
Progress

Thank you!
Questions?

References

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