

# Weeding Robot Team 11

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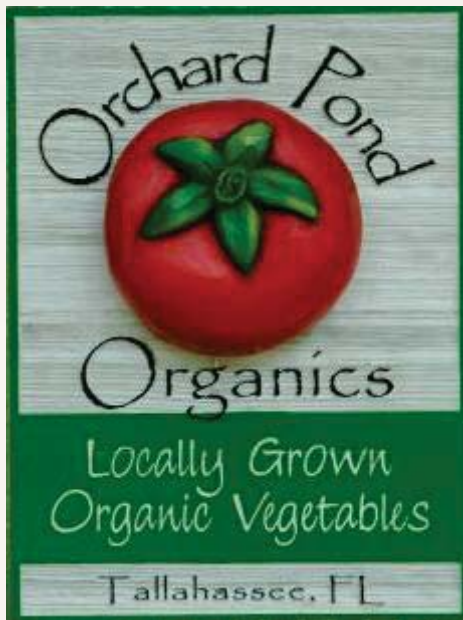
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# Background Information

## Purpose

- To create an autonomous robotic system to remove weeds from a plot

## Orchard Pond Organic Farm

- About the farm
- About the sponsor

## Constraints

- Affect all weeds in a given area
- Should not disturb below 1 inch of soil



# Motivation

For an organic farm to compete, it must make up for the excessive manpower required

Allow for the farm to expand

Weeding is a menial task that could be automated

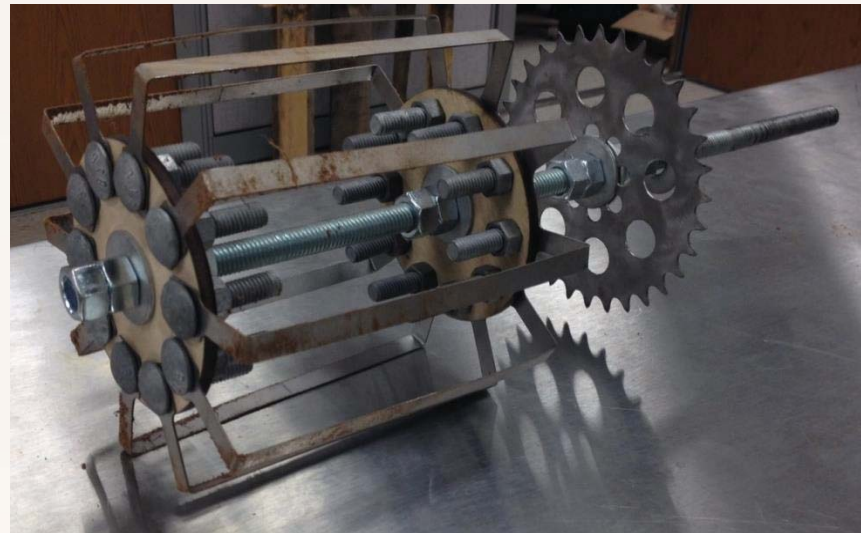
Weeding can be physically taxing on an individual





# Updated Progress

- Finished second prototype and found flaws
- Started modifying the second prototype for new ideas
- Integrated ultrasonic sensors with the navigation system





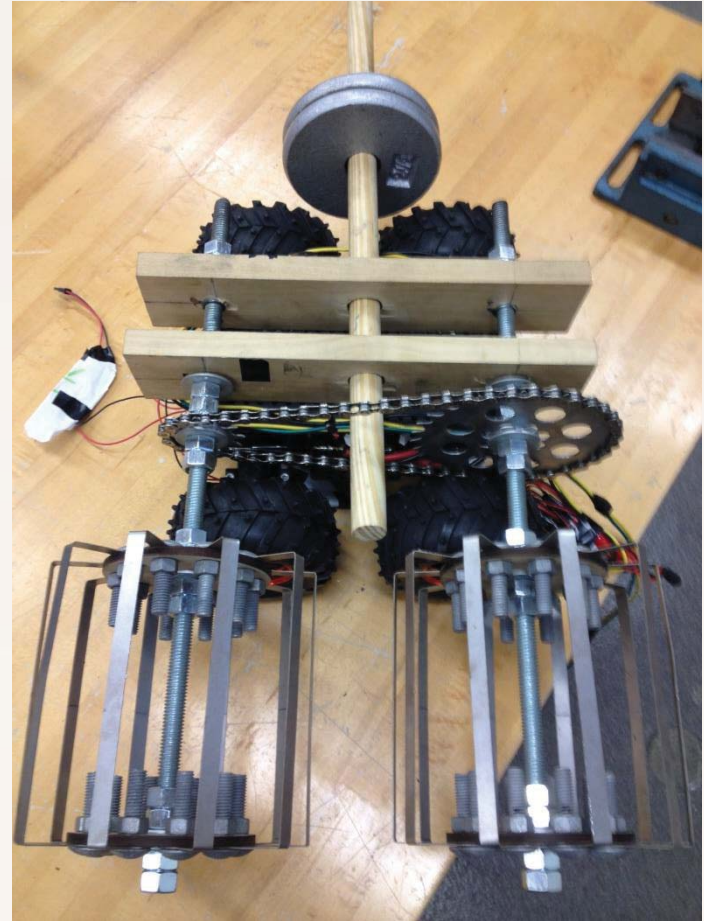
• Weeding Mechanism

• Navigation System

• Future Plans/Budget

# Old Weeding Method

- 2 basket weeding mechanism
- Using a gearing ratio to get the desired effect
- No motors needing for this method



# Failed Testing

The first basket drags too much  
This removes weeds disturbs  
more than an inch of dirt  
Bed built too high

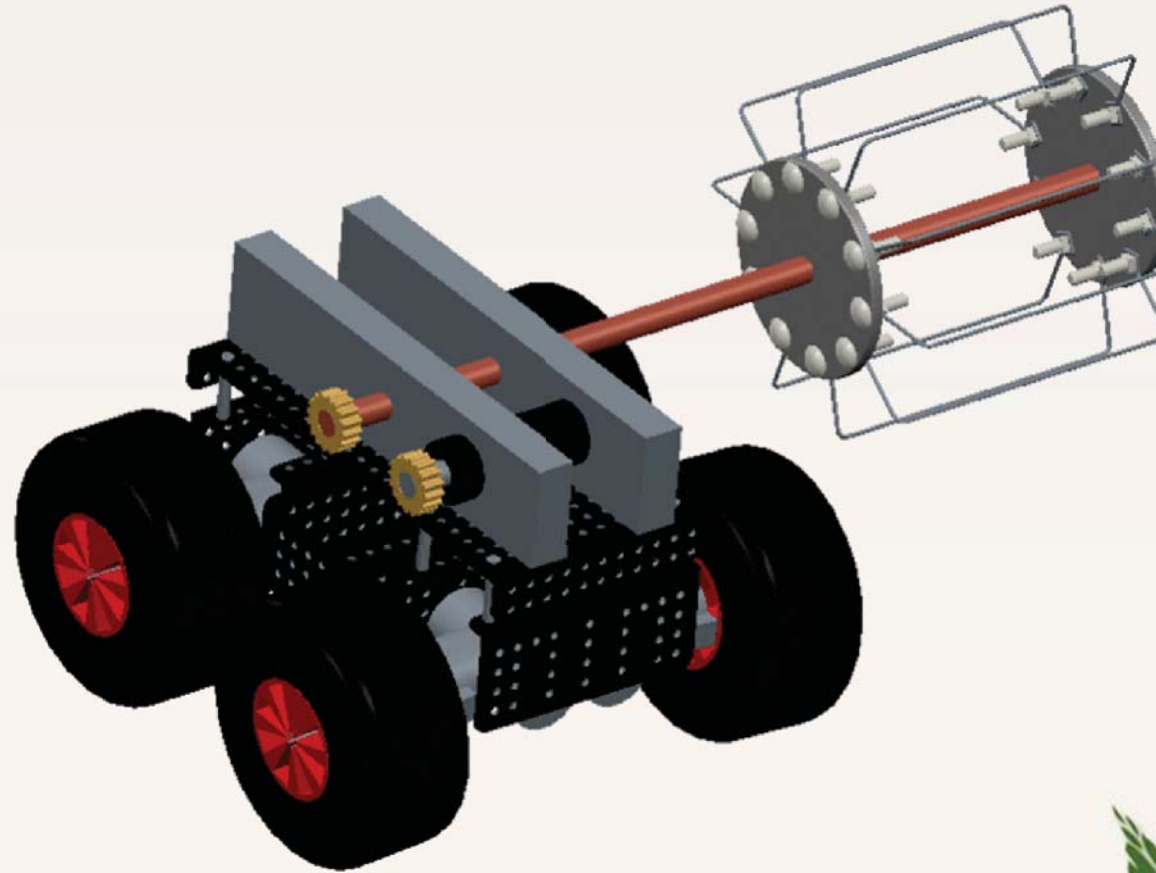


# Proposed Modification

Only one basket

Driven by a motor attached with a chain 1 to 1

Turns basket in the opposite direction with respect to the wheels





# Measurements





# Video of Torque Testing

- The required current was 1.16 A
- The required torque was calculated to be  $1.53 \text{ N} * \text{m}$





▶ Weeding Mechanism

▶ Navigation System

▶ Future Plans/Budget

# Navigation System Changes

Navigation System now has 2 major components

Computer Vision for location areas for robot to drive

Ultrasonic sensor to determine more accurate position in row





# Navigation Video



# Statistical Analysis of Navigation Systems

<i>System Type</i>	<i>Loading Conditions</i>	<i>Success</i>	<i>Failure</i>	<i>Total Attempts</i>	<i>Success Rate</i>
Vision only	Target center position	14	1	15	0.93
	Midpoint calculation	10	5	15	0.67
	Successful Navigation	7	9	15	<b>0.47</b>
Ultrasonic only	Distance from Bed	12	3	15	0.80
	Successful Navigation	11	4	15	<b>0.73</b>
Vision and Ultrasonic	Successful Navigation	13	2	15	<b>0.87</b>

# Current Testing

<i>Speed</i>	<i>Loading Conditions</i>	<i>Current Draw (mA)</i>	<i>Max Battery Life (Hours)</i>
30%	No Load	0.091	54.95
	Load: Robot only	0.102	49.02
	Load: Robot + Weeding Mech	0.127	39.37
60%	No Load	0.162	30.86
	Load	0.193	25.91
	Load: Robot + Weeding Mech	0.199	25.13
90%	No Load	0.156	32.05
	Load	0.21	23.81
	Load: Robot + Weeding Mech	0.219	22.83



▶ Weeding Mechanism

▶ Navigation System

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# Electrical Project Plan

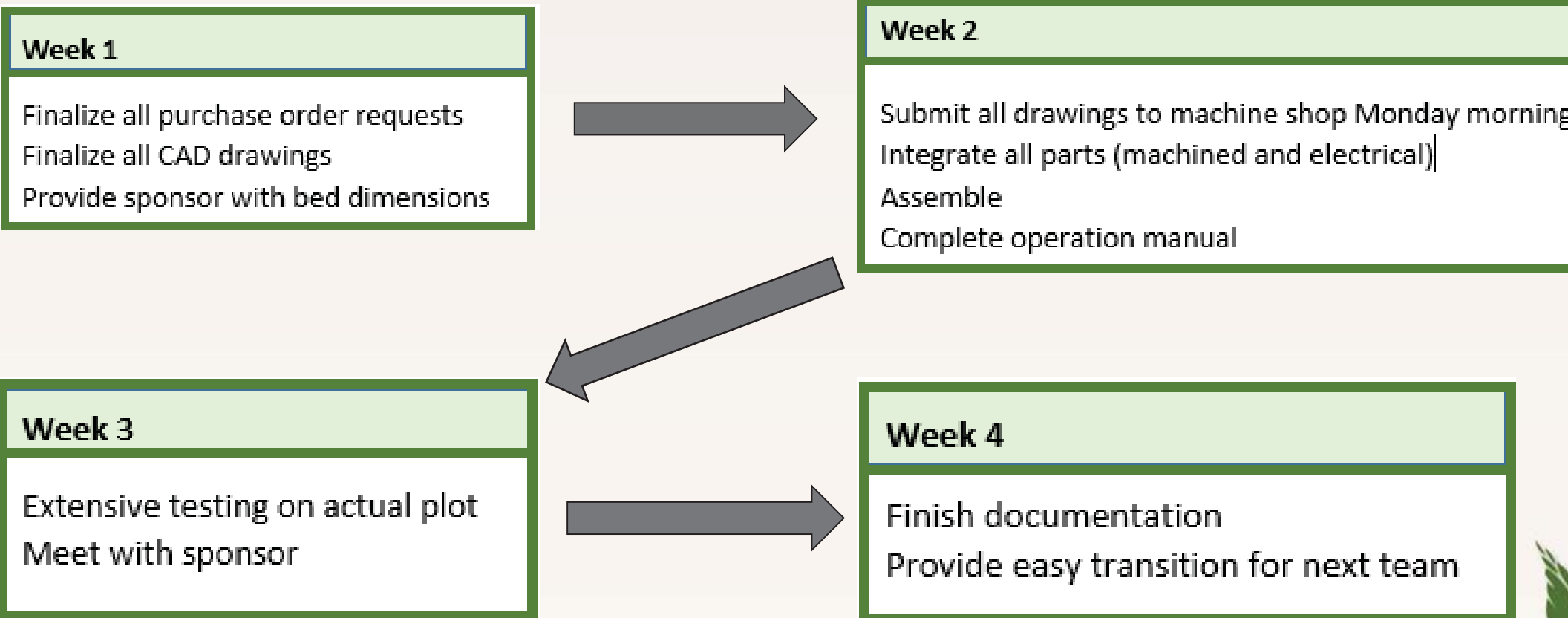
Fine tune navigation system for accuracy (ultrasonic and vision)

Build system for changing rows

Compensate for changes in robot with weeding mechanism attached

Provide documentation

# Mechanical Project Plan



# Budget

71.5% of the total budget has been spent

