UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

ME 370

P2D2 Legged Package Dispensing Robot

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11/13/2025

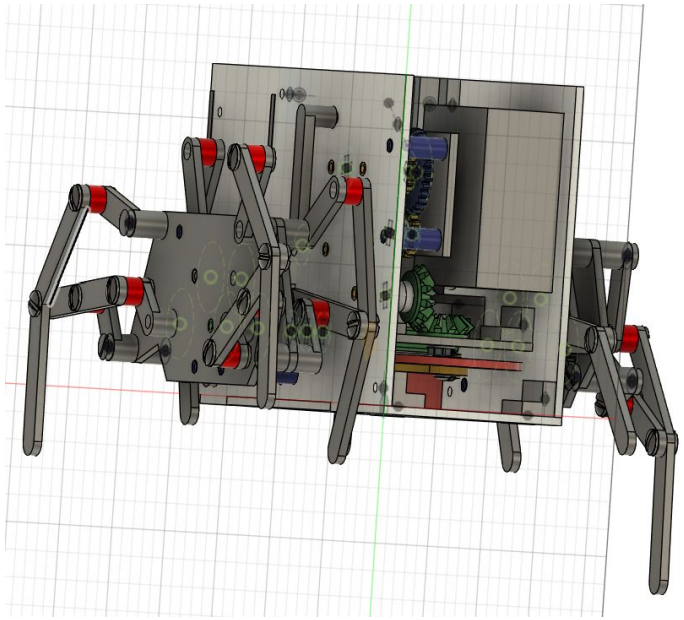
Overview of Legged Package Dispensing Robot

Theme Consideration:

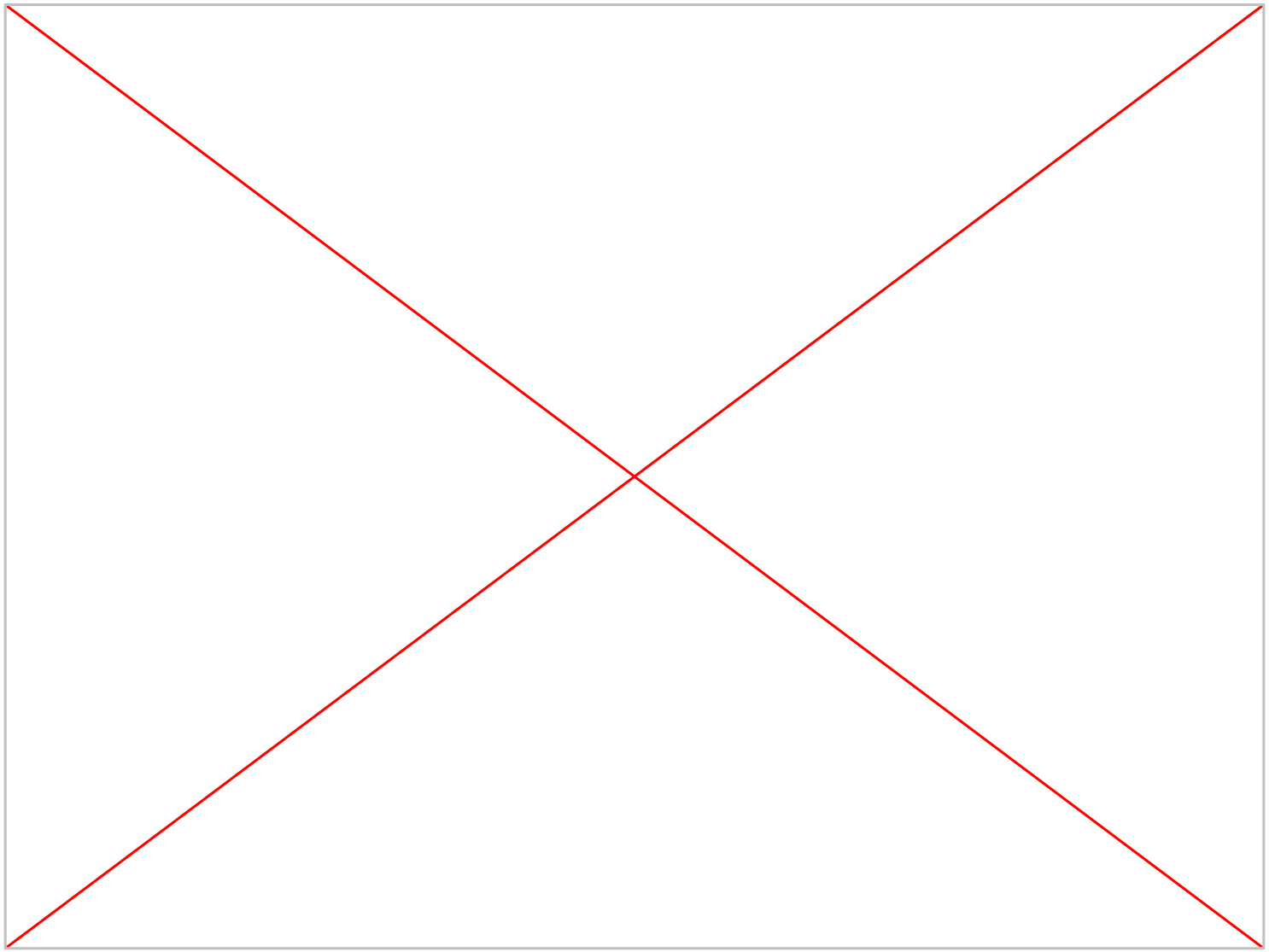
Provide packages delivery services for apartment buildings.

Functional requirements:

- Deliver packages of different sizes
- Easily loaded with large dispensing chute
- Be able to climb over small obstacles
- Tough design resilient to small impacts

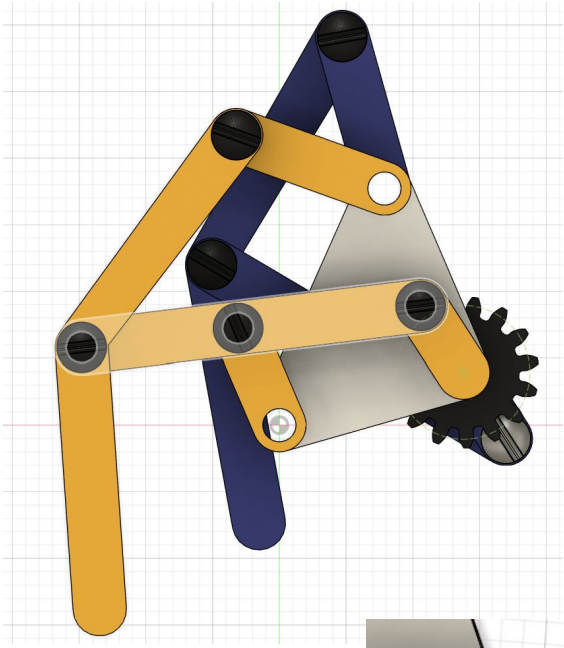


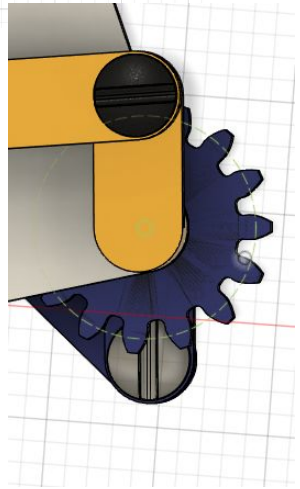
CAD Animation



Proposed design —— Walking mechanisms

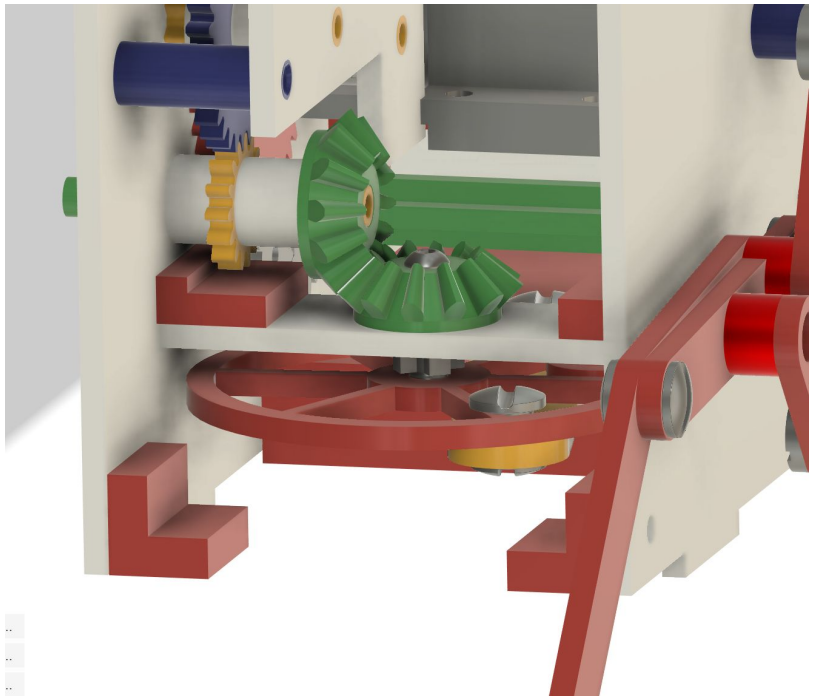
- Eight-leg design
  - 4 sets of two legs at each corner
  - 180 degrees out of phase
- Legs use Klann linkage
  - 6 links
  - 7 full joints
- Four feet on ground at all times to ensure stability

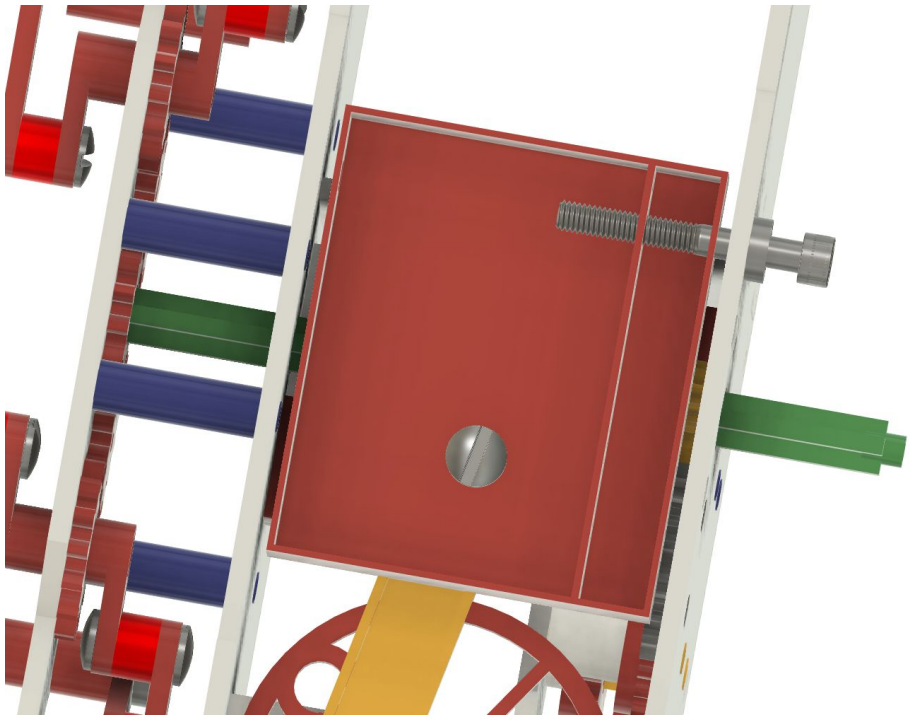


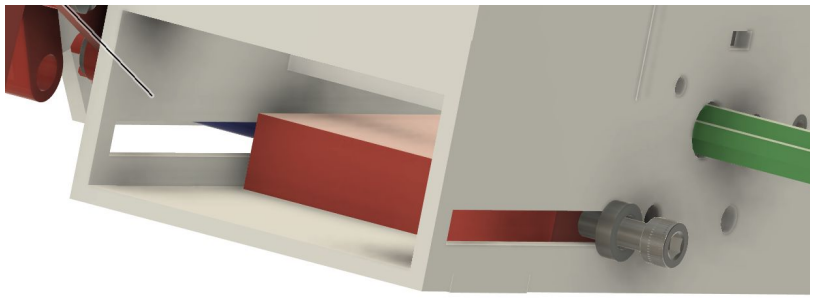


Proposed design —— Dispensing mechanisms

- Crank-Slider mechanism on a partial gear
- The slot prevents the slider from rotating,
- The screw reduces friction and easy to adjust tolerance

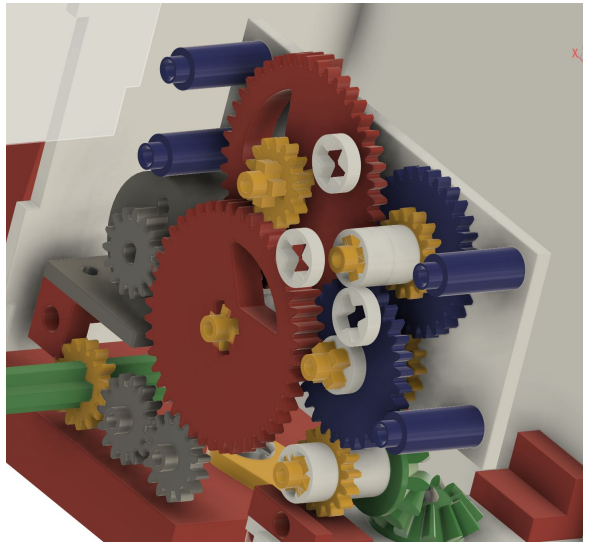


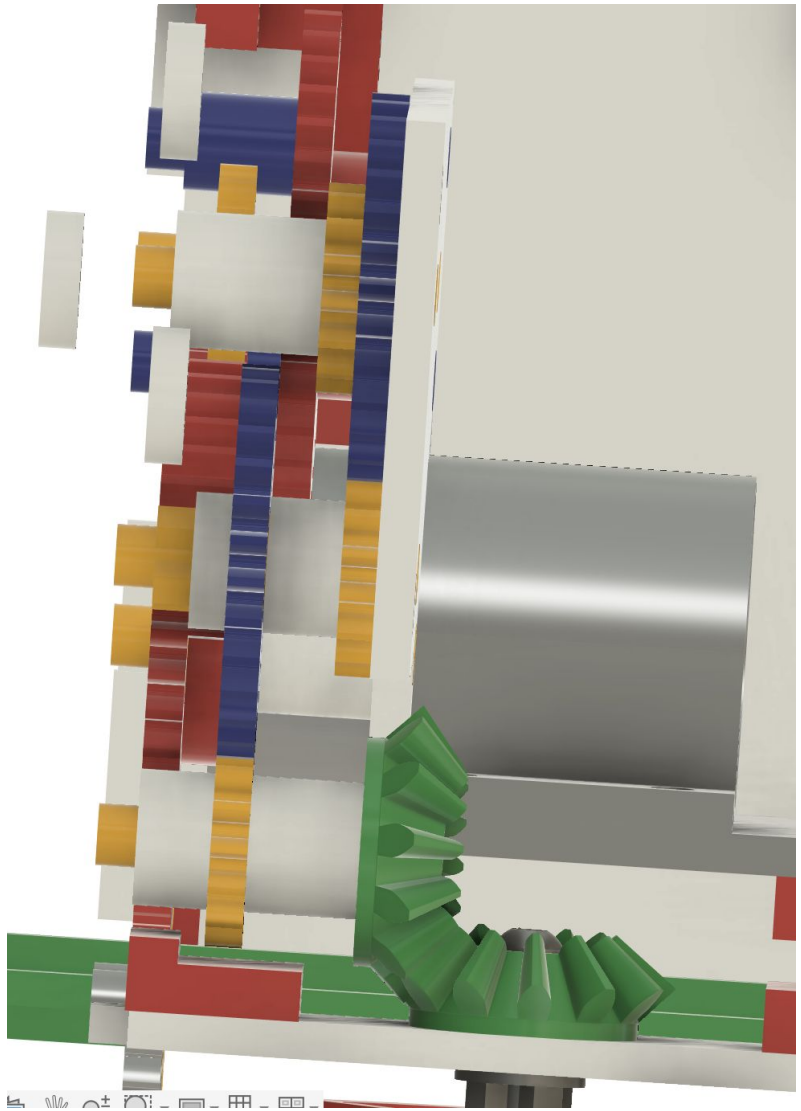




Proposed design —— Connecting mechanisms

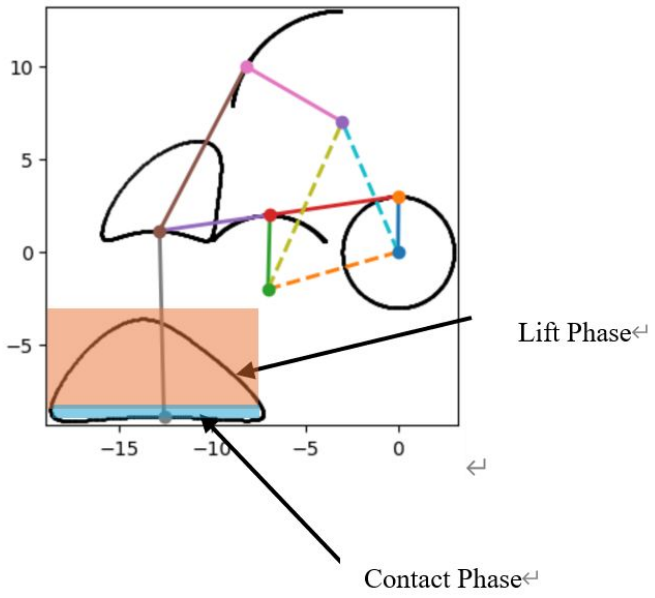
- Partial gears achieve a 40:1 transmission ratio.
- Partial gears and normal gears are stacked to form double-layer gears.
- Bevel gears connect dispensing parts.
- Spacers are used to offset gear positions, saving space.

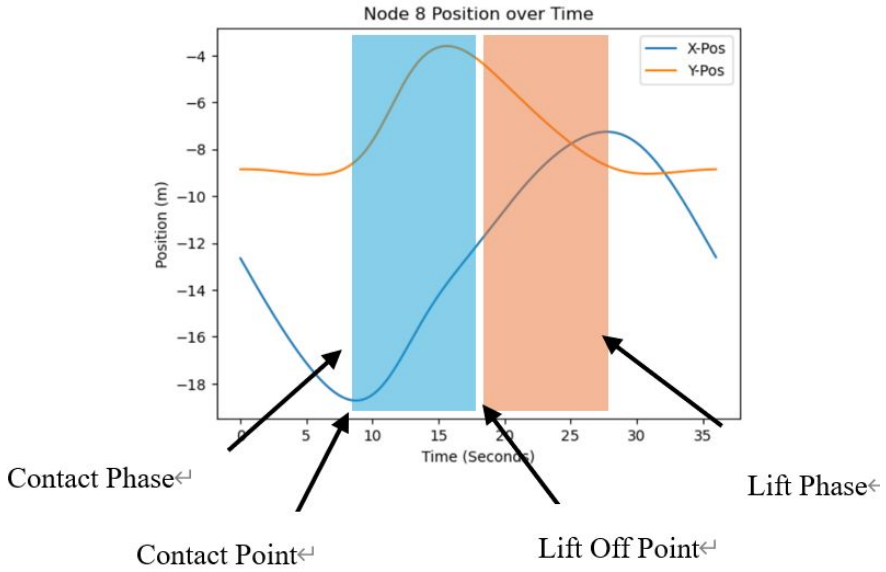




PVA analysis for leg motion, gait, and robot velocity

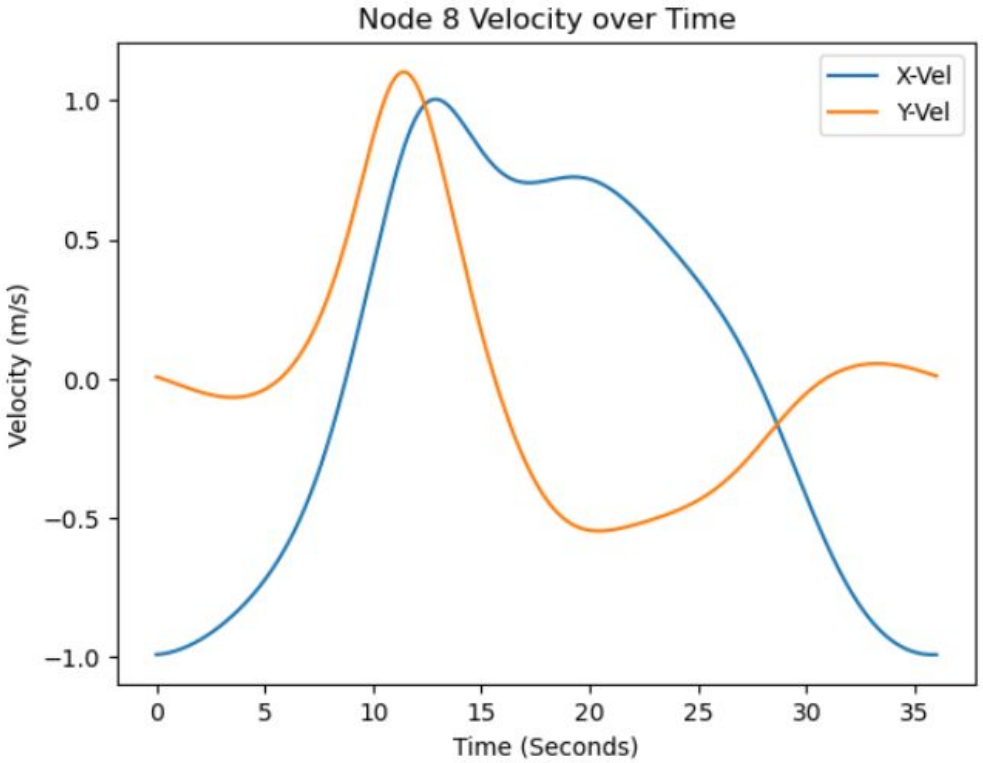
- Leg movement diagram – contact phase and lift phase
- Duty cycle β = 0.5, step size 0.1m
- Alternating landings, each set of legs moving forward in a staggered pattern.

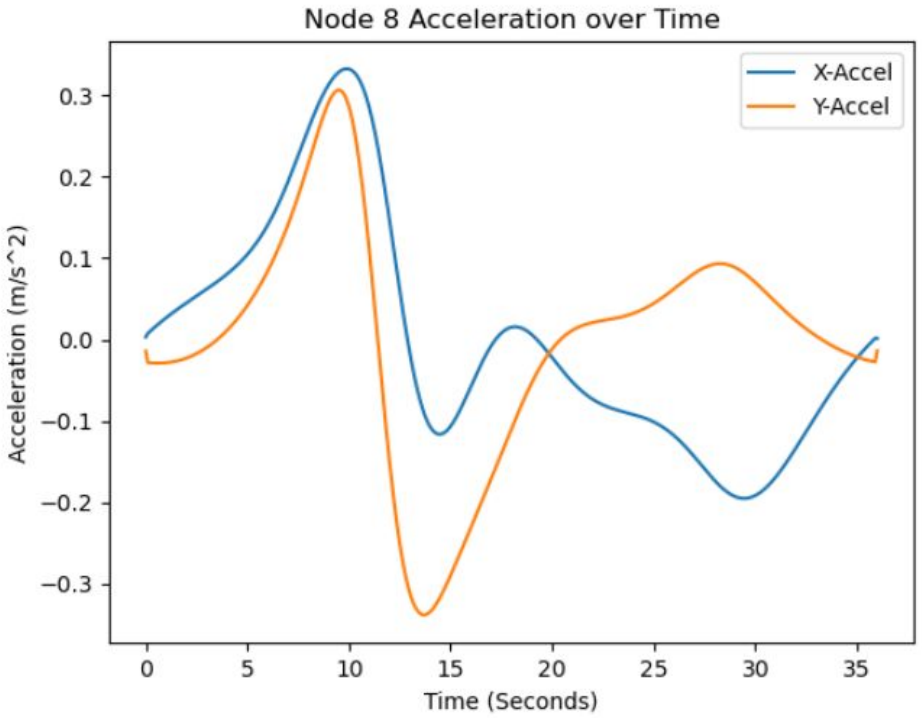




PVA analysis for leg motion, gait, and robot velocity

Image of leg velocity and acceleration

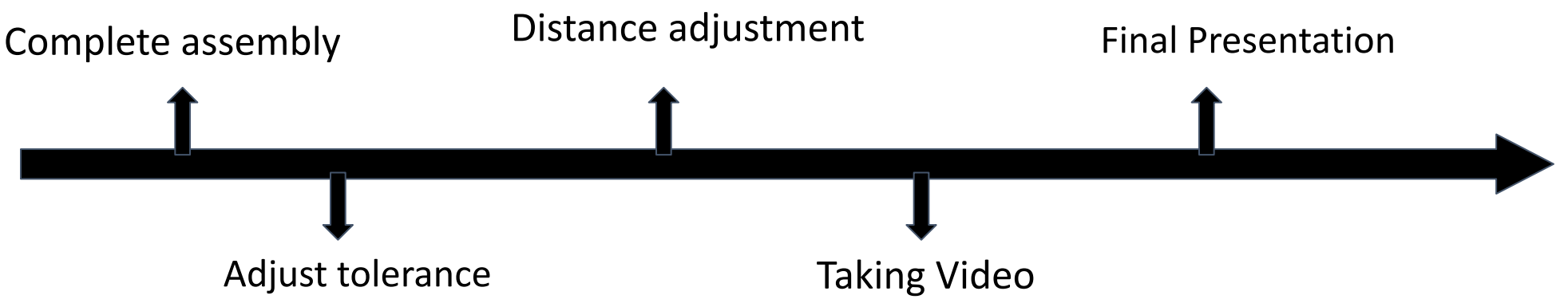




Expense Report

Lab section number, day, time: (clicker on cell to right & select section from drop-down list-click on down arrow in lower right corner)	BB1 (13:00-14:20 W)				Team 48	
Description	Qty/$	Unit Price	Qty purchased	Source(click in space below and use drop-down list)	Purpose	Total Cost
HDRHS M3 x 5	3/$	$0.33	6	Innovation Studio	For assembly	$1.98
Plastic Barrel Fastener, 1/4" L	3 Sets/$1	$0.33	24	Innovation Studio	For assembly	$7.92
Plastic Barrel Fastener, 1/2" L	3 Sets/$1	$0.33	30	Innovation Studio	For assembly	$9.90
Heat-Set Insert M3x0.5	5/$1	$0.20	6	Innovation Studio	For assembly	$1.20
1/8" Acrylic, 12×24“	1/$10	$10.00	1	Innovation Studio	To make board	$10.00
1/8" Acrylic, 12×12“	1/$5	$5.00	1	Innovation Studio	To make board	$5.00
3D Printing (PLA Filament, InnovationStudio)	1g/$0.03	$0.03	40	Innovation Studio	Legs, Pusher, gears, Wheel	$1.20
Manufacturing cost for laser cutting	$0.001/cm	0.001	80	Innovation Studio	Laser cut boxes	$0.08
Manufacturing cost for printing	$0.25/hour	$0.25	8	Innovation Studio	Legs, Pusher, gears, Wheel	$2.00
						$39.28

Future plans

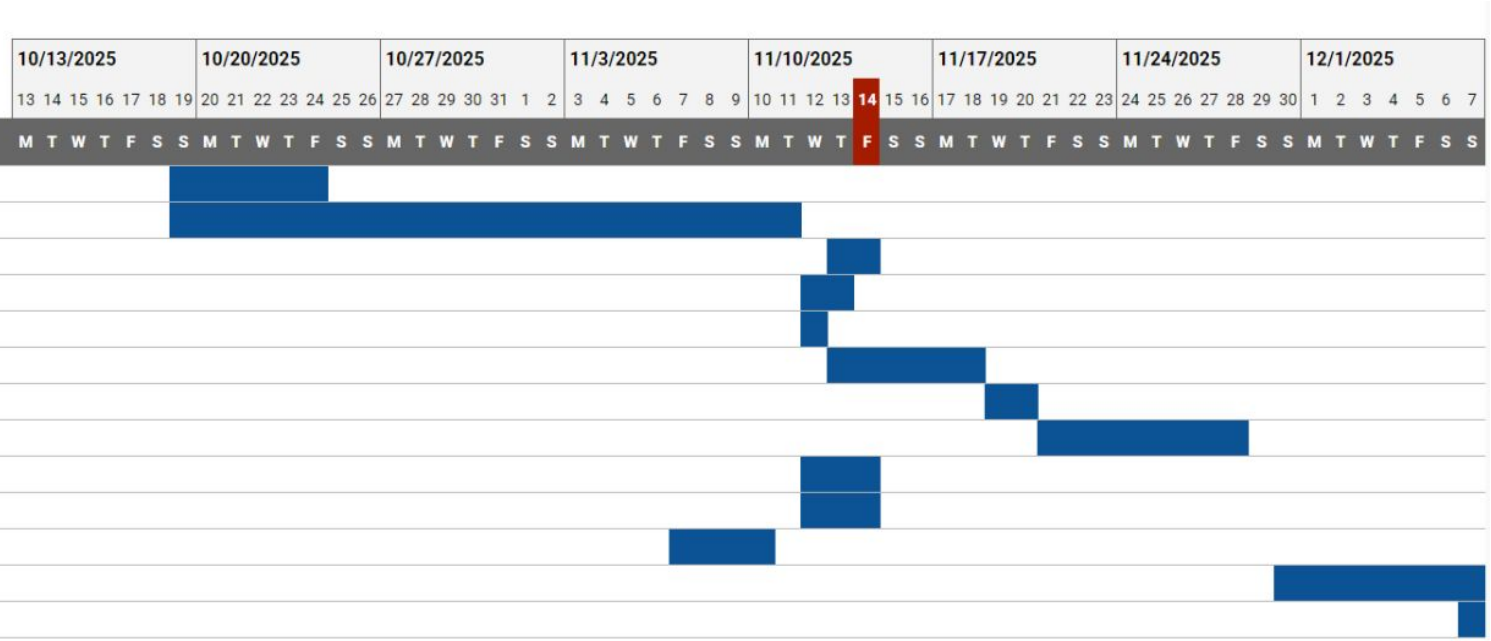


ME370

Project Start: 10/19/2025

Display Week: 1

TASK	ASSIGNED	PROGRESS	START	DAYS	END
Project Idea Brainstorm	Together	100%	10/19/2025	6	10/24/2025
CAD modle design	Together	100%	10/19/2025	24	11/11/2025
Simulation	Daniel, Yuan	100%	11/13/2025	2	11/14/2025
3D printing	Yuan, Bing	100%	11/12/2025	2	11/13/2025
Laser cutting	Daniel, Sebastiar	100%	11/12/2025	1	11/12/2025
Tolerance adjustment	Sebastiar, Bing	70%	11/13/2025	6	11/18/2025
Project 1 and 2 assembly	Together	50%	11/19/2025	2	11/20/2025
Assembly motor	Daniel, Yuan	70%	11/21/2025	8	11/28/2025
Engineering drawings	Daniel, Sebastiar	100%	11/12/2025	2	11/14/2025
Animation	Sebastiar, Yuan	100%	11/12/2025	2	11/14/2025
PVA analysis	Yuan, Bing	100%	11/7/2025	3	11/10/2025
Take the video	Together	0%	11/30/2025	7	12/7/2025
Final Presatation	Together	0%	12/7/2025	10	12/17/2025



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Prototype Demonstration

The Grainger College of Engineering

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