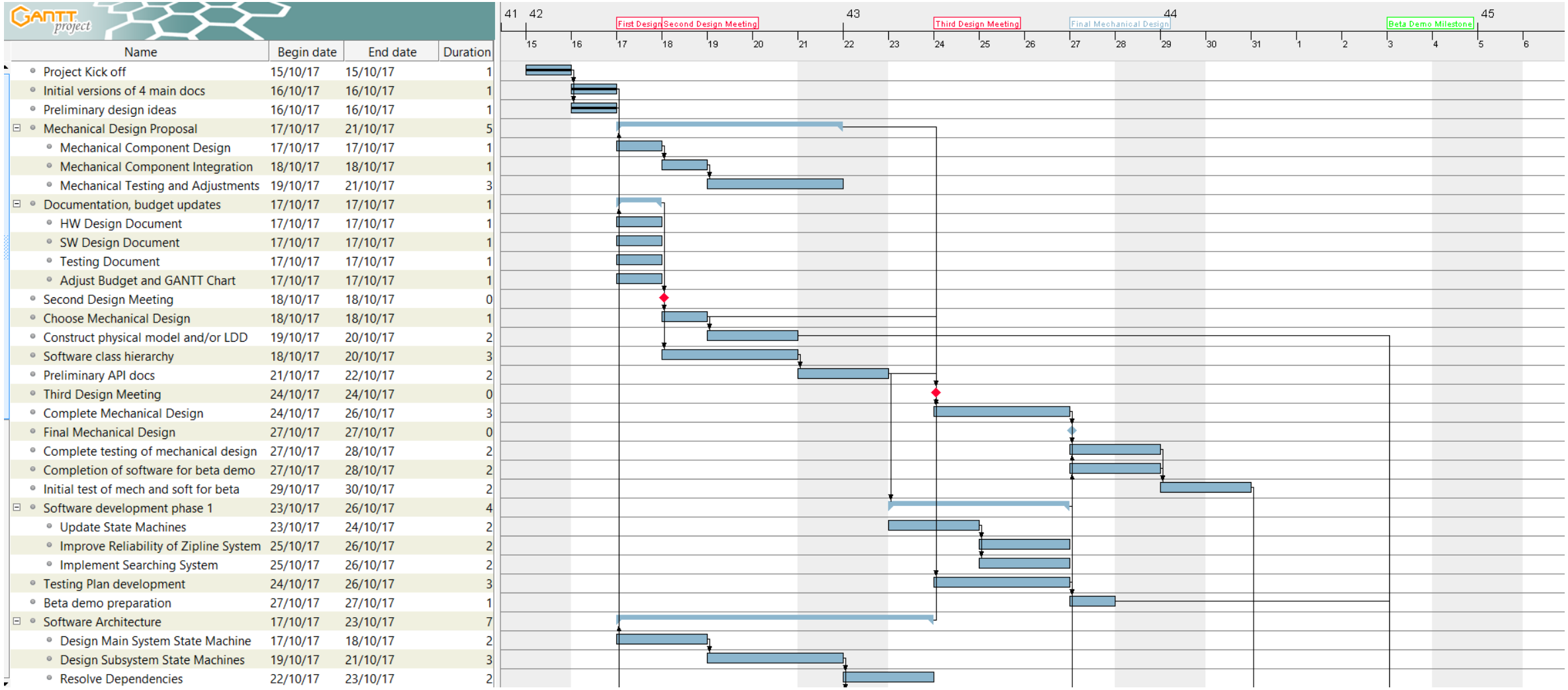
Meeting Two

DPM Final Project
Fall 2017
Team 6

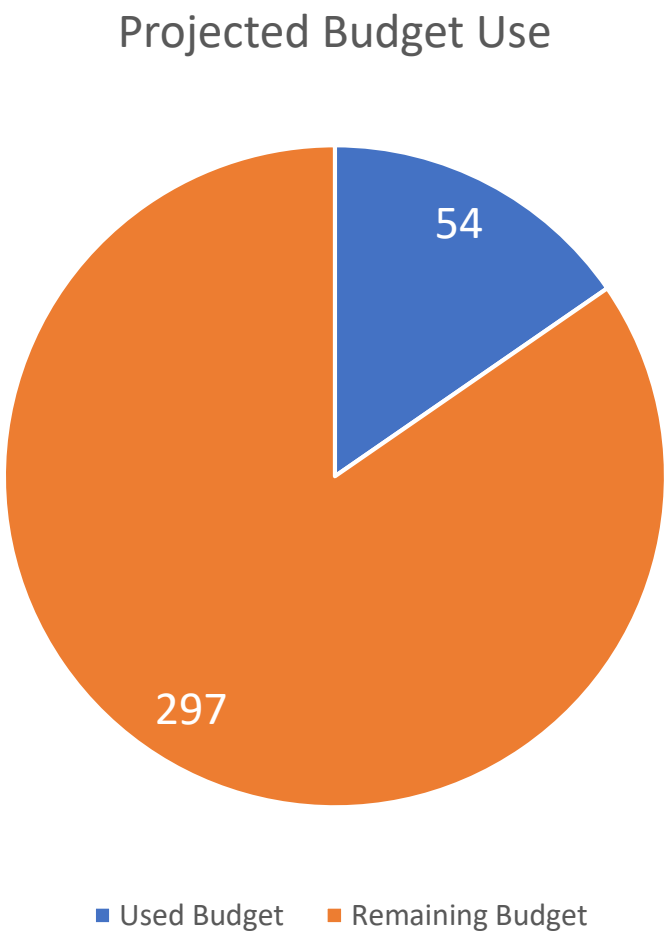
Status updates, mechanical design proposals, and preliminary software architecture

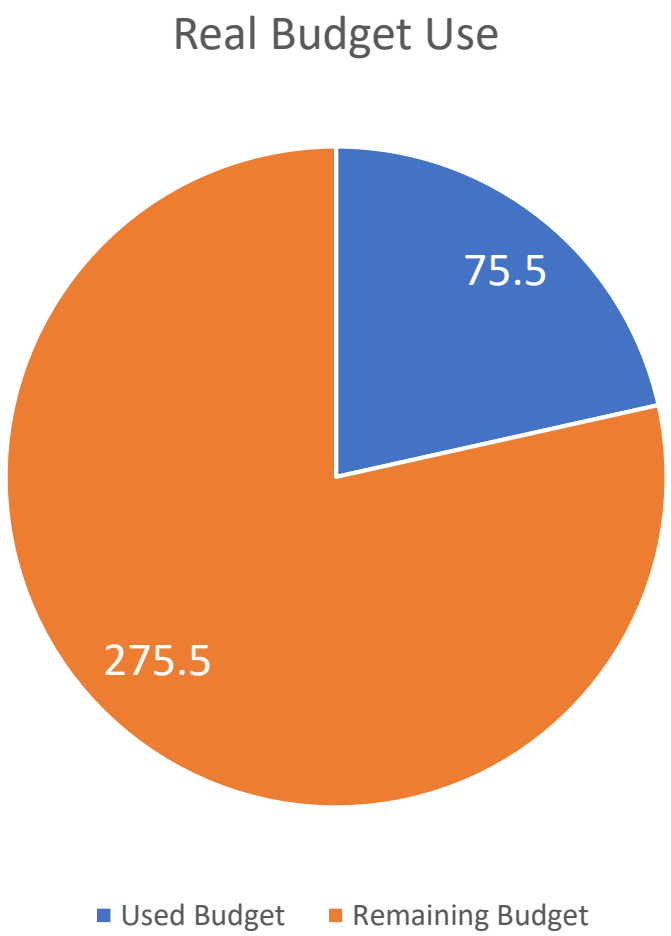
GANTT Chart Update



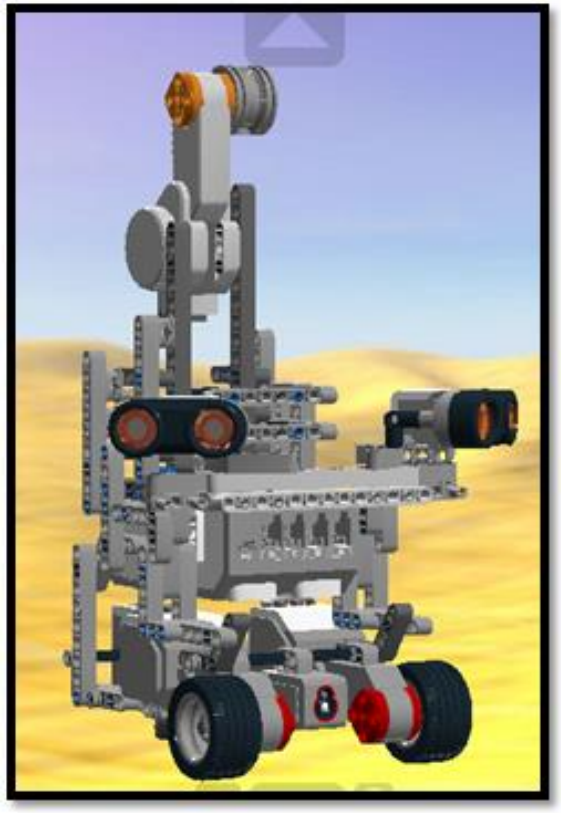
Name	Begin date	End date	Duration
Project Kick off	15/10/17	15/10/17	1
Initial versions of 4 main docs	16/10/17	16/10/17	1
Preliminary design ideas	16/10/17	16/10/17	1
Mechanical Design Proposal	17/10/17	21/10/17	5
Mechanical Component Design	17/10/17	17/10/17	1
Mechanical Component Integration	18/10/17	18/10/17	1
Mechanical Testing and Adjustments	19/10/17	21/10/17	3
Documentation, budget updates	17/10/17	17/10/17	1
HW Design Document	17/10/17	17/10/17	1
SW Design Document	17/10/17	17/10/17	1
Testing Document	17/10/17	17/10/17	1
Adjust Budget and GANTT Chart	17/10/17	17/10/17	1
Second Design Meeting	18/10/17	18/10/17	0
Choose Mechanical Design	18/10/17	18/10/17	1
Construct physical model and/or LDD	19/10/17	20/10/17	2
Software class hierarchy	18/10/17	20/10/17	3
Preliminary API docs	21/10/17	22/10/17	2
Third Design Meeting	24/10/17	24/10/17	0
Complete Mechanical Design	24/10/17	26/10/17	3
Final Mechanical Design	27/10/17	27/10/17	0
Complete testing of mechanical design	27/10/17	28/10/17	2
Completion of software for beta demo	27/10/17	28/10/17	2
Initial test of mech and soft for beta	29/10/17	30/10/17	2
Software development phase 1	23/10/17	26/10/17	4
Update State Machines	23/10/17	24/10/17	2
Improve Reliability of Zipline System	25/10/17	26/10/17	2
Implement Searching System	25/10/17	26/10/17	2
Testing Plan development	24/10/17	26/10/17	3
Beta demo preparation	27/10/17	27/10/17	1
Software Architecture	17/10/17	23/10/17	7
Design Main System State Machine	17/10/17	18/10/17	2
Design Subsystem State Machines	19/10/17	21/10/17	3
Resolve Dependencies	22/10/17	23/10/17	2

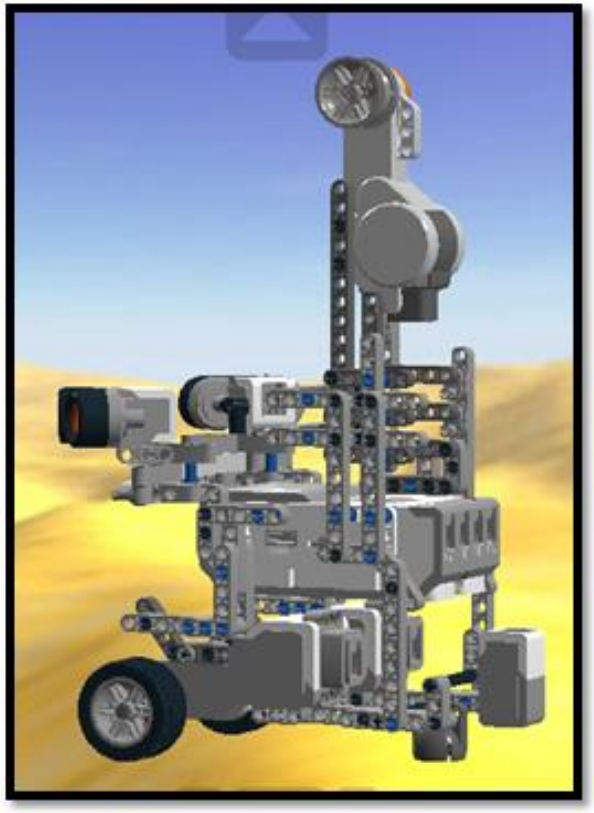
Budget Update





Mechanical Design Proposal – Option 1

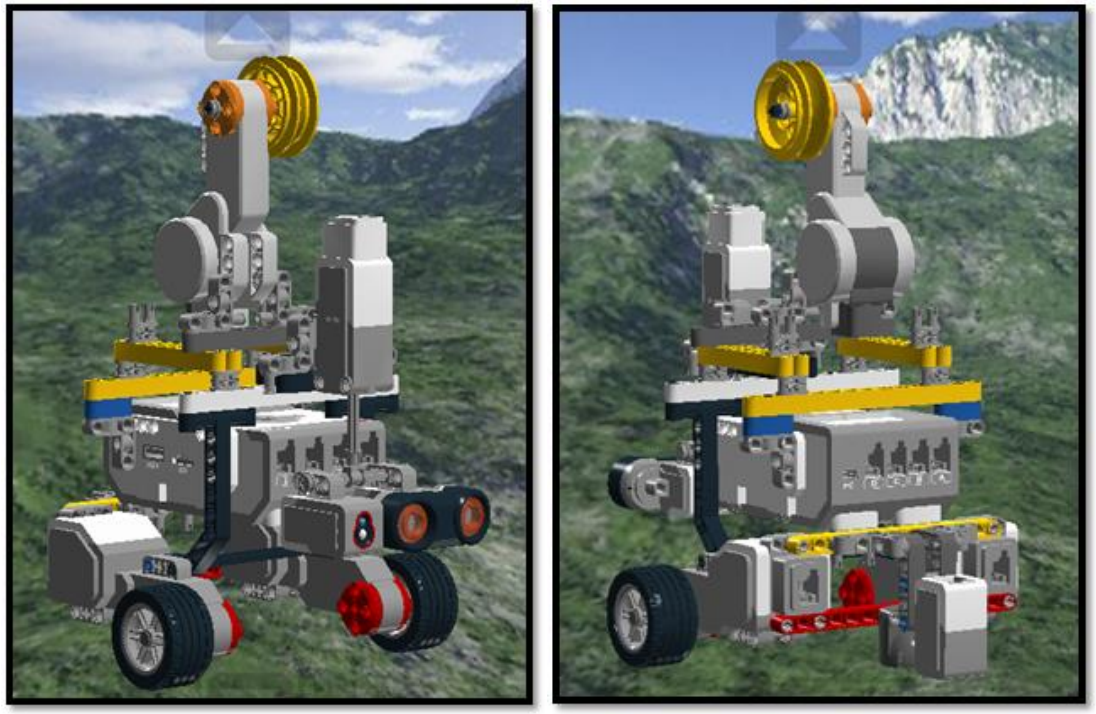




Features
Set two ultrasonic sensors at 45 degrees in front of the robot.
Set one light sensor in front of the robot, between the two ultrasonic sensors, facing straight ahead.
Set the other light sensor as close as possible to the floor on the back of the robot, pointing downward for localization.
Set the EV3 brick horizontally (important for the balance point).
Set the wheels slightly larger than the width of the EV3 brick, with two motors.

PROS	CONS
Can detect a good range of distances since the two ultrasonic sensors are both oriented at a 45 degree angle.	No remaining ports for gyro sensor.
Only three motors; the weight is well-distributed.	Might fail to detect an obstacle at 180 degrees.
	The two ultrasonic sensors might be set too high and give incorrect readings.
	All the sensors are fixed.

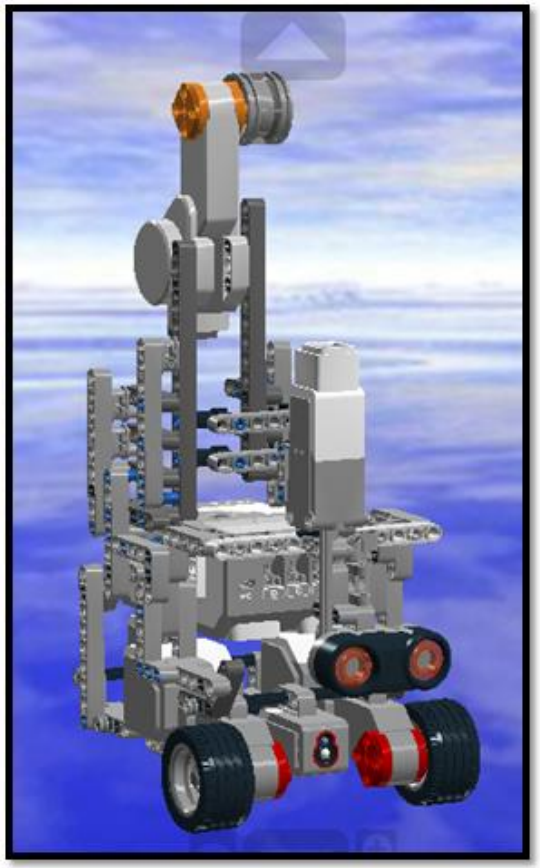
Mechanical Design Proposal – Option 2

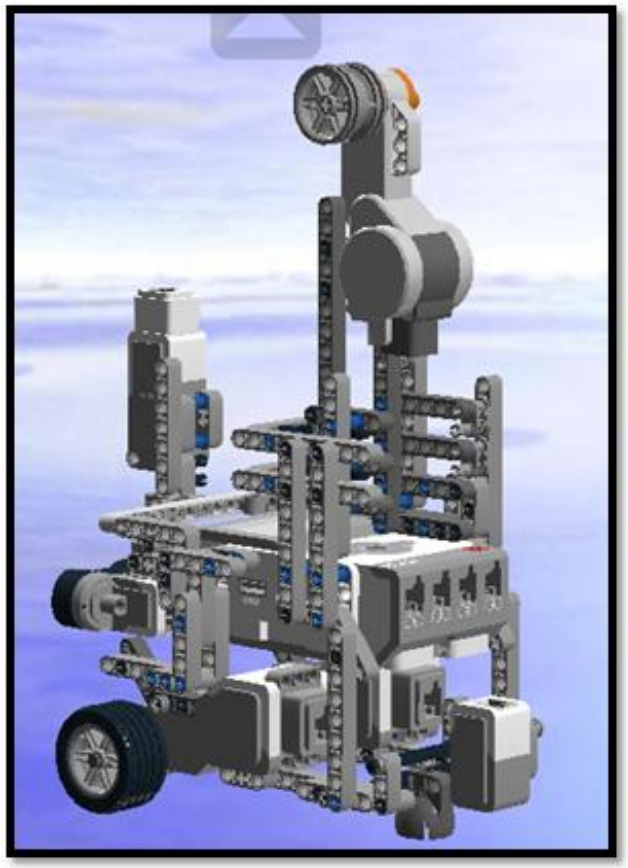


Features
Set one ultrasonic sensor and one light sensors that are pivoting together in front of the robot. Use one medium motor.
Set one fixed light sensor as close as possible to the floor on the back of the robot, pointing downward for localization.
Set the EV3 block horizontally toward the front of the robot to avoid wheel slippage. As a result, we will need to add more weight toward the back for equilibrium. This robot will be heavier than the others.

PROS	CONS
The smallest robot, lower chance to hit obstacles during navigation or localization.	Height is too low.
The lightest robot, less supporting pressure on both motors.	Supporting arm needs revision.
Light and US sensors attached together, more efficient in detecting obstacles and targets.	

Mechanical Design Proposal – Option 3

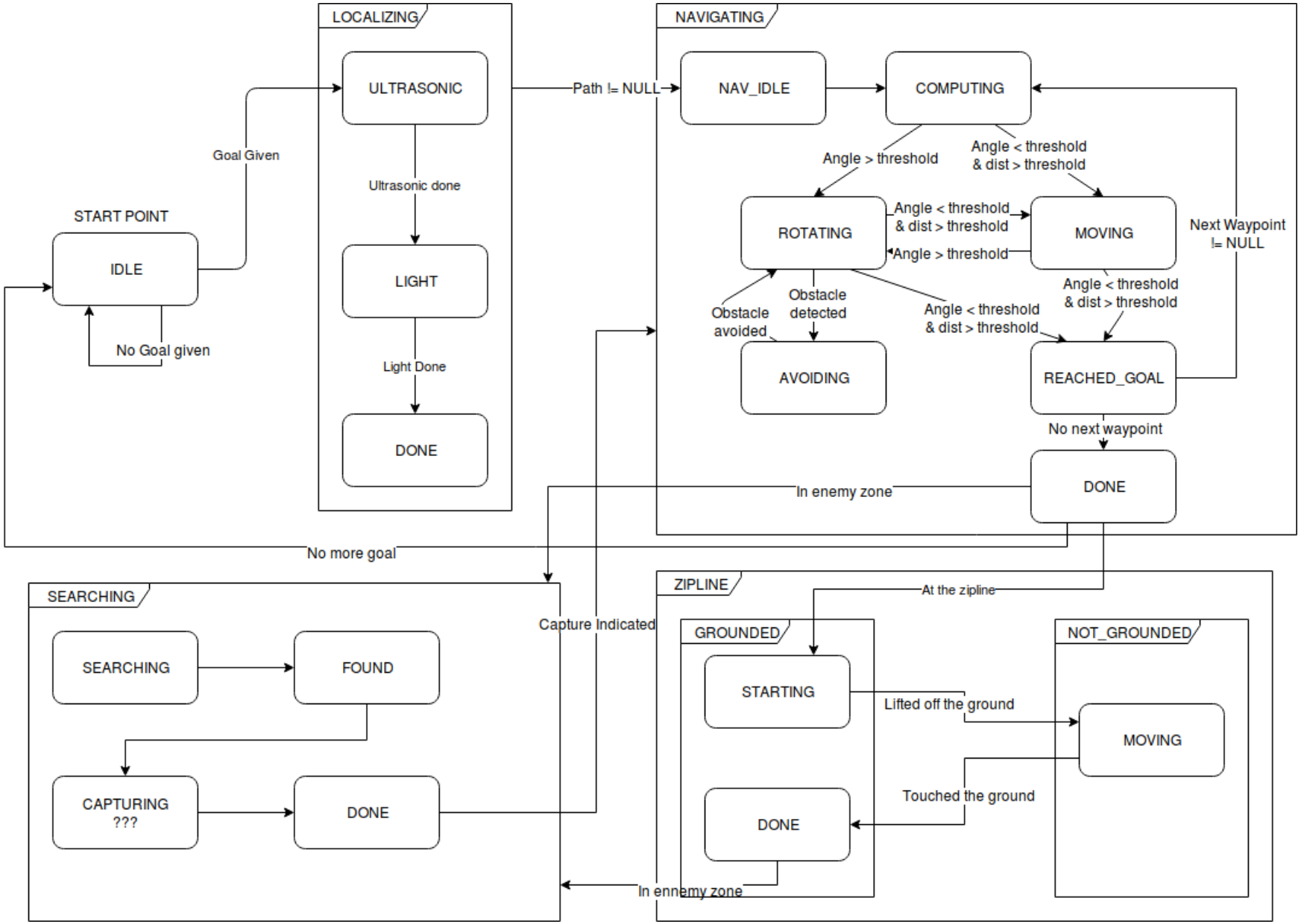




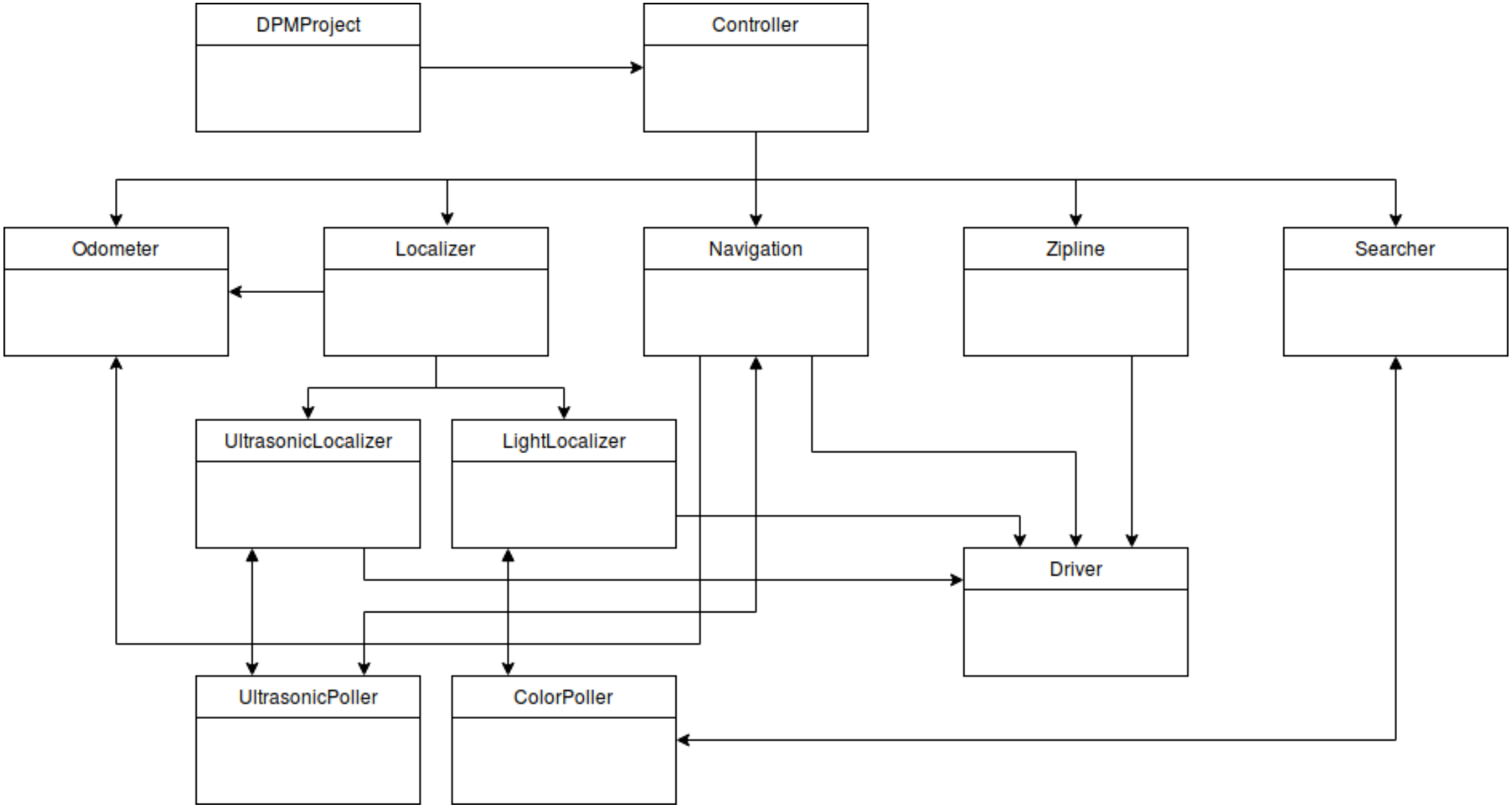
Features
Set only one ultrasonic sensor in front of the robot that is pivoting. We will have to use one medium motor.
Set one fixed light sensor in front of the robot that is facing straight ahead.
Set one light sensor as close as possible to the floor on the back of the robot, pointing downward for localization.

PROS	CONS
Both the ultrasonic and light sensors positioned in front are low enough.	The stability of the arm should be revised.
The ultrasonic sensor can be moved.	The light sensor is not attached to the ultrasonic sensor, so it can't pivot and is less efficient for detecting the object's color.
Simple design, leaves one spare port for the gyro sensor if necessary.	

Software Architecture – State Machine System



Software Architecture – Class Hierarchy



Lab 5 Results and Weekly Plan

- Design presentation (5/5)
  - team successfully answered all questions
- Pose orientation accuracy (0/2.5)
  - robot orientation was greater than 2^o away from zip line axis
- Pose position accuracy (2.5/2.5)
  - robot position reached (X_o, Y_o) within the 2 cm error tolerance
- Zip line traversal (0/20)
  - the zip line wheel was not oriented closely enough with the zip line, giving the robot no chance to mount or traverse the zipline.
  - note: our testing showed that the robot was capable of mounting, crossing, and stopping after dismounting the zipline, but it had no chance to do so in the demo because the robot's localization and navigation were not accurate enough to get the robot to the start of the zip line

Week 2 Plan

- Finish Lab 5 software; prepare documents for team meeting #2
- Test and demo Lab 5; team meeting #2
- Write Lab 5 report; document improvements required after Lab 5 performance
- Test and finalize mechanical design
- Finalize state machine and software structure
- Prepare documents for team meeting #3 (milestone #1)