

EE / CprE / SE 492 - sdmay21-40

Dancing Swarm of Robots

Bi-Weekly Report 3

Feb. 22 - 28

Client: Dr. Akhilesh Tyagi

Faculty Advisor: Dr. Akhilesh Tyagi, Dr. Diane Rover

Team Members

Abdalla Abdelrahman — Meeting Facilitator, Software Engineer

Daniel Nikolic — Test Engineer

Benjamin Schneider — Report Manager, Hardware Engineer

Noah Thompson — Chief Hardware Engineer

Mason Walls — Chief Software Engineer

Cole Weitzel — Meeting Scribe, Software Engineer

Weekly Summary

During this one-week cycle, we made progress on the first version of our follower algorithm. This version is centered around a lead robot only moving forward without turning while stopping at random points for random amounts of time. This allows us to test follower movements in one dimension and evaluate the accuracy of their movement decisions. Once this algorithm is finalized, differential steering will be implemented to allow for formation movement behind a turning leader. Some adjustments to the lead robot's geometric model were also made to allow the reflector cylinder to be detected by each follower robot's distance sensor. Lastly, we completed and gave our first PIRM presentation.

Past Week Accomplishments

- Successfully completed 1st PIRM presentation
- Implemented first version of our straight-line follower movement algorithm

Pending Issues

- A potential issue within WeBots when switching between repo branches was identified. In some cases, device node IDs between a robot's child nodes and the robot's controller become unlinked. The issue seems to occur every time different branches are checked out locally.
- Our follower algorithm is still relatively generalized. It will require adjustments in order to fully incorporate it into our WeBots simulation, since we are most likely not going to do a hardware implementation for this project due to lab shutdowns.

- Since we are only pursuing a simulated model for the time being, we are integrating artificial limits for the minimum time needed to perform basic robot operations such as scanning with the distance sensor.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Abdalla	<ul style="list-style-type: none"> - Debugged errors within original follower algorithm (No longer being used, instead we will be using Mason's algorithm) with Daniel - Walked through current design and identified potential errors - Brainstormed with Daniel on how to allow the leader to move in tune to a media player (Use of LM393 Sound Detection sensor) 	5.5	11
Daniel	<ul style="list-style-type: none"> - Brainstormed with Abdalla on allowing the leader robot to move in tune with a media player - Tested some aspects of the follower algorithm 	4	9
Benjamin	<ul style="list-style-type: none"> - Made 2nd draft script for PIRM presentation - Assisted Mason with first version algorithm - Cleaned up unused controllers on repo 	7	23.5
Noah	<ul style="list-style-type: none"> - Tested different speeds for sensor sweeps - Tested movements in webots 		
Mason	<ul style="list-style-type: none"> - Created basic flock movement in Webots - Fixed leader bot model to allow for detection - Experimented with different bot and scan speeds for flock 	4	10
Cole	<ul style="list-style-type: none"> - Worked on creating a controller for the leader - Worked on follower movement controls 	3	12

Plans for Coming Week

- Abdalla
 - Meet With Mason/Noah to see how to further assist in follower algorithm
 - Identify if the LM393 Sound Detection sensor can be implemented within WeBots
 - Start implementing sound detection within WeBots
- Daniel

- Implement sound detection for the leader robot within WeBots
- Conduct more thorough testing of the follower algorithm
- Benjamin
 - Investigate device node ID issue
 - Continue work on straight-line algorithm
 - Test hardware limitations of geometry models for algorithm specifications
- Noah
 - Work on algorithm for turning/turn detection
- Mason
 - Start formulating and implementing an algorithm for turning
 - Calculate delta distance for followers
- Cole
 - I will continue working on implementing a follower movement algorithm and working on the controller for the leader robot. I plan to do some testing/experimenting if we can maintain our original margin of error of about $\pm 10\%$. This will depend on certain fundamental constraints of the WeBots platform.

Summary of Advisor Meeting

--Meeting with Professor Tyagi on 2/25/2021:

Discussed changes to the git repo.

Discussed margin of error of the follower robots. We need to do some calculations and experiments to determine if we can accurately keep a 10% margin of error, or if there are certain factors about the WeBots platform that will limit our algorithm, and require us to increase the margin. Below is a screenshot of our preliminary follower algorithm in use:

