

EE / CprE / SE 492 - sdmay21-40

Dancing Swarm of Robots

Bi-Weekly Report 2

Feb. 8 - 21

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 cycle, we finished off the basis of our simulation platform and finalized our plans for the semester. Since lab availability is still very limited, we will most likely not be building a hardware implementation for our project. Instead, our project will be fully simulated in the WeBots software suite.

As of this week, we now have models of all three participant robots (two followers and a leader) modelled in our simulation. These models have independent controllers which can be catered to the participants' individual roles. With these models, we can now begin implementing our prototype movement algorithm on the simulated environment. On the administrative side of things, the first draft of our PIRM presentation was completed.

Past Week Accomplishments

- Completed geometry models for both the two follower and the leader robots
- Repaired controller bugs with device node ID references
- Built a small-scale external simulator for a preliminary design of our algorithm
- Began work on our PIRM presentation for Feb. 23rd

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 was resolved for now, but it may be a recurring problem later on.

- 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 may need to add artificial handicaps to the system to more accurately replicate the behavior of hardware components. For example, simulated distance sensors can perform scans as quickly as the simulation can render them, up to several thousand times a second. The sensor we are modelling has a sampling cap of 100 Hz, so some sort of delay will be needed to create an accurate simulation.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Abdalla	<ul style="list-style-type: none"> - Followed up with ETG about lab openings - Incorporated Ben's WeBots simulation - Started developing algorithm to have follower sensors detect distance from leader - Attempted to further develop Follower Algorithm 	4.5	5.5
Daniel	<ul style="list-style-type: none"> - worked in WeBots to further develop the follower algorithm - discussed tools needed to improve the simulation 	4	5
Benjamin	<ul style="list-style-type: none"> - Replicated simulated prototype design in WeBots to model the second follower robot - Built leader robot model with a cylindrical reflector to be more easily seen by followers - Fixed invalid node ID error on follower controllers - Built individual controllers for each follower and leader - Added geometry node to show a line through the LiDAR sensor's FoV for each follower 	15	16.5
Noah	Worked with Mason, discussing follower controller routines as well as discussing scans, distance, angles, etc.	4	6
Mason	Started work on implementing follower controller code. Working on follower distance calculations, as well as scan area.	5	6
Cole	Continued work on the 2D design to test the follower movement. Worked on the powerpoint for the in class presentation on 2/23/2021. Started working in WeBots on follower movement.	6	9

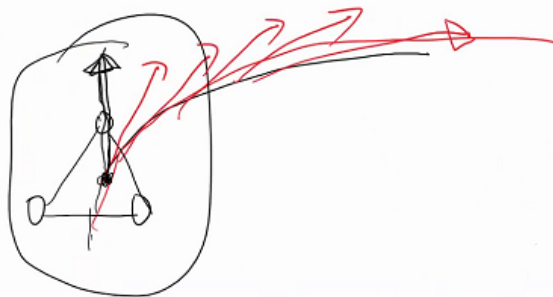
Plans for Coming Week

- Abdalla
 - Add distance recognition code to the controllers in Benjamin's Simulation
 - Continue working on algorithm for followers to detect leader movement
 - Identify a way to allow leader movement to be controlled by music
- Daniel
 - Continue working on follower algorithm
 - Testing the entire framework to ensure the robots move according to their required path
- Benjamin
 - Finalize robot geometry models
 - Clean up unused controllers in repo
 - Test hardware limitations of geometry models for algorithm specifications
- Noah
 - Simulate multiple robots in one setting
 - Have multiple robots run independently in a "flock" setting
 - Expand upon movements and angle maintenance
- Mason
 - Import two follower model
 - Program separate controller code for each bot
 - Run and test basic movement of flock
- Cole
 - Convert my follower movement code from my 2D simulation to the WeBots platform
 - Work on the leader controller to get keyboard input from the user.
 - Start testing the follower movement

Summary of Advisor Meetings

--Meeting with Professor Tyagi on 2/11/2021:

It looks the labs in coover will not be open for our team to use, so we will continue with our plan to implement our project with the WeBots simulation program. We also discussed some of the technical movements of our robots and how the followers should move with the leader. This picture was drawn as an example of how the followers should turn when the leader turns:



--Meeting with Professor Tyagi on 2/18/2021:

Discussed progress so far. Adjusted original timeline of the project. Just started working on the follower movement in WeBots. For the month of March, we will implement the follower movement. By late March, we will start testing the overall design. Early April we want to start working on finishing touches and writing reports and making our final presentation.