

ENGN1735 Active Particles Group Contract
Sarah Nguyen, Helen Primis, Andrew Mombay, & Kaya Bruno
Mentor: Jack-William Barotta

Communication

Team Member Contact Information

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Our primary internal form of communication will be iMessage. This will be used to communicate between the four students on a regular basis to ask questions, provide updates, and schedule meeting times. We will communicate with Jack through the Slack channel and schedule meetings via Google Calendar to make sure that all 5 of us are available. Team members should check iMessage and Slack at least once a day and keep their notifications on. Responses should be made in a timely manner upon seeing a message with a maximum response time of 24 hours. We want to be respectful of Jack's time, Professor Harris' time, and of each other. We will create a shared Google Drive folder to share documents, updates, and prepare presentations. The folder will serve as a one-stop-shop to keep track of the progress of our project.

Making Decisions

To make decisions, we will decide based on group consensus following thorough research and holding thoughtful conversations. We will operate as a democracy and treat everyone equally and with respect such that we can facilitate fair discussions and come to a reasonable solution for all issues we encounter. Regarding the content of the presentations and other documents, we will generate a framework of details we think are important to include before narrowing down to generate both brief and informative documentation for our project elements. This will be done through working with one another and having discussions with our mentor, Jack, on what he believes would be most important to include. Following talks with him, we will likely turn to TA office hours so we can best refine our presentation structure.

Team Participation

To ensure cooperation and equal distribution of tasks, we will discuss and write up outstanding tasks during our group meetings and keep track of workload that each member takes on. To ensure our team stays on track while working on the project, each task will have a deadline that is agreed upon by the team. For attendance of group meetings, we plan to meet once a week for one hour, at a time determined by our when2meet. This time will be agreed upon after our first meeting this Thursday, October 7th. If a member needs to miss a meeting, they should notify the rest of the team two days in advance. Since the meetings are virtual, team members should be on time to each meeting. To keep track of responsibilities for assignments, timelines, and deadlines, we will create a shared folder that includes a document with all assignments and

their respective deadlines. This will also include each team member's role with respect to each task.

Conflict Resolution

It's foreseeable that we may run into scheduling conflicts that might lead to shifting responsibilities during the semester. Whether it's illness or parts of the project taking longer or being harder than expected, we agree to step in and help one another when possible. Asking good questions and challenging each other to optimize our group performance is especially key in this. In addition, it is likely that we may become burnt out or overly frustrated with components of the project that are proving difficult to resolve and thus, we believe that taking a step back from the task at hand and taking a higher level view of the problem will allow us to reduce the risk of burnout. Being compassionate and helpful to one another is the primary way we hope to work as a team so we can best support each other and lean on one another when challenges arise.

Anticipated Roadblocks and Solutions

Throughout our project, we will face and endure many challenges. Two main challenges we identified would be experimental challenges and data processing difficulties. As our project focuses on the collective behavior of active particles using Hexbugs, the Hexbugs themselves may give us some trouble, as their intended purpose is not for scientific research. There are many sources of error due to this, as the longer we use them, their behavior may change due to a lower battery level and general wear. To attempt to circumvent this, we will try to ensure that the battery level is at an acceptable level and record any inconsistencies otherwise. We will also continue to monitor the general condition of the Hexbugs and note any changes to their condition. Another roadblock we may encounter is the data processing itself. As there are many moving parts to our experimentation, collecting all the different aspects of the experiment will be difficult, as there are too many variables to record ourselves. To solve this problem, we plan on using image processing software to track and collect all of our data. As there will be many more unexpected problems as we complete our project, we will work as a team to brainstorm and overcome any challenges at hand.

Project Goals

- Predict and tune collective behavior of coupled active particles using hexbugs as an example
- Examine the role of synchronization and sustained oscillations in elastic networks
- Study and possibly design spring linkages in self-propelled particles
 - Attempted to understand coupling equations which govern the active particles that are linked together
- Harness understanding of coupled active particles to accomplish tasks

Team Roles

Helen: hardware, MATLAB, data processing/assimilation, report writing

Andrew: hardware, MATLAB, Python, prototyping, mechatronics

Kaya: hardware, CAD, reporting

Sarah: hardware, MATLAB, python, data processing