**Proposal for MSE Capstone Project**

**Project Title: A Testing Tool for a Swarm Simulator**

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**Faculty Advisor: Dr. Mathias**

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**A Testing Tool for a Swarm Simulator**

# Objective

The aim of this project is to develop a desktop application that can interact with an existing swarm simulator and allow users to generate both swarms and data about their swarms.

# Background

This project originated from a larger project that focused on the development of a frontend tool to simulate swarm behavior. Previous iterations of this tool were focused on simulating physical agents and how they could solve a simple tracking problem. The most recent version of this tool simulates how well a group of agents can meet the demand of a variable number of tasks. The goal of all these tools is to find a way of describing a swarm that can address various tasks efficiently. The swarm should be able to adapt to a shift in demand from one set of tasks to another. This project will be primarily concerned with developing a tool to use the most recent simulator that supports variable tasks. The tool takes user input in a text file and generates demand based on predefined functions. Once the simulation is complete, a variety of data is generated that describes how the swarm behaved, performance of the swarm, and individual agent activities. This data is represented to a user through text files and PDF files of graphs.

This project aims at developing a tool that will interact with a modified version of the variable task swarm simulator. This program will allow a user to define their own tasks and relationships between tasks in a user interface. This program expands on the functionality of the previous simulator by offering both custom demand and relationships between tasks. The user will also be able to specify swarm size and behavior such as task selection. This program will run the simulation and then output visual representations of the swarm’s behavior and performance. A user will be able to save swarm simulations to improve their understanding of how changing certain aspects of a swarm can improve its efficiency.

# Current Project

The current project focuses on developing a tool that would allow someone with basic or advanced knowledge to develop a swarm that can efficiently satisfy one or more tasks simultaneously. Users of this tool can create and save swarm trials in the process of developing swarms that perform well. The tool must meet the following requirements:

* The user must be able to specify one or more tasks that the swarm must address. This can be a simple as selecting a predefined demand profile, or as complicated as a custom function that takes into account the demand of another task.
* The tool must use a database that will store all information on a swarm simulation.
* The user should be able to use values from a previous swarm simulation to construct a new simulation
* The tool should be able to show the user the demand profiles that it generates.
* The results of the simulation should be easy to understand.

# Challenges

The following are some of the challenges in this project:

* Custom demand functions entered by the user must be checked for validity and represented in the simulation.
* Functions that are dependent on other functions could create a cycle of dependency.
* It will be challenging to find an internal representation of the demand profiles that are generated so that they can be displayed to the user.
* Developing a user interface that is understandable for users with little or no experience developing swarms, while still supporting advanced swarm tuning will be difficult.

# Project Schedule

The following schedule is proposed by the student.

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **From** | **To** | **Credits** |
| Develop requirements document and problem analysis | Mar 01, 2022 | Apr 30, 2022 | 3 |
| Develop first prototype | May 01, 2022 | Jul 30, 2022 | 3 |
| Develop second prototype | Aug 01, 2022 | Nov 30, 2022 | 3 |
| Refine and test | Dec 01, 2022 | Jan 31, 2023 | 2 |
| Demonstration and project report | Feb 01, 2023 | Mar 31, 2023 | 1 |

Total: 12

# Resources

The student will use his personal computer and the compute server to complete the project.