***Honours project interim report***

**What is my project?**

For my Honours project I have decided to create a robot controller for a swarm of robots that will collaboratively complete an assigned task such as moving a box from point A to point B.

**What is swarm robotics?**

“Swarm robotics can be defined as the study of how a swarm of relatively simple physically embodied agents can be constructed to collectively accomplish tasks that are beyond the capabilities of a single one” - Sahin, E., Spears, W., & International Conference on Simulation of Adaptive Behavior. (2005). Swarm Robotics SAB 2004 International Workshop, Santa Monica, CA, USA, July 17, 2004, Revised Selected Papers (1st ed. 2005. ed., Theoretical Computer Science and General Issues ; 3342). Berlin, Heidelberg: Springer Berlin Heidelberg : Imprint: Springer.

**What are collaborative and cooperative swarms?**

**Why use and EA and NN? (other options considered)**

The three options I considered for completing this project are:

* One central control robot and keep track of the robots:

This solution, though it would be the easiest to implement presents the issue of having a single point of failure, and having almost all the decisions made on one machine which means that it would have to be much more powerful than if the processing workload was split among the individual robots in the swarm. It dramatically hinders the scalability of the swarm.

* Finite state machine controlled by a neural network trained by an evolutionary algorithm:

In this option the states would have to be hard-coded, and the neural network would take the inputs from the robot’s surroundings and use those to decide what state the robot(s) should be in.

* Neural network controller trained by an evolutionary algorithm:

This is where the robot uses a neural network to take the inputs from the environment and maps them directly as the speeds to set the wheels at. This approach will take a lot of training for the EA and NN

**What have I done so far?**

In my project so far, I have learned how to use the WeBots simulation software, write controllers for robots in Python, how to write an evolutionary algorithm and how to build neural networks using the numpy library in Python.

**What am I planning on doing and how?**

I am planning on writing a finite state machine for a swarm of e-puck robots, controlled by a neural network that will be trained by an evolutionary algorithm.