Last modification: April 3, 2023

RBE595/CS525: Swarm Intelligence
Spring-Term 2022/2023
Homework 9

Exercise 1: Threshold Model

Implementation [50 Points]

Goal. Your goal is to implement the threshold model of Theraulaz *et al.* we saw in Lecture 15.

Project files. The project is composed of five files:

1. `threshold_model.bzz` is the script you must implement
2. `threshold_model.argos` is the ARGoS configuration file for the experiment
3. `threshold_model.h` is the header file of the loop functions
4. `threshold_model.cpp` is the implementation file of the loop functions
5. `CMakeLists.txt` is the CMake configuration file to compile the code

Compiling the code. To compile the code, do the following:

```
$ cd RBE595CS525_HW9
$ mkdir build
$ cd build
$ cmake ..
$ make
```

Running the code. To run the code, make sure to be in the `RBE595CS525_HW9` directory and type

```
$ argos3 -c threshold_model.argos
```

About the parameters. The formulas we saw in class depend on a number of parameters. The values of these parameters are the same as in the original paper, and you are not required to change them to get full credit. You can play with these values if you think it's interesting.

About the loop functions. In your final project, you'll need to write some loop functions to interact with the simulation (e.g., get values from the controller and save them in a data file). You are encouraged to read the loop functions provided in this project, because they are a pretty good starting point for your work. The main files to check are

- loop_functions.h
- buzz_loop_functions.h
- buzz_loop_functions.cpp

The files are thoroughly commented. Ask questions if you have any doubt.

Analysis [50 Points]

Main goal. Reproduce the graphs at slides 17–19. Can you observe specialization?

Getting the data. The loop functions are designed to create a data file that contains the following columns:

- Time step
- Robot id (numeric)
- Task id in which the robot is engaged
- Threshold of the robot for task 0
- Threshold of the robot for task 1

By default, the data file name is `data.dat`. You can change it by modifying line 95 of `threshold_model.argos`.

Deliverables

The usual deliverable instructions: submit an archive called `LastnameFirstname.zip` with the following structure:

```
LastnameFirstname/
  report.pdf
  threshold_model.bzz
  <any other file you wrote that is required to execute your script>
```