



# WPI

## Swarm Intelligence Homework 10

### Exercise 1: Threshold Model

#### Implementation [50 Points]

**Goal.** Your goal is to implement the threshold model of Theraulaz *et al.* we discussed.

**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

**Update Buzz.** I made a small compilation fix that required updating a CMake file in Buzz. Update Buzz as follows:

```
$ cd ~/WPI_SwarmIntelligence/Buzz
$ git pull
$ cd build
$ sudo make install
```

The only file that changed is `src/utility/BuzzConfig.cmake`, which is used when you want to use CMake to compile Buzz scripts.

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

```
$ cd RBE511_HW10
$ mkdir build
$ cd build
$ cmake -DCMAKE_BUILD_TYPE=RelWithDebInfo ..
$ make
```

**Running the code.** To run the code, make sure to be in the RBE511\_HW10 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 might 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.** Run the code and try to reproduce the graphs at slides 17–19. Can you do it? Can you observe specialization at all?

**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 104 of `threshold_model.argos`.

## Deliverables

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

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```

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