

Outreach Module User Guide

This guide serves as an overview and user guide for the Swarmathon NetLogo outreach modules. The modules follow a five part progression and include all of the documentation and NetLogo code files you need to get started.

The download section in the Swarmathon outreach web page (<http://nasaswarmathon.com/outreach>) contains links to five different NetLogo Modules. Each module contains several files outlined and explained below, but the primary activity is the module walkthrough that is a self contained activity that walks students through the coding of a complete agent based model with concepts and lessons directly related to the NASA Swarmathon.

Module Contents

When you download a module it will contain the following files:

1. **Walkthrough** - This is the primary document most outreach environments will be interested in. This is the same document as the project specs, but it includes significantly more explanation and code examples and does not assume that a student has previous experience with NetLogo.
2. **Student Code** - The student code is the NetLogo base code that the student will open in NetLogo to start a module. When appropriate for the module, it will contain some skeleton code and lots of comments with explanations that coincide with the project specs and walkthrough documents. Note: some modules contain image files that will be loaded into the module. These are required in addition to the student code.
3. **Images** – The modules have Mars.jpg or parkinglot.jpg images that need to be in the same directory as the Student Code in order for the simulation to run.
4. **Setup Files** – Some modules have .nls setup files that need to be in the same directory as the Student Code in order for the simulation to run.

Additionally, there is a sample Instructor Code file available by request for Modules 1 and 2. The instructor code is an answer key that contains a completely coded example of the module. Students should not be given access to this file. If the modules are taught as a lesson in a course, instructors can use this code as a grading key. Student code need not match the instructor code precisely, but it is a good guide.

Using the Modules

The following are recommendations for using these modules in a series of workshops to prepare high school students to participate in the high school NASA Swarmathon Netlogo competition.

We recommend that Netlogo be installed on computers (PC, Mac or Linux) in advance, and that students work on these activities in pairs (alternating which person codes and which person guides the coding verbally).

I. Module 1: Foraging Intro

A single 1-2 hour workshop along with a basic introduction to the Swarmathon Competition.

II. Module 2: Direct Recruitment

A single 2-3 hour workshop, complete module 2 as a walk through while also engaging students by having them code on their own and discuss NetLogo programming basics.

III. Module 3: Stigmergy

A single 2-4 hour workshop. This is a larger workshop that may take one or two sessions to complete. This module incorporates more advanced NetLogo programming topics than Module 2 as well as topics in Biology.

IV. Module 4: Swarmathon 1

A single 2-4 hour workshop. This is also a larger workshop that builds upon all of the lessons learned in the first three modules. This is a good place to review NetLogo programming concepts introduced in the other modules so that they can be applied in the next module.

V. Module 5: Swarmathon 2

This module is the capstone project of the module progression. It will allow students to be able to apply the lessons they learned from the previous models in order to create their own agent based model. The students should be given as much time as possible to design, write, and test their solution. The code written for this module is what a Swarmathon high school competition would be based on.

Downloading the Modules

The modules are available for download at <http://nasaswarmathon.com/outreach/>

When you download a module it will contain a compressed ZIP file with all of the necessary files and documents.

Each module after the first typically builds upon the previous one in the series, so it is recommended to start with the first module if you plan to use the project specs.

However, when using the walkthroughs all of the coding is thoroughly explained and examples are provided, so it is possible to use any module that you want.

Additional Resources:

These websites provide additional support and information regarding the modules and NetLogo:

- <http://nasaswarmathon.com/outreach/>
The NASA Swarmathon outreach website with links to this guide and the five part module progression.
- <https://ccl.northwestern.edu/netlogo/>
The main NetLogo website.
- <https://ccl.northwestern.edu/netlogo/docs/dictionary.html>
The NetLogo Dictionary provides a comprehensive guide to the NetLogo programming language and all of its features.
- <https://ccl.northwestern.edu/netlogo/oldversions.shtml>
The NetLogo repository of all versions from the newest to the oldest that can be downloaded and installed (for free).