Swarm Simulation System

Swarm is a programming library that facilitates both research and teaching in the field of complex systems and agent-based modeling.

The software is provided under the open-source terms of the GNU general public license. It is used and supported by a worldwide network of researchers who participate under a framework created by the Swarm Development Group (a nonprofit corporation in Santa Fe, New Mexico).

Important things to know about Swarm

1. **General Framework**. Swarm imposes only minimal substantive restrictions on the modeling enterprise. It is necessary to represent individual agents by objects, but everything else is open to customization. As a result, Swarm is a useful environment for modeling problems in fields ranging from political science and economics to ecology and biology.

2. **Multilanguage**. Routines in the current Swarm libraries can be accessed from programs written in Objective-C and Java. Development versions of Swarm can be accessed from C++ and javascript as well.

3. **Multiplatform**. Swarm can be compiled on almost any Unix/Linux system and all recent vintages of MS Windows.

4. **Open Source Workbench**. Swarm's development coincides with the growth of the open source movement. By exposing all implementation details of the libraries and encouraging authors to make all code available for inspection, we move closer to the ideal of a commonly accepted simulation "workbench."

5. **Simulation Management**. Swarm's activity library provides scheduling tools to support "bottom-up" modeling of complex systems and emergent phenomena. A range of possibilities can be explored, including:

- totally decentralized behavior of agents who decide when and if to act
- nested ordering of agent actions
- conventional cellular automata

6. **Graphical Output/Interaction**. Graphs and displays can monitor a simulation as it proceeds. Code can be designed to allow user interaction with the simulation (e.g., create new agents, reposition agents, change their attributes).

7. **High Quality Support Libraries**. State of the art library support for generation of random numbers and simulation of draws from statistical distributions.

8. **Large Variety of Example Applications**. The SDG provides a package of supported example programs as well as a Swarm tutorial in the swarmapps package. Many other example programs are available, either from the SDG ftp service or from the authors themselves. There are Swarm implementations of many classic agent-based models, such as the El Farol model, Sugarscape, and Conway's Game of Life. Applications range across social and natural sciences.