Sam Woodman

Thesis 2015-2016

NetLogo Log

**bees-simple.nlogo**

* 10-14-15
  + Created file by saving ant example file
  + Goal: create super simple model, build up
  + Model where bees just randomly moved, did time testing
  + Results for 100 ticks:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Population** | 100 | 500 | 1000 | 2000 | 4000 | 5000 | 7000 | 9000 | 10000 | 20000 |
| **Time (s)** | 3.8 | 3.8 | 4.0 | 4.4 | 7.3 | 9.0 | 11.7 | 14.0 | 15.4 | 30 |

* + Beekman and Lew 2008
    - Time step = 10s real time
      * 2880 for 8 hours
    - 20 runs per model variation
  + Dornhaus *et al*. 2006
    - 1000 bees per colony
    - “approximate number of foragers in a honeybee colony” (Seeley 1985)
    - time step = 36s
      * run for 5000 time steps
      * 50 hours
      * 5 days of foraging, 10 hours of activity
      * “We chose this interval because it is close to the length of time individual floral food sources may be open and rewarding for bees”
      * 10-20 simulation runs for each set of parameters
* 10-22-15
  + Map size 1000x1000
  + Results for 100 ticks:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Population** | 100 | 500 | 1000 | 2000 | 4000 | 5000 | 7000 | 9000 | 10000 | 20000 |
| **Time (s)** | 14 | 17 | 20 | 25 |  | 42 |  |  | 70 |  |
| **Time (s, fast)** |  | 13 |  |  |  | 13 |  |  | 14 | 15.5 |

**10-29-15**

* Decided we can (probably) use a 3000x3000 grid for the environment. If a colony has a range with a radius of 10km, this means one patch corresponds to 10000m/1500 = 6.67m.
  + Each NetLogo patch is one ‘resource patch’
  + Bees fly at around 15mph = 6.7m/s
    - Have bees move multiple patches per tick?
* See Bees-Simple time-table-edited.csv for timing information
* TO DO this week: Begin to implement aspects of the model
* Functionality implemented
  + Create hive (3x3)
  + Have slider for percent chance each patch has a resource

**11-3-15**

* G

**11-4-15**

Q’s

* How to do ephemeral?
  + Poisson distribution, but what does that mean?
* How to do clumps
  + Idea 1
    - Create random distribution
    - Run iteration moving resources together with some probability
  + Idea 2
    - Have set number of clumps
    - Set size/distribution of sizes for clumps

**11-5-15**

To do

* Implement iterating clumps together
* Proposal
* Flower characteristics data analysis
  + Determine distribution that best models quality and quantity for flowers
  + These variables could depend on species and/or date
  + Allow me to look at intra-species variability and inter-species variability

**Sim facts**

-Percentage of foragers in a colony

-15s per tick

-10h range (2400 ticks per sim)

-20 simulation runs

Each run consists of run with large colony and run with small colony

Keep env the same for each run (large and small colony), random food distribution across simulation runs

-Parameters

density: prob of resource on each patch

patchiness: prob of clumps

How long does each resource last

Have them disappear with prob from Poisson dist

-Map size

bees can forage up to 10km

TODO:

-Look up flying speed; how does it correspond to time per tick and patch size

-time spent on flowers?

**12-8-15**

-Implementing state machine.

**12-10-15 (Lab Meeting)**

* Why is random number generator apparently generating more than it should?
* Clustering parameter
  + Drop random point in space. Distance to nearest resource is x. Distance from that resource to next resource is y. Ratio is x/y
    - Ratio > 1: clumpy
    - Ratio = 1: random distribution
    - Ratio < 1: uniform
* How to cluster
  + Have density and patchiness user parameters
  + TODO: research spatial statistics, species distribution (Wiki page)

**1-24-16**

* Went through and commented code sections and renamed variables to make them more consistent
* Renamed remaining? to quantity\_label? and added quality\_label?
  + Error-check: can’t turn both on at the same time
* Added TODOs

**1-25-16**

* Put NetLogo file on GitHub
* All changes will be logged in commits on GitHub from now on