

# CS 346U: Exploring Complexity

## Genetic Algorithms lab

**Writeup due Monday, November 9, 2009**

In this lab you will experiment with a genetic algorithm that evolves strategies for Robby the Robot. This lab will work only on Windows; if you are using another operating system and don't have access to Windows, please let me know.

1. Create a folder for your GA experiments.
2. Download `robby.exe` from the class web page into your new folder.
3. Run `robby.exe`. It will prompt you for parameter values. Use the following parameters:

Population size: 200

Crossover rate: 1 (probability of crossover taking place between two parents)

Mutation rate: 0.005 (probability of mutating each bit of an offspring after it has been created)

Number of moves per session: 200 (number of moves Robby will make for each fitness calculation)

Number of generations: 300

(This takes about 3 minutes on my laptop) . The program will write out three files; the file names will have the run's random seed as a preface and ".header", ".short", and ".best" as suffixes. The .header file contains information about the run. The .short file reports the fitness of the best individual in the population at each generation. The .best file contains the string representing the best individual in the final generation.

Repeat this two times to get three different runs with these parameters. Plot the data in the .short files for the three runs (all three on a single plot).

4. Try running Robby with the same parameters as in step 3, except set the crossover rate to 0. Again, do three runs with these parameters, and plot the data in the resulting .short files on a single plot (different from the plot in step 3.)

5. Same as step 4 but with crossover rate set to 1 and mutation rate set to 0.

6. Devise two experiments of your own—that is, two different settings of the parameters. Predict how the behavior of the genetic algorithm will differ on each setting versus what you saw in steps 3-5. Then run the GA, three times for each parameter setting, and see if your predictions hold up. Again plot each set of three runs on a single plot (producing two plots from your two experiments in this step).

7. Write a few paragraphs reporting on your experiments in steps 3-6. What differences did you see among these runs and why do you think that these differences occurred?