Christopher LaJon Morgan

CS 470

Sep 17, 2013

This problem has you experiment with genetic algorithms. Download this [MATLAB file](http://students.cs.byu.edu/~cs470ta/goodrich/fall2009/homework/GA.m). The problem is to find the minimum cost path from the lower left of the graph. Rather than trying to find a specific goal node, the problem is one of trying to find the cheapest path of a fixed length. This simulates flying a fixed-wing UAV in such a way that you stay aloft for a fixed amount of time. The code is written so that edges that are darker are cheaper and such that visiting the same edge twice incurs a very heavy penalty.

The gene is set up so that it encodes a series of directions, N,S, E, or W. Thus, each gene encodes a series of directions and, thus, the edges to traverse through the graph. Genes are initially chosen randomly, but between each generation a new set of genes is constructed. The top NUM\_TOP\_GENES are preserved from generation to generation. Additionally, the top genes are copied and then mutated with a probability of 1-MUTATION\_THRESHOLD. Finally, the top two genes swap heads and tails, and the top gene swaps tails with the third ranked gene.

1. PATH\_LEN (the number of directions in the gene). Try 1\*WORLD\_DIM, 2\* WORLD\_DIM, and 3\*WORLD\_DIM.
2. NUM\_GENES (the number of different genes considered). Try 10, 50, and 100.
3. MAX\_GENERATIONS (how many generations the code runs). Try 30, 60, and 120.

FYI, the only code that you'll really care about is the global parameters set at the top of the file, and the code between lines 243 and 273.

**Note:** there is a small bug in the matlab code that prevents you from trying low values of NUM\_GENES. Change line 17 to say this: NUM\_TOP\_GENES = min(floor(NUM\_GENES/3),10);

**What happens when you vary the following parameters? Why?**

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