

CSCI 4560/6560 Evolutionary Computation

Assignment Number 6: Due Thursday 12/5/2005 (in class)

1. [20 points] Consider a genetic algorithm using a binary representation with bit strings of length 5. Consider the following two fitness functions:

- $F1(x)$ = the number of ones in bit string x
- $F2(x)$ = the number of ones or zeros in bit string x whichever is larger

- (a) What is the average fitness of schema $***11$ under $F1$?
- (b) What is the average fitness of schema $***11$ under $F2$?
- (c) What is the average fitness of schema $***00$ under $F1$?
- (d) What is the average fitness of schema $***00$ under $F2$?
2. [20 points] Consider a genetic algorithm using binary representation with strings of length 5. Assume that the initial population (generation 0) was as follows:

Individual	Genotype	Fitness
1	10001	20
2	11100	10
3	00011	5
4	01110	15

Assume also that a standard generational GA (using 1-point crossover and bit mutation) is used with mutation probability $p_m = 0.01$ and crossover probability $p_c = 1.0$.

- (a) calculate a lower bound for the expected number of representatives of schema $1****$ in generation 1.
- (b) calculate a lower bound for the expected number of representatives of schema $0**1*$ in generation 1.
3. [40 points]

Choose two of the research papers presented in class and provide a brief review for each of them (no more than one page each, half a page each preferred). Your review for each paper should include:

- Paper title
- Which evolutionary computation technique was used in the paper
- What was the best thing you liked about the paper
- What was the worst thing about the paper
- How could you continue/extend the research described in the paper