

COMSM0302 - WEEK 10 EXERCISES

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1. EXERCISE 1 - MIXING MATRIX FOR POINT MUTATION

Construct the mixing matrix U for the point mutation operator that, with probability μ , mutates exactly one allele of a length 2 binary chromosome.

2. EXERCISE 2 - FIXED POINTS OF MUTATION AND SELECTION GA

Instantiate the mixing matrix constructed in exercise 1 for $\mu = 0.1$. Use this to calculate the fixed points of the mutation and selection GA on the *OneMax* fitness function (N.B. with one added to the fitness of each chromosome). Sketch the unit simplex for this GA, and the position of the fixed points in and around it.

Hint: using Matlab will greatly simplify the necessary matrix operations

3. EXERCISE 3 - WALSH TRANSFORM OF GOLDBERG'S DECEPTIVE FUNCTION

Calculate the Walsh coefficients of Goldberg's 3-bit deceptive function. Derive the relationship between the Walsh coefficients and the schema fitness averages.

4. EXERCISE 4 - FITNESS LANDSCAPES

Calculate the local optima and their basins of attraction for the fitness landscape described by the search space of 5-bit binary strings, the fitness function $f(x) =$ integer encoded by binary chromosome x and the CX operator, with steepest-ascent neighbourhood search.

Hint: you may want to write a computer program to help with this