Checkpoint 5 -- Crossover / Mutation

What you will be doing

- Goals:
  - Define and implement crossover / mutation operators.
  - Experiment with a variety of crossover / mutation combinations
  - More statistics gathering.

- Reminder: all checkpoints to contribute to what eventually will be reported in your final report / presentation.

Deliverables
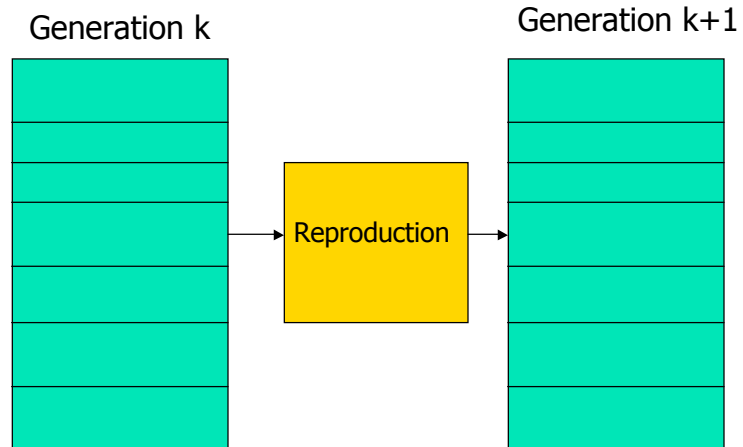
- Report and Code

Reproduction

Generation k

Generation k+1

Reproduction

Reproduction

- Tasks:
  - Implement 3 crossover operators
  - Implement 2 mutation operators

  - Compare EA convergence of using the 6 combinations.

Reproduction

- Crossover on Strings / Arrays
- Common mechanisms:
  - One-Point Crossover
  - Two-Point Crossover
  - Cut and Splice
  - Uniform and Half-Uniform Crossover
  - Arithmetic
  - Heuristic

Standard Mutation

- Bit String
  - Flip a bit
- Array
  - Modify gene by random amount
- Trees
  - Replace branch with random subtree.
- Can also do "swaps"

Exchange Mutation

- Randomly selects two cities and swaps

3	2	4	1	7	5	8	6

3	2	7	1	4	5	8	6
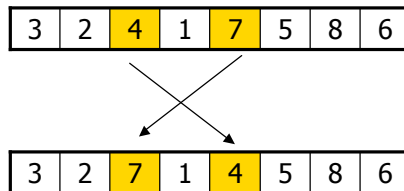
At the very least

- Crossover
  - One point crossover
  - Two point crossover
  - Uniform crossover
- Mutation
  - Bit flip / value mod
  - Swap mutation.

If you feel adventurous

- Crossover
  - Permutation crossovers (if appropriate)
  - Multi-parent crossover (must change selection)
  - Your own custom crossover / mutation.

Comparisons

- Keep all other parameters constant
  - Population size
  - Selection Mechanism
  - Crossover / mutation rate.
  - Genotype / Phenotype / Genetic Mapping

- Use values that showed most promise in previous checkpoints.

Report

- Be sure to include:
  - Crossover operators implemented (with descriptions!)
  - Mutation opertaors implemented (with descriptions!)
- Include:
  - Summary of 6 runs (best, worst, avg / generation)
  - Conclusions on which combo seems most promising.

Questions?

Ground rules

- To be done in your teams.
- Report submission in PDF, Word, or plain text.
- Code submission as zip, tar, etc.
  - Include instructions for building/running.
  - Include platform as mycourses comment when submitting.

- Electronic submission via mycourses.

Submission

- Due Tuesday, February 6.

- Any trouble, see me sooner rather than later.