# Final Project Checkpoint 1

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## Progress

- We have completed a random walk, allowing for n variables and various distributions. Although we believe this to be working, we have not yet fully tested the accuracy of the walk.

- We have several basic problems on which to test our algorithms. These include a fence problem, where area is to be maximized given a set length of fencing and one side that is a natural border (e.g. a river); a box problem where, given a desired volume, the surface area must be minimized; and a manufacturing problem, where a manufacturer must maximize profit given a limited amount of each resource, with each product requiring different amount of said resources and resulting in a set profit.

- The entirety of the cuckoo search algorithm has been coded, but it has yet to be tested. Currently, testing has commenced with the fence problem, but there are some bugs that still need to be smoothed out. The algorithm must then be better generalized to receive problems of various types.

- Coding of the PSO has begun. It's implementation is mirroring that of the Cuckoo Search so that the two can be more or less interchangeable. More work is required here.

- Although we have several problems on which to test our algorithms, we are still working on narrowing down a doable yet more complex application. We still wish to do the nurse scheduling problem, but may alter it to make it more feasible.

## Problems

- Importing a Levy Flight random distribution library has been troublesome. We've been able to import a library that uses comparable random distributions (e.g. Weibull, Cauchy) but have not been successful with the Levy distribution yet.

- There are a few issues patching together the code to actually use the algorithm on a given problem. These issues do not seem unsolvable, however there are quite a few to be resolved.

## Teamwork

For some stages of the project, especially in the beginning, we worked closely to ensure a solid overall design for our code. We assigned modular tasks as needed, but each of us has worked on all aspects of the project (e.g. problems, solutions, and algorithms). We've outlined a few of the more modular segments below, but overall the code collaboration has been highly fluid, and we've been able to efficiently take on the necessary tasks.

- Sam
    - alterations to class and interface design choices
    - box problem (bivariate problem)
    - Particle Swarm Optimization algorithm
- Nick
    - statistical library import
    - fence problem (univariate problem)
    - Michaelwicz minimization problem (bivariate problem)
    - code cohesion, the beginning testing stages of cuckoo search
- Crystal
    - searched for java libraries with distributions other than Gaussian
    - settled on a statistics library using Weibull distribution with shape and scale to resemble Levy distribution
    - random walk accounting for multiple random distributions and a neighborhood of constant distance
    - manufacturing problem (bivariate problem with multiple constraints)

## Plan

- Resolve any outstanding issues with Cuckoo Search and the various problems that it may be passed. (Nick)
- Continue and complete the coding of PSO (Sam)
- Choose and implement real-world applications that are more complex than fence/cube (Crystal)