

# 1 Methodology

In this chapter, the simulator used to investigate the research questions is described. An overview of the system is presented in section 2. Section 3 includes implementation details, and design decisions made when implementing the genetic algorithm which is the foundation for all the population distributed genetic algorithms. Sections 4-6 contains implementation details of the population distributed genetic algorithms. The wind scenarios used to evaluate the different population distributed genetic algorithm are described in section 7, and the choice of implementing the genetic algorithm from scratch is defended in section 8.

# 2 System Architecture

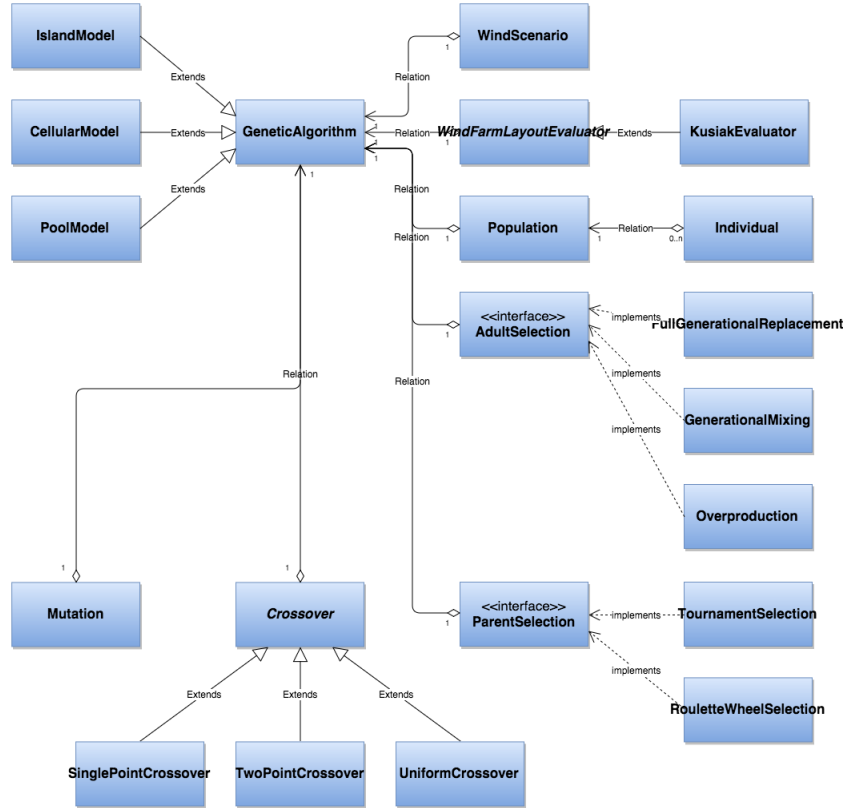


Figure 1: Class Diagram.

The program is implemented in Java and the interactions between the dif-

ferent classes of the program are shown in figure 1. The GeneticAlgorithm class is extended by the three population distributed genetic algorithm classes: IslandModel, CellularModel and PoolModel. In addition, the GeneticAlgorithm class is also implemented as instances in all three population distributed algorithms **fix this in figure**. The main loop of the program is contained in the GeneticAlgorithm class. It uses instances of the classes WindScenario, Wind-FarmLayoutEvaluator, Population, AdultSelection, ParentSelection, Crossover and Mutation. AdultSelection, ParentSelection and Crossover are interfaces that needs to be implemented if new methods are to be added to the program. Mutation is a class containing four different mutation methods.

## **3 Genetic Algorithm**

### **3.1 Adult Selection**

### **3.2 Parent Selection**

### **3.3 Genetic Operations**

### **3.4 Wind-, Wake- and Power Model**

### **3.5 Fitness Function**

## **4 Island Model**

## **5 Cellular Model**

## **6 Pool Model**

## **7 Scenarios**

## **8 Motivation**