Lab 4 Summary:

The first figure demonstrates the time cost(second) with same number of threads but different maze size. Intuitively, the time cost should increase as the maze size increases. However, that is not the case in the figure. The cause of this result is that both size 10 and 12 run until reaching the generation threshold, but not for the rest. The possible reason of such cause may be the complexity of the maze. Genetic algorithm relies the current best genome to construct a better genome. However, if the solution of a certain maze is first getting close to end point and then leave far away from it in order to get even closer, such solution will be hard to achieve by genetic algorithm, compare with the solution that sub-solution leads you to the destination closer and closer. In this case, we would have different complexity(difficulty) for maze with same size, and therefore maze size will not be the only factor that affect the maze complexity and performance.

The second figure shows the time cost with different number of mutating and mixing threads given fixed total number of threads. We receive the best performance when mutating threads is 5 and mixing threads is 3. There are two possible causes that lead to the result. First, the mutating threads can contribute more than mixing thread to find the solution. Second, the work load of mutating threads is heavier than that of mixing threads, and therefore we need more mutating threads to consume the result from mixing threads to optimize the performance.

The third figure shows the time cost with same size of maze but different number of threads. The result is unexpected that we receive best performance by using 4 threads. Except for luck, the possible reason may be contention. The cost we pay for resolving contention might be greater than the performance gain from using more threads given a certain combination of mixing and mutating threads. Thus, it is possible that we receive this uncanny result.