Package delivery has always been a tricky task. Delivery man’s job is to deliver packages as soon as possible, at the mean time, their employer expect them to use as few resource as possible. To employer, they need the delivery man to handle packages quick so they can take care of more packages and also don’t waste a lot resources like gas to deliver them so they can actually make more money. This is a classical traveling salesman problem (TSP), which was formulated in the 1800s by the Irish mathematician W.R. Hamilton and British mathematician Thomas Kirkman. The TSP originally ask the following question: ”Given a list of cities and the distances between each pair of cities, what is the shortest possible route that visits each city and returns to the origin city?” Isn’t that familiar with the package delivery problem as we mentioned? The difference of these two questions is that every cities in TSP don’t actually affect later choice, but in package delivery problem, they do.

To understand the difference, we need to figure out what exactly is this package delivery problem we have been talking about. Assume a delivery man leave from package warehouse and have 20 package (P1 ~ P20) with him. He need to go to 7 places (A ~ G) to delivery these packages. There are some roads (R1 ~ Rn) he can choose and those roads are not the same length. Considering the delivery man need to delivery these package as soon as possible, what is his best way to chose the route? Or even more, if we consider the extra package weight will cause vehicle consume more gas, and delivery man need to make sure he can delivery package fast and economical as well. What route is best for this scenario?

To be precise,

Scenario 1 description: Package delivery arrangement and optimization.

System Data Input for Scenario 1: Package weight (P1 ~ P20), Road length (R1 ~ Rn)

Input Data Types for Scenario 1: Matrix

System Data Output for Scenario 1: A functional road selection collection

Output Data Types for Scenario 1: Array

Scenario 2 description: Garbage collection arrangement and optimization.

System Data Input for Scenario 2: Garbage weight (P1 ~ P20), Road length (R1 ~ Rn)

Input Data Types for Scenario 2: Matrix

System Data Output for Scenario 2: A functional road selection collection

Output Data Types for Scenario 2: Array

This is a NP-Hard problem and it’s not easy for un-highly-educated man to solve and that’s the value of out project, which is help to solve this complicate problem by simply need user provide basic information like how far from A to B and what’s the weight of P1. The outcome of this project will not need any basic of computer and simple typing skill will do.

This problem can also be seen as a garbage collection process where the collection worker need to pick up garbage from different places and there are different length from one to each other. Also, we can not neglect that with collected garbage, the collection vehicle will definite consume more gas than before.

This project will be divided into 3 parts. First one is try to build a working map to simulate the delivery progress. Secondly, we need to try to figure out what is the best strategy to delivery packages without considering gas consumption. Last part, we take package weight into consideration and try to analyses data to come up with a functional resolution. For now, we are thinking Xuenan and Zhenyuan will be in charge of coding and algorithm design, Kristie will be in charge of report writing and also algorithm improvements. Both three of us will be participate in presentation preparation.