The STSM short Report

April 28, 2016

Purpose of the STSM   The purpose of this STSM could be categorized in three parts:. At first,we concluded a paper investigating some features of a real routing problem. Besides, new features of the problem are analyzed. Since adding new constraints makes the new problem much more complicated and the number of variables grows exponentially, I have started learning how to use SCIP in order to apply Column Generation Methods.

1   Description of the work carried out during the STSM

Here I will explain all the mission in three sections

- Finishing the first paper

At the first step, we worked on the paper entitled "Set-Covering formulation and a preprocessing idea for routing of heterogeneous trucks with container loads". This paper addresses a routing of heterogeneous trucks with single and double containers load problem, where container loads must be shipped from a port to Importers and from Exporters to the port by trucks carrying one or two containers, without separating trucks and containers during customer service. We first describe the problem statement, we present a set-covering formulation and we enumerate all feasible routes. We also investigate if the distribution id improved by the introduction of new links from exporters to importers. Finally we compare the computational results with the previous node arc formulation and its heuristic approach. We use Mathematical Programming

Language (AMPL) for writing the model, which was solved by CPLEX directly. The paper will be submit in a few days.

- Define the next step of the Project

In the previous paper, containers were never unloaded or reloaded from the chassis of the truck along a route. The truck and the containers are coupled in the sense that the truck carries the same set of containers throughout the route. In the second phase, we add these four types of customer services:

1. delivering a loaded container to an importer, where the container is left;
2. picking up an empty container from an importer;
3. delivering an empty container to an exporter, where the container is left;
4. picking up a loaded container from an exporter.

These new additional trips, make the problem more complicated: the number of variables increase significantly and it is possible to solve with CPLEX only small instances. We are going to adopt a Column Generation method to solve the problem in an exact way. In this part, I learn some basic concepts such as Column Generation, Branch and Price, and Branch and Cut and Price techniques.

- Learning how to use SCIP

In the last part, I practice using SCIP as a solver or a framework for constraint integer programming and branch-cut-and-price. I am actually learning how to use SCIP to solve the MIP problems. Therefore, I download and installed the software and have been trying to solve some simple examples on it. To become skillful in using the SCIP, I am trying to use it to solve some instances taken from the first paper. This part actually is in progress.

2 Description of the main results obtained

The main results of this mission are listed below

1. Conclude to submit a paper

2. Define the next step of the project

3. Learning SCIP

3 Conclusion

To sum up, my assignments in this short period could be summarized as below: completing a paper, defining the next steps of my project in order to make more realistic problem, and practicing using SCIP.