Internship at Center for Maritime Studies – National University of Singapore
An Internship Report

I recently concluded my PhD internship, one of the requirements in the Integrated Graduate Program that I belong to. I had the opportunity to have it at Center for Maritime Studies (CMS) in NUS from November 5, 2012 to February 1, 2013. It was the best place for me to conduct my internship to meet my objectives being the following: (1) Widen knowledge about the field of Maritime Transport, (2) Work under Professor Qiang Meng, one of the track leaders in the center who is an expert in my field of research, maritime network design (2) gather research inputs from other researchers and experts in my field.

Introduction to CMS

CMS is a research center specializing in maritime affairs, undertaking researches in areas of relevance to the industry. The center caters consultancy services to private companies and entities seeking maritime knowledge and expertise. The center meets these demands by hiring researchers most having PhD degrees in maritime fields from NUS and other notable universities, and supervised by the NUS professor themselves. CMS receives its funding from both the NUS and donations from the maritime community, which is one of the busiest and having the most advanced port facilities in the world. Singapore has the busiest transshipment port in the world, being the 2nd busiest in terms of total shipping tonnage.

The projects handled in the center are categorized into (1) Maritime Policy and Management and (2) Maritime Operations and Modeling. Several projects are currently being conducted, some of which related to policy for stowaways, container port operations and supporting IT systems, and database establishment for throughput and port characteristics in East and South East Asia. Each project is led by a track leader and worked on by one or two researchers.

The CMS building is a rather peculiar one inside the campus, it perhaps the only blue-colored, located at 12 Prince George's Park.

Activities during internship

To achieve the objectives set for my internship I did the following:
(1) Widening of knowledge about maritime transport by interacting with fellow researcher and staff

Since most of the researchers are of my age, it was easy to talk to them and discuss the projects they were working on. I learned an overview in the projection of throughput in ports, in data

collation of port features and throughput, and design of transportation networks, among others, from them. I also attended the CMS seminar held every week of January, and learned more about what the CMS projects are about.

One interaction that is very relevant to my research is with Mr. Hiroyuki Nishijima, a senior project leader and serving as a Managing Director of Japan Marina and Beach Association. He has practical knowledge in port management thus I gathered from him good advices, and even explanations of basic maritime terms, giving me a good picture of how the shipping industry and ports work. He gave me a contact working in JICA Philippines that could help me once I visit the Philippines and conduct interview and survey in the ports.

The young researchers in CMS

During one of the discussion with
Nishijima-san

(2) Research progress reporting to Professor Meng

Professor Meng includes me in his weekly meeting with the students he supervises. He calls a meeting every week if possible, when he does not have any commitment overseas. The meeting is conducted 30mins to an hour where he checks ones research progress, and sometimes a group meeting is held to facilitate discussion within students of the same research interest.

I am thankful I had the opportunity to be guided by Professor Meng since he gave me good input and ideas to make my research unique. He had been a very good research motivator.

(3) Research presentation with the CMS staff as audience

I am very thankful to be given a time to present my research in the CMS seminar. I presented my research entitled "Hub-and-Spoke Network for the Philippines". In summary, I aim to model a hub-and-spoke network for the Philippines. I am going to use a cost minimization objective function to locate the optimal location of hub ports.

Among the helpful suggestions I gathered are to consider fixed cost in establishing a hub port in a certain port location, and ideas in the programming softwares to use (e.g. CPLEX, Lingo).

Research Progress during the internship

(1) <u>Formulation of objective function</u> – I drafted 2 cost minimization functions for my hub location problem. The simpler one considers only single allocation (cargo flows from nodes are only allocated to one hub port) and another one considering multiple allocation (flows in a node can be allocated to more than one node). Other consideration in the function are use intermodal transport (container vessels and roll-on roll-off vessels), variable discounts for the hub-to-hub cargo flow, and serviceability (travel time). The models are adapted from the papers of Skorin-Kapov et al. (1996) and Ebery et. Al. (2000), respectively.

(2) <u>Use of Lagrangian relaxation</u> – one of the techniques used in simplifying hub location problems is by using Lagrangian relaxation to separate an objective function to two simpler objective functions. I studied this technique and intends to implement this in my research.

(3) <u>Programming with Matlab</u> – I finally started working with Matlab and was able to make a simple program that could locate hub ports based on the first model mentioned in item 1 above. However, this program does not work when the needed number of ports (29 ports) is used. Thus, currently, I am working on the programming with Lagrangian relaxation to simplify the problem. But the simple program previously made served a good practice in programming with Matlab.

Recreations during Internship

(1) I enrolled in a yoga class.

(2) Toured Singapore and visited their tourist spots (i.e. Sentosa, Marina Bay Sands, Zoo)

Summary

The internship was a very fruitful experience for me. I am really thankful to be given such opportunity, thankful to the CMS director Fwa Tien Fang for approving my stay and to Professor Meng for the guidance, and to CMS staffs for being very welcoming.

I learned what other researches are being pursued in my field, which are more on the practical use and in demand by the maritime community. I gathered good inputs from a network modeling expert and other maritime researchers. And, I enjoyed learning the Singaporean culture and even my everyday life in Singapore. It had been quite an experience.