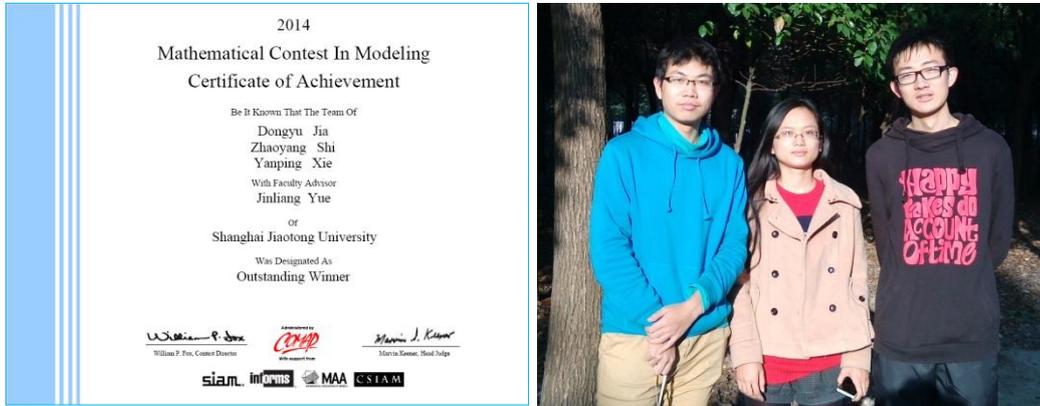# Story with MCM

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Recalling the moment when we found that our team won the Outstanding Winner of MCM2014 never fails to bring excitement and feeling of accomplishment. The story with MCM has been a precious experience. The days we prepared for the contest, the hours we endeavored to refine our model, and the minute when the result was announced, are all engraved in our memory.

The members of our team were all sophomores at the time of the contest. Dongyu is the team leader and he majors in Computer Science. Zhaoyang is from Electrical Engineering. They have participated in China Undergraduate Mathematical Contest in Modeling (CUMCM2013) together. And both of them are good at math and coding. In order to better adapt to MCM's feature, Yanping joined the team. She is also from Computer Science and is good at English writing. The strengths of every team member are quite complementary and that is an important part of our secret to success.

Dongyu and Zhaoyang had experience in mathematical modeling but Yanping was a totally a new hand. Since we were quite busy during the semester, we had to prepare for the contest after we finished our final exams. We spent a few days in the library at the start of the vacation. Dongyu invited Fucai Zhu, a schoolmate from Information Engineering, to introduce for us a course of his major, Statistical Inference, which employs Matlab to solve a modeling problem. We then worked on the problem from that course, as a way to learn and practice Matlab coding. We actually accomplished the project of the course Fucai introduced in just one day. The next day, we turned to the learning of Latex. No one of us have used Latex before, so we searched online and practiced the usage of it. We dismissed on the third day and it was quite efficient of us to finish the preparation of Matlab and Latex in less than three days.

Not much preparation was done then before the contest began. The contest started several days after the Chinese Spring Festival, and we all returned to school from home and gathered in the library.

On the first day of the contest, we spent one or two hours on choosing the problem. We thought that the search for data needed by problem B was a little bit difficult, so we gave it up and chose Problem A which discussed on highway traffic. After we decided on the problem,

searching for relevant works began. Dongyu and Zhaoyang mainly looked for papers in Chinese and Yanping focused on English ones. After dinner, we've formed the basic idea of how to solve the problem. We simplified the problem and abstracted a basic model. Dongyu and Zhaoyang started coding and Yanping continued reading related researches.

The second was about improving and debugging. We divided our model into three sub-models, the vehicle generation model, the vehicle following model and the vehicle overtaking model, to satisfy the complicated scenario of the problem. We considered two different traffic rules, a keep-right one and an unrestrained one. Dongyu and Zhaoyang continued coding and Yanping started the writing of the paper.

On the third day, we mainly made graphs for data gathered from the simulation program, did data analysis and continued on paper writing. The next day was mostly about writing paper and translating paper into Latex code. The work seemed simple and easy, but we actually finished our paper late in the night.

The winning of the Outstanding Winner is quite a surprise to us, but we also see it as the acknowledgement of our endeavor and encouragement to never stop learning and solving problems. We are grateful for the acknowledgement, proud of our achievement and inspired on our future life. To us, the meaning of MCM is far more beyond a contest. The award will definitely help in our future study and career. But what's more important is that, MCM cultivates and encourages our positive attitudes toward teamwork, learning and problem solving.

Dongyu Jia's Experience

I've been interested in mathematical modeling contests when I first entered college. At that time, I was just started with coding and high-level mathematics and was not good at English, so I didn't register for the MCM of that year. But I wanted to take part in it next year, so in the winter vacation of 2012, I gathered my classmates and we discussed on how to prepare for it. We decided to meet every one or two weeks and study together on basic models and classic algorithms. So we met on every morning of Saturday in the second semester of Grade One, and we would read books on mathematical modeling in library and discuss together. However, we only grasped the basic idea of the models but hadn't studied deep into them.

In the September of 2013, we took part in the China Undergraduate Mathematical Contest in Modeling. At that time, we had quite some misunderstanding of mathematical modeling in fact. We thought that modeling was mostly about coding, and we even did not know about the necessity of building a model. So we spent most time on coding in the contest and wrote the paper in a hurry. It was not until we submitted our paper when we found that some formulas did not display rightly in the pdf format. We finally won the Second Class Prize in the region of Shanghai, which was not a satisfactory outcome. Later I studied on the works of the Special Prize and First Class Prize in China, and learned quite a lot.

Then the registration for MCM began. The members of my former team all studied Mathematics Olympics in high school and we are very analogous in our strengths. That was not a good situation in fact, since we had the common weakness in English. So I started looking for someone good in English and I noticed Yanping from the Data Structure course, who had won a prize in an English contest. I invited her to join our team and the team became more balanced.

Yanping barely had any experience in mathematical modeling but the study workload of Computer Science was relatively heavy, so we had to wait until the winter vacation to start our preparation. I invited a schoolmate from Information Engineering to introduce a course project using Matlab to solve a modeling problem. We finished the project in one day and practiced Matlab coding at same time. The next day we studied on the usage of Latex and returned home on the third day. In the rest time of the vacation, I was busy with something else and did not do much about the contest.

The time of the contest soon arrived. We decided on the problem, and started to look into related works. The usage of related papers could reduce the cost of communication, for that I could tell my teammates to use the method from which paper directly rather than organizing the words myself to explain the method. And I highly suggest reading the papers for two times. The first round is scanning the papers and selecting the useful ones and the second is to understand the papers. We build a simple model on the first day's evening. The next day, we improved our model and divided it three sub-models. Paper writing started on this day, because it did not need to wait until the model was realized and data were collected. In the next two days, we made graphs, analyzed data and finished the paper. After the library closed on the last night, we went to a room without air-conditioning and I should never forget the coldness there.

To be honest, I did not expect for such a good result. I am really thankful for my teammates. It is the complementariness among us that lead to our achievement. Besides, MCM is not only a contest, but also a social event. Comparing to the result, I cherish the progress more, when we endeavored together.

For the teams that want to participate in MCM, my suggestion is that, working hard on your academic work. It is not worthy to sacrifice your academy work to prepare for the mathematical modeling contest. And you can actually get inspired from the major courses a lot, because mathematical models are used in many fields like engineering and finance, and knowledge on coding and mathematics will help a lot in modeling.

Zhaoyang Shi's Experience

I've heard about mathematical modeling back in high school. At that time, I only knew about math, but I did not understand what a model is, not to mention mathematical modeling. I only had the impression that the mathematical modeling contest is very challenging and wining a prize will help a lot in future study and career.

After entering college, I focused on fundamental courses in the first year, and started to pay attention to various contests. Before taking part in the MCM of 2014, I participated in the China Undergraduate Mathematical Contest in Modeling in 2013. It was my first experience in a mathematical modeling contest. Although we successfully submitted the paper, many problems emerged during the process. We won the Second Class Prize in the region of Shanghai but it actually did not meet our expectance. Dongyu and I read the papers of the higher prizes after the contest and analyzed the things we could learn from them. We expected for better performance in later contests.

MCM is a challenge for us. The contest problems are usually more flexible than those of CUMCM, and sometimes it is really difficult to figure out where to break in. Moreover, the paper

needs to be written in English and will be a little burden for non-native speakers. Before the contest, we did some preparations. We studied former problems of MCM, and thought about how we would do to build the model; we read some good papers of MCM and learned from their thoughts and methods; we also pay attention to the expressions native speakers used in the papers; and we practiced in the usage of Matlab and Latex.

The contest took place during the Chinese Spring Festival. The ticket from home to school was hard to book and the train station was rather crowded. The first step had forecast the hardness of the following contest. Because it was in the middle of winter vacation, canteen and dorm services were simple and plain. In addition, the weather was rather cold, which made the condition harder. From analyzing the problem, choosing the problem, to searching for related works, building the model, from analyzing data and the result to refine the model and writing the paper, four-day time flashed. On the last night, we had to stay in the freezing corridor of a building to continue our work. We worked on our paper until 4 am and submitted it. Looking at my watch and the night view of the campus, a scene appeared in my mind that when Kobe Bryant, the famous NBA basketball player, was asked the question, "How do you succeed?", he answered," Do you know how Los Angeles looks like at 4 am? I do."

When I got to know that we won the Outstanding Winner, I was rather calm, because I'm not very familiar with the prizes. Not until I was informed that there were no more than twenty teams who won the Outstanding Prize did I realize what achievement we've made. After the contest result was announced, we were invited to share our experience and our paper was displayed on the forums on mathematical modeling. The prize will help a lot when we pursue a higher diploma or career.

Moreover, I think what I obtained from the contest is more than the glory. It is more about the understanding and application of mathematical model. After the contest, I participated in a PRP research project in our college, and I felt very experience to apply a mathematical model to analyze data and control the equipment. Mathematical model is very important in research projects of Automation, and the experience in MCM will help me more in future research.

Yanping Xie's Experience

When I received Dongyu's invitation, I was quite surprised. I had never participated in any mathematical modeling contest, or planned to take part in one. But Dongyu said that Zhaoyang and he were good at math and coding and they were looking for someone good in English to complement the weakness of the team. I'm a person who is always willing to try new things, so I thought, the contest that I had never experienced must be fun and I would learn a lot from them two and the process. And I'm good at English so I accepted the invitation and became part of the team.

The first three days of the winter vacation, we gathered at the library and learned how to code in Matlab and in Latex. We finished the practice in three days, which was an efficient and interesting arrangement. Since I knew that I would be responsible for the writing of the paper, I downloaded a lot of Outstanding papers and studied carefully at home. I analyzed the structure, the pattern and the expression of the papers and made a list. I also read the reviews from the judges and found out that, the arrangement of the paper matters a lot.

Then the contest day came around. On the first day, I mainly searched for English papers, to look for good ideas we might adopt. The rest three days, I worked on the writing of the paper. My mission was to understand the model thoroughly and express it concisely and clearly. I was being really careful in my work that we did not submit our paper until 4am.

During the contest, I was accommodated in a dorm without air conditioning, and the freezing nights really suffered. But when we won the Outstanding Winner, I guess all the hardship was worthy.

I did not expect too much about the outcome, so when I was first told that we won the Outstanding Winner, I thought it was unbelievable and I wondered whether it was a joke. When the news was confirmed, I felt really excited and grateful. I am thankful that Dongyu and Zhaoyang asked me to join the team, that they've shown me brilliant mathematical thoughts and coding skills, that they introduced to me the new world of mathematical modeling and that we've endeavored together. And I'm proud of the glory we earned together.

What MCM brings me is far beyond the prize itself, it opens a new world for me, and it arouses my interests in mathematical modeling. And as I supposed before, participating in the contest was interesting and I did learn much from my teammates and from the procedure.