

IDEA League Summer School
(RWTH Aachen)
Student Reports
(2014 –)

IDEA League Summer School 2023 @ RWTH Aachen University “Scalable Quantum Computing – From First Principles to Market”

Overview

IDEA League is a strategic alliance between five leading European universities of science and technology, TU Delft, ETH Zurich, RWTH Aachen, Chalmers University of Technology and Politecnico di Milano. They aim to create valuable connections that inspire innovation and the pursuit of ambitious goals by joining forces together. Summer schools aim to connect and inspire a new generation of European science and technology graduates, champion innovation and entrepreneurship and steer Europe towards a more competitive and compassionate future.

Tokyo Tech is one of the members of ASPIRE League, which is a sister network of IDEA League, so students are invited to participate IDEA League summer schools. This Scalable Quantum Computing Summer School at RWTH Aachen University is aimed at Masters and PhD students in physics who want to gain an overview of quantum computing platforms believed to have the potential for practical applications. The topics covered range from fundamental principles to technological implementations and touch on real-world market considerations. This on-campus summer school took place on RWTH Campus, which is in an area in the historic town of Aachen. Aachen is the westernmost city in Germany, and borders Belgium and the Netherlands to the west. RWTH Aachen University hosts one of the largest technology-oriented research landscapes in Europe and which is also the home to the Institute for Quantum Information and quantum start-up ARQUE Systems.



Campus of RWTH Aachen University

Preparation before departure

I am a citizen of a country that EU waives our Schengen visa, so I am not required to obtain a visa to enter Germany for travel purpose less than 90 days. Therefore, the preparation for me was only to plan my itinerary, book flights and train tickets. The accommodation was provided by the summer school, and I decided to travel to other cities in Germany after summer school, so I only have to find accommodation for my short trip before going back to Tokyo. On the other hand, administrative procedure at Tokyo Tech includes: (1) submit Overseas Travel Notification and Departure Notice through T2Apps (2) purchase overseas travel insurance provided by university designated company (AIG Insurance Company).

Lectures and activities during Summer School

This is the brief schedule of this summer school.

| | AM | PM | |
|---------------|----------------------------------|--|----------------------------|
| 11 Sep. (Mon) | Introductory Lecture | (1) Quantum Error Correction (2) Orange Quantum Systems | Visit Digital Church |
| 12 Sep. (Tue) | Rydberg Atoms | (1) Cold Ion Traps (2) Infineon (3) Alpine quantum technologies | Visit Collective Incubator |
| 13 Sep. (Wed) | Superconducting Qubits | (1) Superconducting Quantum Systems (2) IQM | Excursion |
| 14 Sep. (Thu) | (1) Spin Qubits (2) Lab Tours | (1) Spin Qubits (2) Intellectual Property (3) Scientific Integrity (4) ARQUE | Dinner |
| 15 Sep. (Fri) | Cryoelectronics | | |

The topic this year was Scalable Quantum Computing – From First Principles to Market. Quantum computing is promising to unlock unprecedented computational power to tackle certain complex problems. This summer school was tailored for students to gain overview of quantum computing platforms believed to have a potential to practical applications, ranging from fundamental principles to technological implementations and touching on real-world market considerations. During this summer school, I explored the fundamentals of quantum computing: qubits, entanglement, quantum gates and algorithms. The course also introduced the leading hardware including superconducting and semiconductor qubits, trapped ions, neutral atoms and photonic quantum computing. The applications, error correction, requirements and scalability were also mentioned. Topics about companies and startups and their role in the quantum computing community also triggered my interested.



During lectures

Besides lectures, the summer school also offered us visiting activities and excursion. We visited a digital church in Aachen City, which is a co-working space for start-ups on Day 2. We visited Inden, a small town near Aachen, for excursion to play soccer-golf and had BBQ on Day3. These are valuable time to get to know more about other participating students. They also planned lab tours for us, which we got to see the practical aspects of quantum computing. We visited three labs, one of them are conducting research about

superconducting quantum computing systems and the other one focus more on semiconductor spin qubits. Lunch during summer school was provided by the university, we were handed a card with charged money that can be used at the student cafeteria on campus. The accommodation was provided by the summer school, a double room with one roommate at a hotel in the city, and they also provided us the transportation fee of buses from the hotel to campus, which usually take about 20 minutes. About credits, this summer school did not provide any credits, so I have no plan to transfer credits to Tokyo Tech.



Digital church



Lab tour



Campus cafeteria

Sightseeing before and after summer school

My flight was a round trip between Tokyo Haneda and Frankfurt am Main, so I had some time to look around Frankfurt before arriving to Aachen. I arrived at Aachen one day earlier and walk around and visited the world heritage, Aachen Cathedral. After the summer school was finished, I travelled to Cologne, Koblenz, and Heidelberg before returning to Frankfurt. I used railway (Deutsche Bahn, DB) to travelled between these cities.



Aachen Cathedral



Cologne Cathedral



Heidelberg Old Bridge

Language

All of the lecture during summer school were conducted in English, and all the staffs and students from different countries were able to speak English, so I had no problem communicate with them using English

(my English level was IELTS 7.5/9.0 tested in 2020). Outside campus, most German speaks English, but most menus in café or restaurant are usually in German, so I used Google Translate to order food. I only knew a few German words, and most of the signs in the train station have English so I think there should not be a big problem if you do not know German when travel to Germany.

Expenses

Flight tickets became more expensive after the pandemic and Japanese Yen is very weak to foreign currency, so it cost more to travel overseas compared to pre-pandemic. I arrived at Germany two days before the summer school and spent six more days after, so this is why I had a higher expense.

| | |
|---|--------------------|
| Scholarship | JPY 80,000 |
| Travel insurance | JPY 8,700 |
| Roundtrip flight tickets | JPY 244,360 |
| Train tickets | around JPY 15,000 |
| Accommodation excluding summer school (8 nights) | around JPY 170,000 |
| Personal expenses (meals, shopping etc.) | around JPY 70,000 |

Personal growth after summer school

I have spent a lot of time focusing on my own research since I started my doctoral study, and did not have a lot of time to gain knowledge of new fields. My networking was limited in the similar field of my research. This summer school provided me an opportunity to learn new things and able to connect with researchers from other fields. I was also able to know people from different countries and get to learn different cultures. I felt more open-minded towards different research field, networking and different cultures after attending this summer school. I would like to make use of what I learned in this summer school to my future career, connecting my own research field to quantum computing.

Advice and tips

Studying abroad may be a challenge for some people, but I think it is always worth a try because you will definitely be different in some way after coming back. For travelling to Germany, here I have some tips:

- (1) For transportation: Download DB Navigator App to buy subway tickets and book seats for intercity express trains. You can also search timetables.
- (2) Prepare cash: Most public toilets in Germany required to pay the fee by coins. Very few toilets accept credit card.
- (3) For networking: Most people outside Japan use WhatsApp instead of LINE to text each other, and LinkedIn is also very common when it comes to professional networking. The coordinator of this summer school created a LinkedIn group for us to stay in touch.

AACHEN

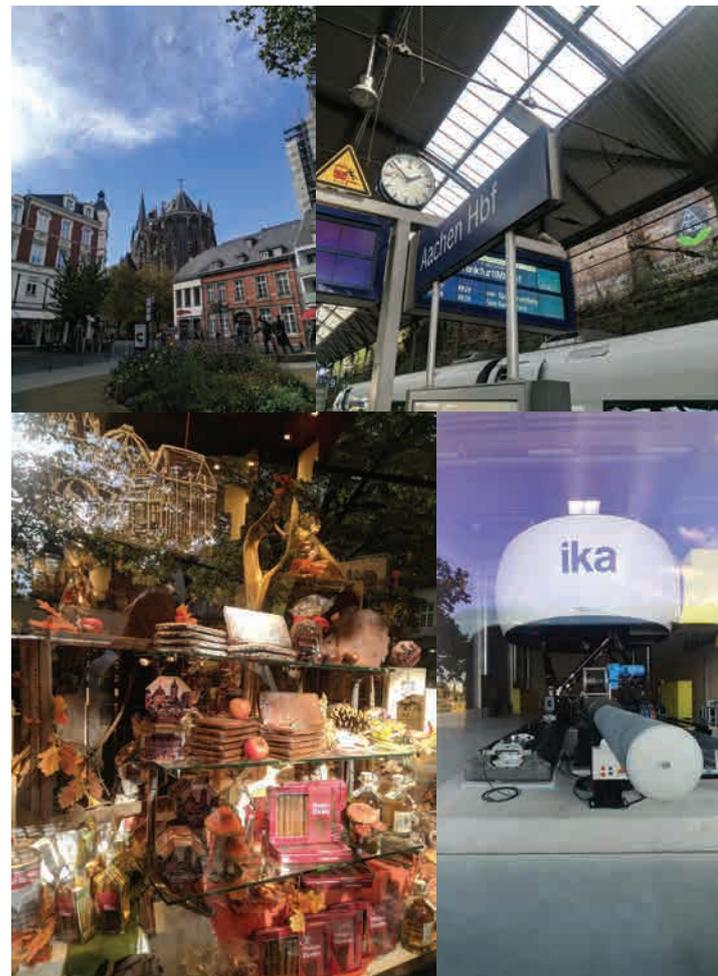
Aachen/Aix-la-Chapelle/Aken is a small city located in Rhine-Westphalia, Germany. The city is located near the borders with Belgium and the Netherlands, south west of Cologne. Romans first developed the city for settlement and spa, and later Imperial residence of Charlemagne was placed. Aachen Cathedral is designated as a UNESCO World Heritage.

IDEA LEAGUE

IDEA League is a strategic alliance among five leading universities of technology in Europe; Chalmers University of Technology in Sweden, Delft University of Technology in Netherlands, ETH Zürich in Switzerland, Polytechnic University of Milan in Italy and RWTH Aachen University. (Delft Zürich and Aachen have been the members of the alliance since it was funded.)

RWTH AACHEN

RWTH Aachen is a research university located in Aachen. It is the largest technical university in Germany with more than 42,000 students in 144 study programs. The university is well-known for maintaining close relationships to industry.



City of Aachen and Instrument in University

| | AM | | PM | |
|-------|---|--|--|----------|
| DAY1 | | | <ul style="list-style-type: none"> - Arrival and registration of participants - Introduction of participants and topic - Free time and check-in at hotel | - Dinner |
| DAY2 | <ul style="list-style-type: none"> - Meeting at "Super C" - Transfer to Düsseldorf - Guided tour at Daimler factory | <ul style="list-style-type: none"> - Transfer to Eindhoven - Lunch | <ul style="list-style-type: none"> - Guided tour at VDL factory - Transfer to Aachen | - Dinner |
| DAY3 | <ul style="list-style-type: none"> - Assembly - Lecture Block 1 "Introduction, Trends and Technology" | <ul style="list-style-type: none"> - Lunch | <ul style="list-style-type: none"> - Group work - Guided tour of IKA | - Dinner |
| DAY4 | <ul style="list-style-type: none"> - Assembly - Lecture Block 2 "User requirements" | <ul style="list-style-type: none"> - Lunch | <ul style="list-style-type: none"> - Lecture Block 2 "User requirements" - "Introduction, Trends and Technology" - Group work - Guided city tour of Aachen | - Dinner |
| DAYS5 | <ul style="list-style-type: none"> - Check-out at hotel - Assembly - Competition (Presentation of group work results) - Award ceremony and end of Summer School | <ul style="list-style-type: none"> - Snacks | | |

CONTENTS OF PROGRAM

The summer program I attended was called “Mobility Summer School 2018.” The Summer school was held by RWTH Aachen University from 17th to 21st of September with and 24 students from IDEA League universities in Europe and ASPIRE League universities in Asia (NTU in Singapore, HKUST in Hong Kong, KAIST in South Korea and Tokyo Tech. in Japan.)

This year’s topic was “Future Urban Mobility” and the program consisted of six lectures, three group work sessions, two guided tour and one-day excursion to automobile assembly lines. Experts form variety of companies in the fields related to urban mobility such as automotive OEMs, components suppliers, strategy consulting firms and researching institutes. Throughout several group discussion sessions, we conduct animated discussions with participants who have different backgrounds. As a result, opinions from various points of view were invloved to the final presentations. Our group of four (two Italians from Milan, one Chinese from Chalemers and I) suggested a VtoX system contibuts to road safety, and the points on technical aspects with possible business model were appreciated.

This Summer School was the very first opportunity to visit other country for academic purpose for me. Not only academic aspects of the Summer School, but the time I spent with other participants from all over the world was extremely impressive for me. It was interesting to share culture, region and private dream with them while drinking beer in local bar after dinner. Network and bond between us still give me strong impression even after I came back to Japan.



Example of Urban Mobility and Group Photo After the Competition



Guided tour of IKA
(A Research Institute in University)

employees and to read menu. In addition, during my stay in Brussels, I used French to communicate with local people there, also. (I have five years of experience to learn French in Japan.)

LANGUAGES

Throughout my trip, I used English almost everywhere since I only knew few German words. The program was organized in English. Every participants, staffs and guest speakers have no problem with communication in English. (Reference; my TOEIC score was around 900 which was measured one year prior to the departure.) Some participants use their common languages for example German, Mandarin or Italian to communicate in their group out of the program.

Not every local people in Aachen speak English fluently. Sometimes I asked some help by local students in restaurant/bar to communicate with employees and to read menu. In addition, during my stay in Brussels, I used French to communicate with local people there, also. (I have five years of experience to learn French in Japan.)

WHERE TO FIND INFORMATION

I was introduced the opportunity to join Summer School at one of the internal events held by International Department of Tokyo Tech which took place in the middle of May. Participant from last year kindly introduced her experience at the event. My supervisor strongly recommended me to take some time for any experiences overseas, also.

After received the notification for final selections by IDEA League, I asked several information via e-mail address provided from the organizer of the program directly. The response from kind staff was very quick.

VISA

In my case, visa was not required since my total stay in Europe was shorter than the regulation of Schengen Visa.

ACCOMMODATION AND MEALS

Hotel near the university which is reserved by organizer. Accommodation fee is included in the price of program. One room with bathroom is for each participant who came out of Aachen, and breakfast was included. It takes about 15 minutes walk to university.

I took every meal while the Summer School since they were included in program. We went to cafeteria on campus for lunch and several restaurants alongside Pontstraße (a famous downtown street near the university where you can find variety of restaurants, pubs and bars.)



FLIGHT TICKETS

The program at RWTH Aachen was held in late September, and it meant that I had to buy ticket in tourist high season in Japan. Direct flights tickets were expensive, and I decided to take flight to Brussels, Belgium via Hong Kong. Since I am in the OneWorld membership, I chose Cathay Pacific for this time. They

provide variety of flight to cities in Europe from Hong Kong, they will be your possible choices.

Most of participants of the program came to Aachen by train from the other cities in Europe such as Paris, Frankfurt and Dusseldorf. They flew from those cities from their home countries.

| | | |
|-------------------------------|---|---|
| Scholarship | : | |
| -Stipend from Tokyo Tech. | : | 80,000 JPY (=615.11 Euros) |
| Transportation | : | |
| -Roundtrip air tickets | : | 1076.00 Euros |
| -Local train (Total) | : | 80.00 Euros |
| Insurance | : | |
| -Plan B by AIU Insurance Comp | : | 5,382 JPY (=41.38 Euros) |
| Accommodation | : | |
| -Hotels in Brussels + Cologne | : | 200 Euros |
| Personal expenses | : | 150 Euros |
| | | Expenses for Whole the Trip |

FINAL THOUGHTS

As a lot of people who experienced program abroad say, a person departing country and returned one after the trip is not the same. For those who wish to apply the program abroad, be relax about your language. I think I can understand how anxious you are, but your English should work after you jump out of this country. Fortunately, Tokyo Tech suggests variety of opportunities, and you will find something good for you.



Fortunately, I have almost no trouble throughout my trip. I will provide some useful tips below for your future use.

Mobile contract

Once you contract mobile services (purchase SIM card) in any EU countries, you can use mobile network via roaming while you are in EU. Since the restriction on mobile contract for foreigner in Germany was strengthened in 2015, I do not recommend you contract with mobile carrier in Germany. I purchased SIM card from BASE in Brussels for this time. You can find some prepaid SIM packages which works in Germany before you leave Japan, also.

DB Navigator

This is an official mobile app published by DB (national railway company in Germany.) You can search timetable, reserve seat and save QR code which works as handy ticket.

mytaxi/Uber

Although Uber does not operate in Germany, mytaxi will be your alternative. You can call and pay taxi with mobile app whose UI is like Uber.

Cash/credit card

In Germany, not a few restaurants and shops refuse to accept credit cards. I recommend you bring cash include coins with you. Like other countries in Europe, most of public washroom needs some coins. (According to some participants of the Summer School, sometimes you can use touchless credit cards in some washroom.)

WhatsApp

This is one of the most popular mobile app for texting in the world. Participants used it to send messages each other. It needs SMS certification when you sign up. (I recommend you finish signing up before departure.)

LinkedIn

Most of participants of the Summer School used this networking service for professionals. It is also important in networking with guest speakers.

For those who wishes to apply



Fig.1. City of Aachen

My abroad experience took place in Aachen, a small historical city near Germany's border to Belgium and Netherlands. Aachen is a town with quite amount of students within it, making the surrounding comfortable to live with. On top of that, the city is marked with homes built in the classic European architectural style, which does not exist in both Japan and my origin country, Indonesia.

The program I attended was called Mobility Summer School 2017 and was held by RWTH Aachen University. Since the program was mostly revolved around mobility, Institute for Automotive Engineering was in charge of its contents. As in for the activities, they managed to squeeze 4 lectures, 3 group discussions, 2 city/campus tours and 1 visit to IAA Frankfurt in one-week schedule, all conducted in English. The participants of this program were mostly came from European university (RWTH Aachen University, TU Delft, Chalmers University, ETH Zurich, and Politecnico de Milano). Alongside, there were participants who came from Asian universities (Tokyo Institute of Technology, Tsinghua University, and Hongkong University)

Accommodations were provided in a decent hotel near the campus where each participant got their own room. During a week of program they prepared sufficient meals as well.



Fig.2. Group Photo at City Tour



Fig.3. Final Presentation of Group Work

Series of activities were eminently well-organized it left special impressions for me even after I came back to Japan. They invited credible experts from the fields related to urban mobility. In addition, we were given lot of chances to conduct intensive discussions and group work every day, thus, making us more engaged to the topic. The highlight of this program was the trip to IAA Frankfurt 2017 where we visited the big players OEM booths such as BMW, Mercedes Benz, and Volkswagen. There we witnessed the applicable concepts of urban vehicles they are currently working on. Therefore we could have a real depiction on how to integrate all the knowledges into reality.



Fig.4. RWTH Aachen University



Fig.5. At the IAA

The person who leave for abroad experience is not the same person that returns. An intercultural experience, even only for short period of time, changes you. Maybe it is the challenge to make new friends, maybe it is the new friends you make, or maybe it is simply being together with group of people with the same goal as you. But through one way or another, the 'old you' makes way for the 'new you'. My week abroad was especially helpful in defining the steps I need to take in my next stage of life. During group and personal discussion, I was exposed to people with creative minds, outspoken arguments, and incredible experiences with different backgrounds. They reminded me that there is no such thing as boundary in achieving your dreams and goals. I become more confident, motivated, and driven. Not to mention all the knowledge I gained from the program which prepare me to be a multifaceted individual.

Prior to my departure to Germany, it was mandatory for me to apply for Germany (Schengen) visa. The required documents were valid passport, invitation letter, official photo with designated size, medical insurance, travel documents (hotel and flight booking), visa fees, and saving bank book. However, since the host university would born all the accommodation and meal expenses during the program, copy of bank book and hotel booking were no longer necessary. My preparation for the program included some readings on paper or contemporary news related on urban mobility; autonomous vehicle, electrification and hybridization, and city planning.

Below are the details of the expenses I spent for the whole trip:

| | |
|--------------------------------|---------------|
| Scholarship | |
| - Stipend from TIT | : 80,000 JPY |
| Transportation expenses | |
| - Round trip airplane ticket | : 125,000 JPY |
| - Local train (per ride) | : 120 JPY |
| Insurance fee | |
| - Plan B in AIU Insurance Comp | : 5,382 JPY |
| Personal expenses | : 15,000 JPY |

For those who wish to experience the same exposure, be active in looking up the study abroad opportunities. It could be anywhere; website, bulletins, and even cafeteria's flyer. You could also visit the international cooperation division to check out the latest opening chances, or even more, you could ask for the program that might actually fit with your educational background and interests. Above all, stop worrying too much about language barrier because you will fit in, eventually.

Idea League Summer School Program

1. Brief program overview

IDEA League founded in 1999 is a focused network of European universities. It is a strategic alliance among five leading European universities of technology. The alliance members include TUDelft, ETH Zurich, RWTH Aachen, Chalmers University, and Politecnico di Milano. This year, I participated in Summer School held in RWTH Aachen in Germany from September 26 – 30. The program is entitled “Mobility Summer School 2016” with this year’s topic focusing on “Safe, Environmental and Economic Transport”. Similar to the European alliance, there is a university consortium among top technological universities in Asia called ASPIRE, ASPIRE members include, Hong Kong University of Science and Technology, Tsinghua University, Tokyo Institute of Technology, Korea Advance Institute of Science and Technology, and Nanyang Technological University. Each year one student from each of the Asian universities participate in IDEA League. This year I represented TokyoTech in IDEA League 2016.

1.1 Program contents

Below is the detailed schedule of activities performed during the program.

| Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|-------|--|--|--|---|
| | 8:30 – 9:00 Assembly | 8:30 – 9:00 Assembly | | 8:30 – 9:00 Assembly |
| | 9:00 – 9:30 Organizational Issues and timeline | 9:00 – 10:30 Lecture “Platooning – Chances for reducing CO2” | 5:00 Meeting at RWTH main building and bus transfer to Hannover | 9:00 – 12:00 Group work competition |
| | 9:30 – 11:00 Lecture “Economic and Environmentally friendly Light- weight design” | 10:30 – 12:00 Lecture “Connected driving – Potential to improve safety and efficiency” | 10:00 – 16:00 Guided tours and individual fair time | 12:00 – 12:30 Award ceremony and end of Summer School |
| | 11:00 – 12:30 Lecture A suppliers view of the challenges for passenger car and commercial | 12:00 – 13:30 Group work “Development of technology roadmap for a | 16:00 Meeting at the parking and bus transfer to Aachen | 12:30 – 13:30 Working lunch |

| | vehicle automated driving. | commercial vehicle OEM” | | |
|---|---|---|-----------------|--|
| 13:00 – 14:00 Arrival and registration of participants | 12:30 – 13:30 Lunch | 13:30 – 14:30 Lunch | 21:00 Dinner | |
| 14:00 – 15:00 Welcome at RWTH Aachen University | 13:30 – 15:00 Lecture Optimized and active aerodynamics on HD trucks | 14:30 – 17:30 Group work | | |
| 15:00 – 15:30 IDEA League presentation | 15:00 – 17:30 Introduction to the group work | 18:00 – 19:30 Guided tour of Aachen city | | |
| 15:30 – 18:00 Introduction of participants | 18:00 – 19:30 Guided tour of ika | | | |
| 18:00 – 19:30 Check in and Dinner | 19:30 Dinner | 19:30 Dinner | | |

1.2 Why I applied for the program and what I learnt from the Summer School.

I have always been fascinated by the way transportation has changed and ruled human lives. This 21st century global connectedness, ability to move people as well as materials from one part of the world to another in matter of hours has been the result of innovation in the field of transportation. However, the need to reduce time, cost, and corresponding environmental impact and increase safety has been gaining unprecedented attention recently. A global platform like “IDEA League” provides new generation of researchers with an opportunity to foster cooperation, stimulate innovative ideas, and learn from each other. The topic of this year entitled “Safe, Environmental and Economic Transport-Meeting future transportation challenges” itself is intriguing and a subject matter I have always been keen to learn about.

Even though the duration of the program is very short, the program covered various lectures regarding new technological possibilities for a safer, more economical and environmental friendly mobility given by academic and industrial experts along with a study trip to the IAA commercial vehicles. Through the Summer School I came to know about many technologies and concepts like platooning, hybrid electric vehicles, battery electric vehicles, light weight design, aerodynamics, drive trains, automation and connectivity, and ergonomics which aims

to reduce energy consumption and thus CO2 emissions while improving the efficiency of vehicles.



Pic 1: Group members with prize



Pic 2: One of the vehicle in IAA, Hannover

Additionally, the program provided me with the opportunity to connect with excellent students from various different countries while testing my own limits and capabilities, I got an opportunity to be a part of an enriching international knowledge exchange. In addition to technological and research based knowledge gaining, the program provided me with intercultural experience, an opportunity to work amid scholars from different academic and cultural backgrounds.

1.3 Final thoughts



Pic 3: Evening view of Aachen city

The activities during the program were basically intensive lectures on current innovation in commercial vehicles and a group work where we had to prepare technology roadmap till year 2025 for an original equipment manufacturer (OEM). Working with six different people from different universities, different countries during the group work was challenging but worthy. Given a timeline of less than half a day we were supposed to prepare a roadmap

for a commercial vehicle original equipment manufacturer. The group work was enjoyable and everyone was hardworking as a result we won the 'first prize' with 25 Euros as a gift to each of the students.



Pic 4: Koln Cathedral

Apart from the coursework the program arranged a short tour of Aachen, which is a small nice and beautiful city. Aachen is a very nice city, with many historic monuments. The people I met there were awesome, ended up having quite a few cool friends within such a short stay. I learnt about many different culture, food, country (mainly European) during my stay. Overall the program was very interesting, though tiring it was much fun.

I am very grateful to Tokyotech for the support it has provided me for the program. It would have been difficult for me to have this great experience without this support. I express my sincere gratitude.

IDEA League Mobility Summer School Summer School in Aachen University: Safe and Sustainable Transport

1. IDEA League Summer School Program

Information about the program

The overseas experience that I participated this September was through IDEA League Mobility Summer School. IDEA League is founded in 1999 and is a network of several European universities such as TUDelft, ETH Zurich, RWTH Aachen, and Chalmers University. This is a collaboration program which leads technology and science activities in education, research, and quality assurance. This has several summer school programs in summer held by 4 different universities. IDEA League also invites several Asian universities and students to participate their program. The title of summer school program which was held in Aachen University, Germany.

The detailed information is as the following:

- Title: Safe and Sustainable Transport: Future passenger and freight transportation challenges-solutions and trends
- Place: RWTH Aachen University, Germany
- Period: September 22, 2014 – September 26, 2014
- Students:

The reason for applying the summer school program

What is extraordinary about Tokyo Institute of Technology is its unique multicultural scientific exchange between many outstanding universities in the world. Especially, when studying in Department of International Development Engineering, more opportunities are given to students who fulfill eligibility of any programs. Through IDEA League 2014, I may have an opportunity to take advantage of scientific exchange over a variety of students from different backgrounds. The other reason is to be motivated through enthusiastic discussions and debates by young scientists in the same field. I am certain that this future experience will definitely stimulate my research motivation and future plan as a researcher. These are the reasons why I would like to apply for IDEA League program 2014 in order to achieve one step forward as a young enthusiastic motivated scientist.

2. Introduction of RWTH Aachen University

Visiting Aachen, Germany



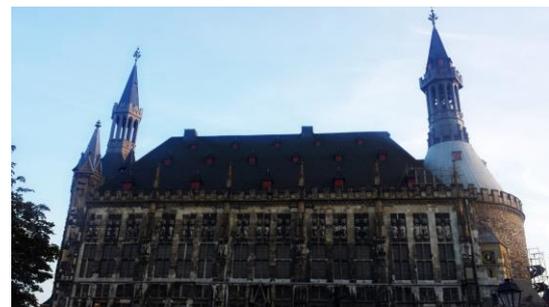
Aachen is a small city located in western Germany which has about 240,086 residents. Surprisingly, the number of RWTH Aachen University students is over 40,000 in the year of 2013, which is about one sixth of the total population. It usually takes two or three hours from Frankfurt by train and one and a half hour from Dusseldorf by train. I took a direct flight from Narita airport to Dusseldorf airport and then took train to Aachen University this time.

Aachen has a famous bread-like cookie called Printen. The taste is similar to ginger

bread and originally it was sold by pharmacists since several ingredients inside were considered to be beneficial to health. The other famous thing about Aachen is Aachen Cathedral located in center of the city. It was one of the first 12 items to be included in entry list of UNESCO world heritage sites in 1978. I had a chance to visit the place and taste Printen during my short stay in RWTH Aachen University.



Pic. 1. Famous Printen in Aachen



Pic. 2. Aachen Cathedral

RWTH Aachen University

RWTH Aachen University was established as Polytechnicum in 1870. It is one of Germany's Universities of Excellence with strong emphasis on technological research. About 20% of total students are international students and their number exceeds more than 6,500. The remarkable research is highly emphasized on electrical, mechanical engineering, computer sciences, physics, and chemistry and so on.



Pic. 3. RWTH Aachen University Main Building (left) and Super C (student center, right)

3. Program Outline

The schedule of summer school program is listed in Table. 1. The program consists of 5 days program with theoretical and applied lectures, visit of IAA Commercial Vehicles held in Hannover, guest lectures by industrial experts, and deepening group work.

Table. 1. 2014 Mobility Summer School Program for RWTH Aachen University

| Day 1: Welcome at RWTH Aachen | Day 2: Safe and Sustainable Transport and City Tour | Day 3: Safe and Sustainable Transport and Group Work | Day 4: Study trip to IAA Commercial Vehicles | Day 5: Competition and award ceremony |
|-------------------------------------|---|--|--|---|
| | 09:00-9:30: Organizational issues and timeline | 09:00-10:00: Customer- oriented vehicle design Nils Neumann, Institut für Kraftfahrzeuge, RWTH | 06:00-10:00: Bus transfer to Hannover | 09:00-12:00: Competition (Presentation of Group work result) |
| | 9:30-10:30: V2X for Road Safety and Efficiency Christian Röss, Ford | 10:00-11:00: Future technologies of commercial trailers Stefan Deutsche, Schmitz Cargobull | 10:00-16:00: IAA Commercial Vehicles (guided tours: SchmitzCargobull , MAN, Scania, DAF) | 12:00-13:00: Award ceremony and end of summer school |
| | 10:30-12:00: Future Mobility, ADAS and | 11:00-12:00: Introduction to group work | | 13:00-14:00: Lunch |

| | | | |
|---|---|--|-------------------------------------|
| | Sustainability Dr. Wolfgang Bernhart, Roland Berger Consulting | Alexander Busse, Institut für Kraftfahrzeuge, RWTH | |
| | 12:00-13:00: Lunch | 12:00-13:00: Lunch | |
| 13:00-14:00: Arrival and registration of participants | 13:00-15:00: Future Mobility Perspectives Richard Jaimes, Continental | | |
| 14:00-15:30: Welcome at RWTH Aachen Dr. Bidian (Secretary general of IDEA League) Prof. Schmachtenberg (rector RWTH Aachen University) Dr. Urban (vice director ika, RWTH) | 15:00-17:00: Future Technologies of Commercial Vehicles Dr. Markus Baum, Daimler Commercial Vehicles | 13:00-18:00: Group Work | |
| 16:00-18:00: Introduction of participants | 17:00-18:30: Guided City Tour of Aachen | | 16:00-20:00: Bus transfer to Aachen |
| 18:00-19:00: Free time and check-in | 18:30 -: Dinner | 18:00-: Dinner | |
| 19:00 - : Dinner | | | 20:00-: Dinner |

4. Experiences in 2014 RWTH Aachen University Summer School Program

Theoretical and applied lectures

We received 6 lectures within 5 days and were asked to present group work at the end of the program utilizing knowledge and insights we gained through lectures. The six lectures are the following:

1. *V2X for Road Safety and Efficiency:*

Vehicle to vehicle communication in Intelligent Transport System to secure safety of drivers and society

2. *Future Mobility, ADAS and Sustainability:*

Connected cars and automated cars – implications for the industry

The trend in megacities, developing countries

3. *Future Mobility Perspectives:*

Methods for future research – forecast, trend, scenario

Need to think and understand complex connections in society

4. *Future Technologies of Commercial Vehicles:*

Active safety technologies

5. *Customer-oriented vehicle design:*

Customer analysis and holistic market approach

Understanding correlation of socio-economic change, mobility behavior of customer groups

6. *Future technologies of commercial trailers:*

Fuel consumption reduction by aerodynamics study and weight reduction

2014 IAA Commercial Vehicles Show

IAA Commercial Vehicles Show is the leading International trade fair for business, automotive, transportation, logistics, automobiles, automotive parts, automotive services, service station supply, etc. New technologies are introduced at the place. Some of the keywords are: light weight design, new chasis design, and research on aerodynamics, low fuel consumption, etc.



Pic. 4. and Pic. 5. Visit to IAA Commercial Vehicles show

Group work presentation and competition

On the third day of summer school, the students were asked to be divided into three groups and present their analysis on the last day of the summer school. The topic of group work was configuration of vehicle powertrains best fitting to demands of specific customer group and scenario of an IDEA League Region 5 years from today. We were given some data about customer targets, different scenarios, information about technologies to reduce CO₂ emissions, etc. and utilize these data to set our parameters and reasons to choose one particular vehicle configuration for each targeted customer group. The work was closely related to marketing and automotive engineering. We had 4 different nationalities in one group: India, China, Germany and Korea and 3 different majors in one group: mechanical engineering, transport planning, and automotive engineering. Successful key factors for winning 2nd place in competition are active discussion,

dividing the tasks while utilizing individual's strengths, high efficiency.



Pic. 6. Group Photo and Pic. 7. Presentation slide from competition day

5. Conclusion

It was actually 3rd valuable abroad experience while studying in Hanaoka Lab, Department of International Development Engineering. The three are the following: British Science Museum Internship, London, Great Britain, 2012, AOTULE International Student Conference, Bangkok, Thailand, 2013, IDEA League Summer School Program, Aachen, Germany, 2014. There are a lot of intelligent young researchers outside and it is always good idea to get stimulation by interacting with people from different disciplines and backgrounds. Although group work seemed to be challenging and complex at first but our team struggled together in order to produce meaningful output. I really am grateful again to have such a valuable opportunity via internship and summer school program here in Titech.