INSTITUT FÜR PHOTOGRAMMETRIE (IFP)

Excursion to IGI Company

22.10.2015 – 23.10.2015

GeoEngine Master Students (3rd semester) and
Geodäsie und Geoinfromatik Master students (1st semester)

Figure 1: Group photo in front of Basilica of St. Castor

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Introduction

The Institute for Photogrammetry has organized this excursion in order to introduce us (GEOENGINE and GUG students) to IGI – company (Siegerland, north of Frankfurt), where this company deal with the development of photogrammetry and laser scanning techniques. And IGI is one of the world's leading geospatial companies and conducts business worldwide. Integrating various sensors with our positioning system and offering complete sensor solutions for airborne and mobile survey missions are our areas of expertise.

The excursion also contained tour around the city of Koblenz that is nicely located at rivers Rhine and Moselle. The tour was started at the place where the basic principles of photogrammetry were developed by Albrecht Meydenbauer. The tour around the city opened our minds to the culture, influence and improvement to the city by the many companies of optics. The following description is the detail about our journey in these 2 exciting days.

IGI Company - Kreuztal

Company Presentation

IGI mbH is a leading company in the photogrammetry field. This company which is based in Kreuztal, Germany was founded in 1978. This company mainly focuses on managing the airborne sensor systems for flight guidance, sensor control using GNSS (Global Navigation Satellite System) and INS (Inertial Navigation Systems). They offer a worldwide technical support to their customers including the Antarctica. Company support and sales are from the headquarters itself and also from their partnering company from all over the world.

They showed during the presentations to us several technologies like AEROcontrol Technology and GNSS/IMU – Technology .Also the Use of Oblique Aerial Images from Multi Camera Systems with practical examples.

German food in IGI restaurant

Several kinds of delicious German foods which were mostly suitable for such a group of international students. Also we had a rare opportunity to have a discussion with some of IGI-members about the company, applications and future opportunities to students in the company due to master thesis or even internship.

Figure 2: German restaurant

1. Presentation Railmapper

IGI Company offers a new rail mapping system. Based on the world's most accurate mobile mapping system, StreetMapper, the new RailMapper system is applicable for clearance measurement, sign detection, new construction, refurbishment and monitoring of rails and tunnels. IGI with its partners designed this new system and established a complete solution with related workflow. By using the unique modularity of IGI equipment, one mobile mapping system can be used for various tasks and applications. Using the very latest laser scanning technology, precision navigation and advanced data processing coupled with innovative system design, RailMapper delivers proven accuracies in the most challenging environments.

The system can be equipped with different types of laser scanners which differ in prescision and range. A typical solution comprises of 2 to 3 scanners to get the best possible results. In addition different kind of RGB and video cameras for integration are available. Also the DigiTHERM sensor is compliant to deliver digital thermal imagery as shown in the figure 3.

Figure 3: RailMapper

Software Interface of Mapper in Real Time The RailMapper is oriented onto the tracks of the rail and aligned accurately with the help of video cameras fixed at the four rubber wheels. RailMapper offers a 360- degree field of view with different sensor options. RailMapper can be operated on speeds above 100 km/h and is a complete system solution with established workflow. The system can be equipped with different types of laser scanners which differ in precision and range. A typical solution comprises of 2 to 3 scanners to get the best possible results. In addition different kind of RGB and video cameras for integration are available.

The onboard navigation system includes a GNSS receiver, a fiber optic gyro-based Inertial Measurement Unit and the latest Direct Inertial Aiding Plus (DIA+) to assist in areas of poor GPS/GLONASS reception. Laser scanners have rotating wheels of frequency 200 Hz and IMU can measure movements with 500 kHz. The equipment is supported by power supply and installed in specific designed car, which also has possibility to go on rail. For the stability of the equipment, they are fixed with special mounts with screws. In order to get very high density data coverage a speed of 20 km/h is required. These data afterward can be used for monitoring, refurbishment and new construction design. With the on board screen, the device can be monitored with its various functions.

One of the advantages of this system is Ease of Use:

RailMapper has dedicated control touch-screens that show status information and allows the data capture parameters to be adjusted. Operations that require a higher level of skill - such as GNSS processing - are undertaken post-mission using sophisticated software for processing the collected navigation data, laser survey measurements and camera, thermal or video images as shown in the figure below.

Figure 4: RailMapper – railway measuring

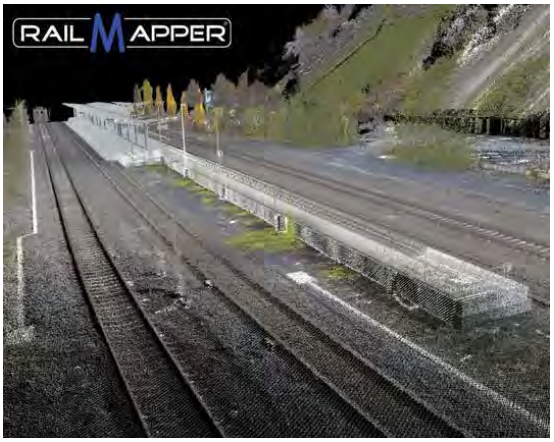

Figure 5: RailMapper – railway station

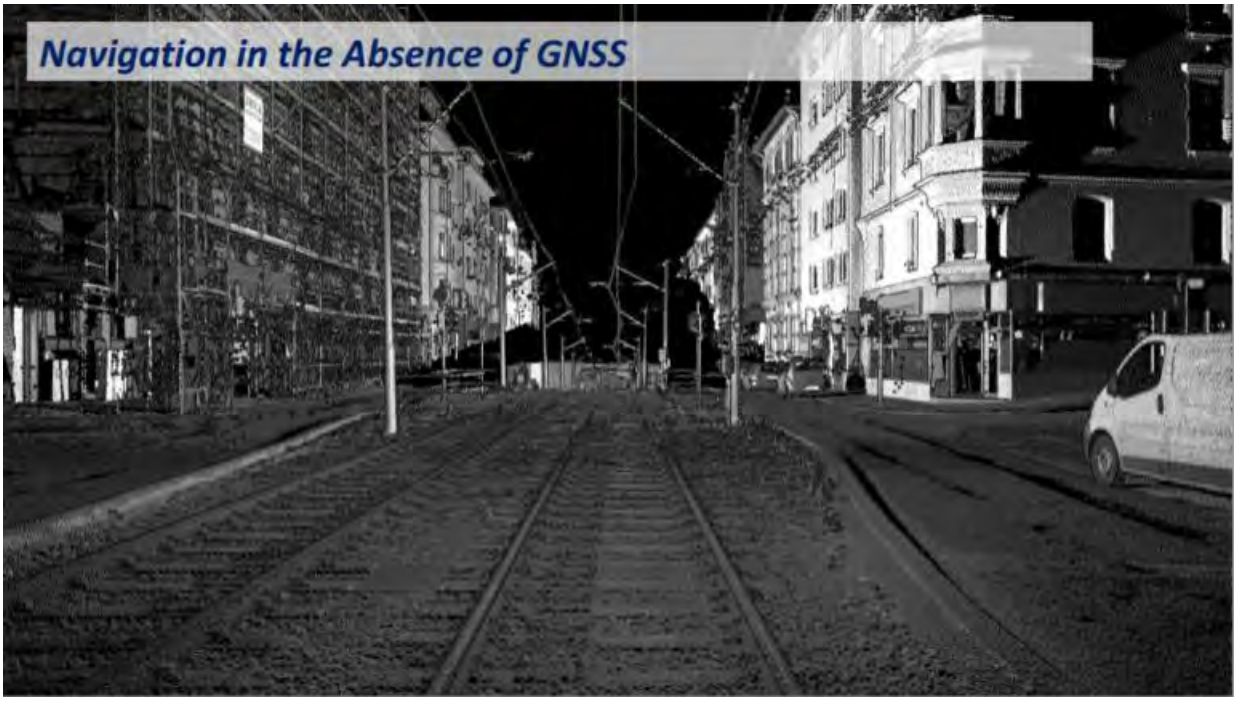

Figure 6: RailMapper – Stuttgart Marienplatz

2. Presentation: Gyrocopter with LiteMapper

One of the IGI products is the Gyrocopter Lite Mapper, about which we had an interesting presentation in Kreuztal. This product is designed to be in between a normal aircraft and a UAV, due to the fact that the main purpose is to cover surfaces which are too big for a normal UAV and for which the price will be too high by using a big aircraft as shown in the figure 7.

Figure 7: Gyrocopter with LiteMapper

Main characteristics:

- Manned aerial system
- Velocity: 145 km/h
- Price area: 90000 euro
- Fuel consumption: 18 l/h
- Fuel capacity: 100 l
- Pay load: 180-290 kg
- Takeoff and landing: 200 m.

On this gyrocopter we can implement three different configurations, for the use of:

- Photogrammetry:
  Flight & Sensor Management- CCNS-5 GNSS/IMU-System- AEROcontrol Digital Camera-DigiCAM-40/50/60 Stabilised Mount.
- Airborne laser-scanning:
  Flight & Sensor Management- CCNS-5 GNSS/IMU-System- AEROcontrol Digital Camera-DigiCAM-40/50/60 Airborne Laser Scanner- LiteMapper.
- 3D city modeling:
  Flight & Sensor Management- CCNS-5 GNSS/IMU-System- AEROcontrol Digital Cameras-DigiCAM (1x nadir, 4x oblique).

System components: See the figure below:

- Inertial navigation system (IMU combined with GPS)
- AERO control + Digi control
- CCNS -5 (computer control navigation system)
- GPS antenna
- Laser scanner.

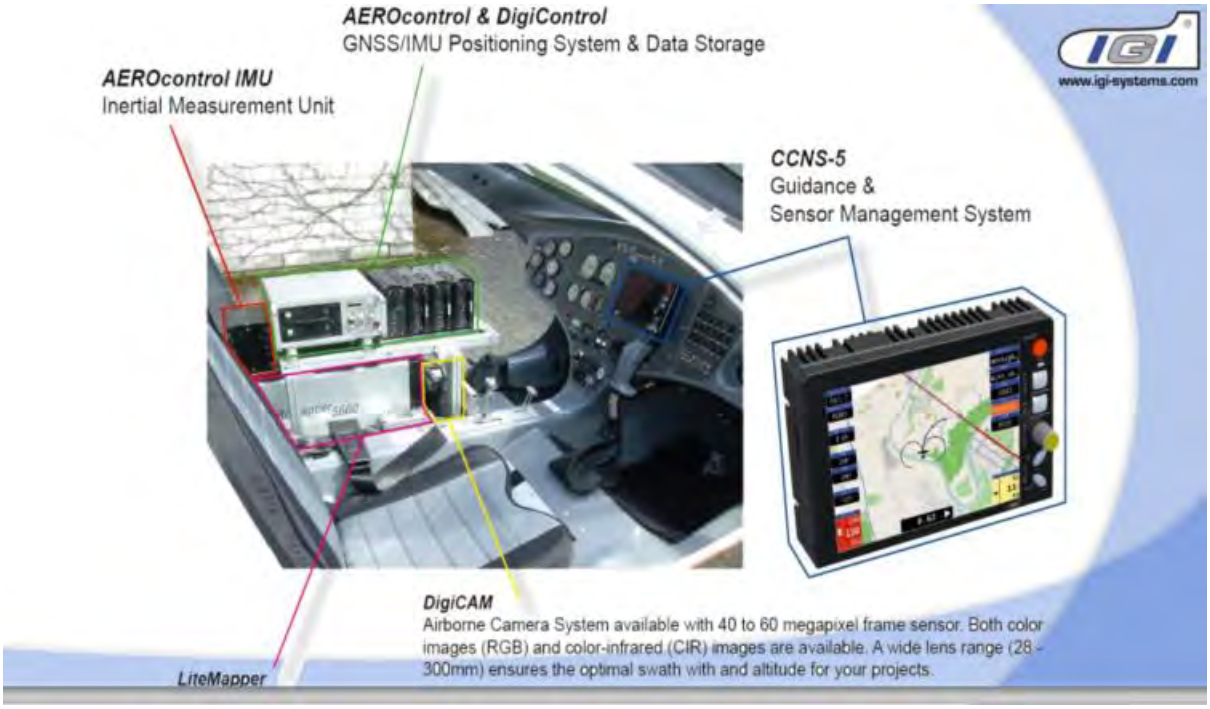

Figure 8: LiteMapper system

Concerning the mission planning, we had a presentation from one of the IGI's engineers. He showed us some examples about how to use the software, regarding the mission planning. For this he used the IGI plan, a software developed by their company. The concept of the company is to provide to its customers all necessary tools, starting from planning a mission, collecting the data and processing, up to delivering the final product. All the system components are very flexible and can be adapted to the customer's wishes. Figure8 shows two examples using IGIplan.

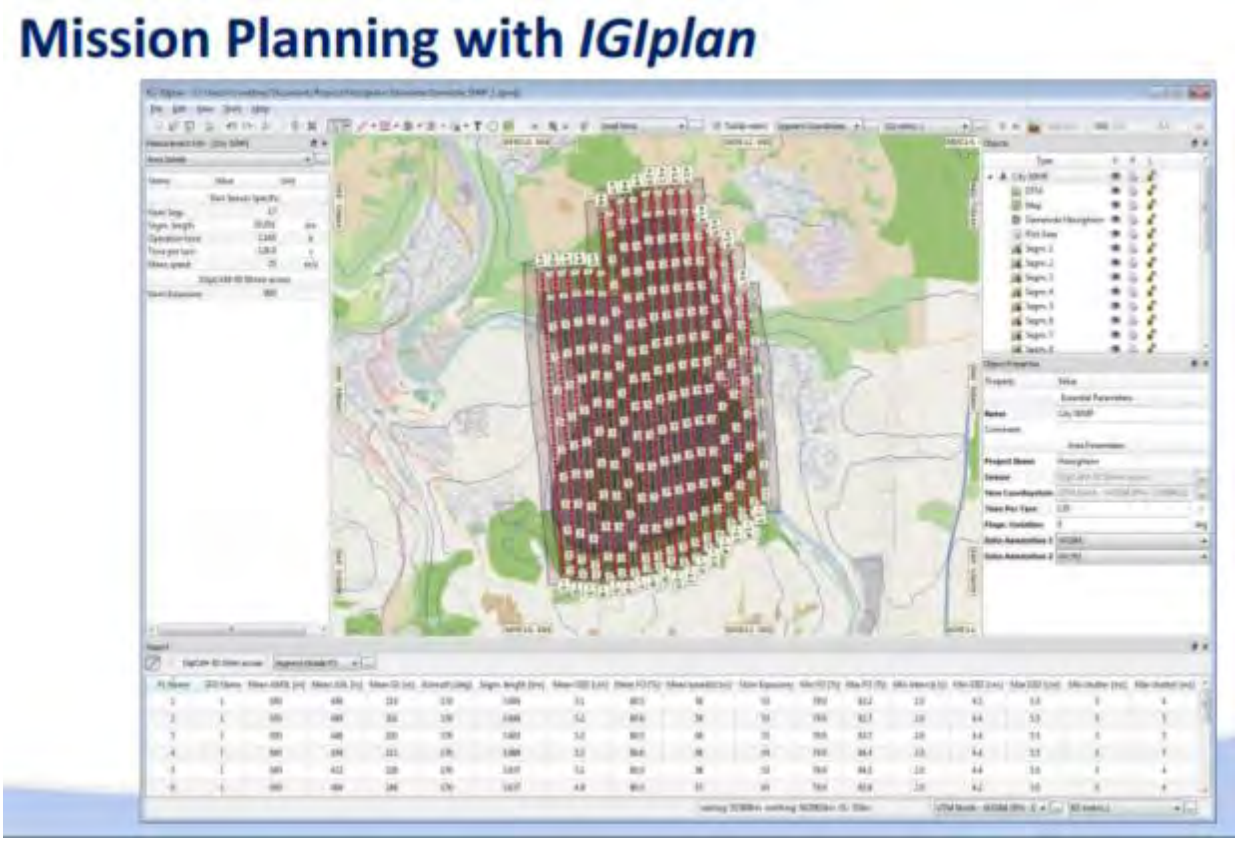

Figure 9: Mission Planning with *IGIplan*

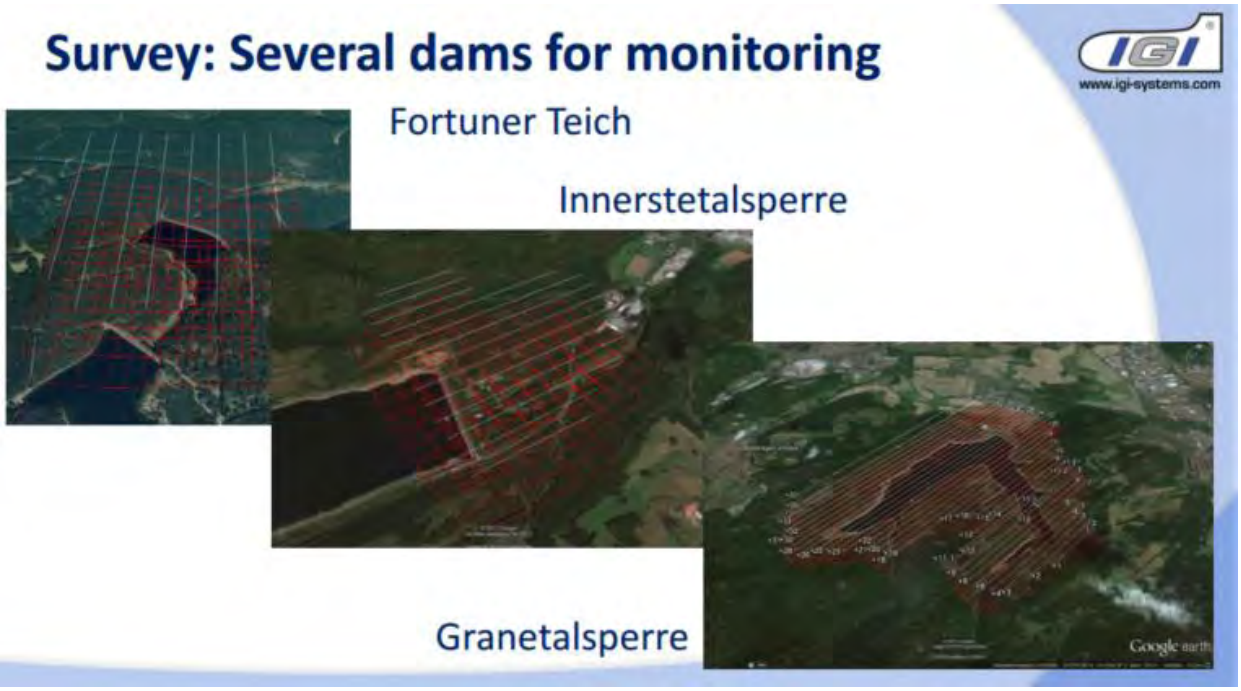

Figure 10: Survey

Gathering at Youth Hostel Lahntal-Jugendherberge

Our Youth Hostel, the Lahntal Jugendherberge, is a really extraordinary place to stay in it, because of his location and the place and great view of the city Bad Ems.

After the dinner we have attended an amazing presentation about Albrecht Meydenbauer's life, hold by the founder of the IGI company professor Albrecht Grimm.

Figure 11: Albrecht Meydenbauer

3. Presentation: History part

At the end of the first day, Professor Albrecht Grimm gave a nice presentation of Albrecht Meydenbauer, history of photogrammetry and Meydenbauer`s Archive. When talking about the history of Photogrammetry, Albrecht Meydenbauer is a monument that cannot be missed, especially for us who are in German. Meydenbauer was born in Tholey in 1834, and he was educated to be an engineer.

In that time, camera was just appeared and Meydenbauer already gave his attention on this wonderful machine and made professional surveying cameras by himself. Through these tools, he measured not only in German but also in other countries, which contributed for the reconstruction of some historical buildings.

Professor Grimm introduced that before the first introduction of the term 'Photogrammetry' (Die Photogrammetrie) in Germany in 1867, it had some other names for instance 'Ikonometrie' and 'Photographometrie' which were operated during that time. He also pointed out that the brothers, Pujo and Fourcade, Published the book 'Photographische Goniometrie' which theoretically illustrated the geometry relationship in photogrammetry.

Professor Grimm also mentioned that the military was the first client who was interested in Photogrammetry.

After a short excursion to the roots of photogrammetry, Professor Grimm presented us about Meydenbauer's Archive. A large amounts of images were collected by Meydenbauer, which is a big treasure for the reconstructions of the historical monuments and sites, one of the splendid examples is the case of Bauakademie's reconstructino. However, most of the files are unavailable due to some historical and copyright reasons. In the reconstruction point of view, the image quality and the compatibility between modern photogrammetry and photogrammetry at that time makes sense. Nowadays photogrammetry puts forward higher requirementsand constrains in the data sources.

The last part was to make questions to Professor Grimm, this was when we got to know Professor Grimm is working on his book. We are all looking forward to the day of the publication of the book.

Then we had a rare opportunity to discuss with our professor about the science and daily topics out of the class, enjoying the taste of well-known beer from this part of Germany.

Figure 12: Evening discussion

Excursion to Koblenz

After having spent the first day diving into the technicalities and literature of Photogrammetry, the second day started as a light hearted fun trip. Driving for about an hour, we reached our destination, the historically rich city Koblenz at 10'oclock.

To say the least about the uniqueness of the city, no road sign was required to tell us if we had reached it because it welcomed us with its outstanding architecture. At 10:30, we were joined by our guide who not only knew the city by heart but also surprised us with the most interesting historical facts.

Walking us through the Streets, the guide narrated the background behind each astounding monument and the beautiful churches. The city's name originated from the Latin adverb "Confluentes" which means merging of the rivers. Rightly names so, the city stands between both the banks of Rhine as an eminent peace in time. The exact place is called the "Deutsches Eck" (German Corner) with its monument of the German Emperor William on a horse back.

Figure 13: Emperor William

Churches as old as 400 year old with generation of wars and development sustaining the city to this day, it is a landmark on the face of this country. The French occupied the city twice in the last 400 years trying their best to make it a part of the French empire but the Germans kept a strong hold of it.

Figure 14: In side of the church

Figure 15: Entry to a little courtyard

Even nature has been extremely kind on this city in terms of beauty. The topography of the city and the varying altitudes make it a favorable tourist spot. Not only that but the flamboyant trees ranging from a strong pink to a bright yellow color seem like little bits of summer in the chilly winters.

Figure 16: Ship of the river Rhine

And for sure, we did visit the Koblenz St. Castor's cathedral, the church that was surveyed by Meydenbauer himself!

Back to Stuttgart

On our way home, this was as interesting as the rest of the trip.

Figure 17: Photo out of the bus with castle

A special thanks to IGI who sponsored the trip and Institute for Photogrammetry around Dr. Cramer who organized the trip.