



**JADE UNIVERSITU OF APPLIED SCIENCES**

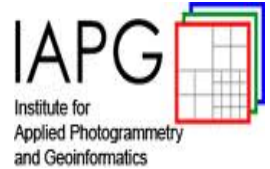
**KYIV NATIONAL UNIVERSITY OF CONSTRUCTION AND ARCHITECTURE**



# COOPERATION PROGRAM

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SUMMARY REPORT



*jade-hs.de*  
*iapg.jade-hs.de*

# UNIVERSITY OF APPLIED SCIENCES THE INSTITUTE FOR APPLIED PHOTOGRAMMETRY AND GEOINFORMATICS (IAPG)

University of Applied Sciences is the leading higher educational establishment in Lower Saxony's and includes a number of specialized institutions in three cities Olsen, Vilhelmshafen and Oldenburg.

## **Facts and figures**

2009 year of foundation

6 faculties

3 campuses

7500 total number of students

37 Bachelor-courses

10 Master-courses

500 number of employees

180 number of professors

90 partnerships/foreign contacts (in 30 countries)

# KYIV NATIONAL UNIVERSITY OF CONSTRUCTION AND ARCHITECTURE (KNUCA)

Kyiv National University of Construction and Architecture (KNUCA) is a leading institution in higher education in Ukraine with a specialization in construction. More than 90% of graduates work in construction industry, therefore the acquisition of practical skills is a priority for training of future specialists. Great attention is paid to expanding and improving the quality of cooperation with related universities of Ukraine and Europe.

## Facts and figures

1930 year of foundation  
6 faculties  
8 campuses  
7500 total number of students  
21 Bachelor-courses  
35 Master-courses  
800 number of employees  
136 number of professors  
43 partnerships/foreign contacts (in 20 countries)



*knuba.edu.ua*

# THE FIRST STEP

- First visit prof. Luhmann Thomas to Kyiv 2011
- Visit Kravchenko Julia and Kvartuch Tetiana to IAPG in 2013

The main activities was including:

- Introduction of Institute of Applied Photogrammetry and Geoinformatics
- Presentation of KNUCA
- Training of modern measurement equipment that included practice of calibration camera and work with laser scanners
- Visit to “Axios services”
- Visit to Haffencity University, Hamburg
- Research of image analyst in software ArcGIS, ERDAS.
- Visit to Institute fuer photogrammetrie und geoinformation (IPI), Leibnis Universitaet Hannover

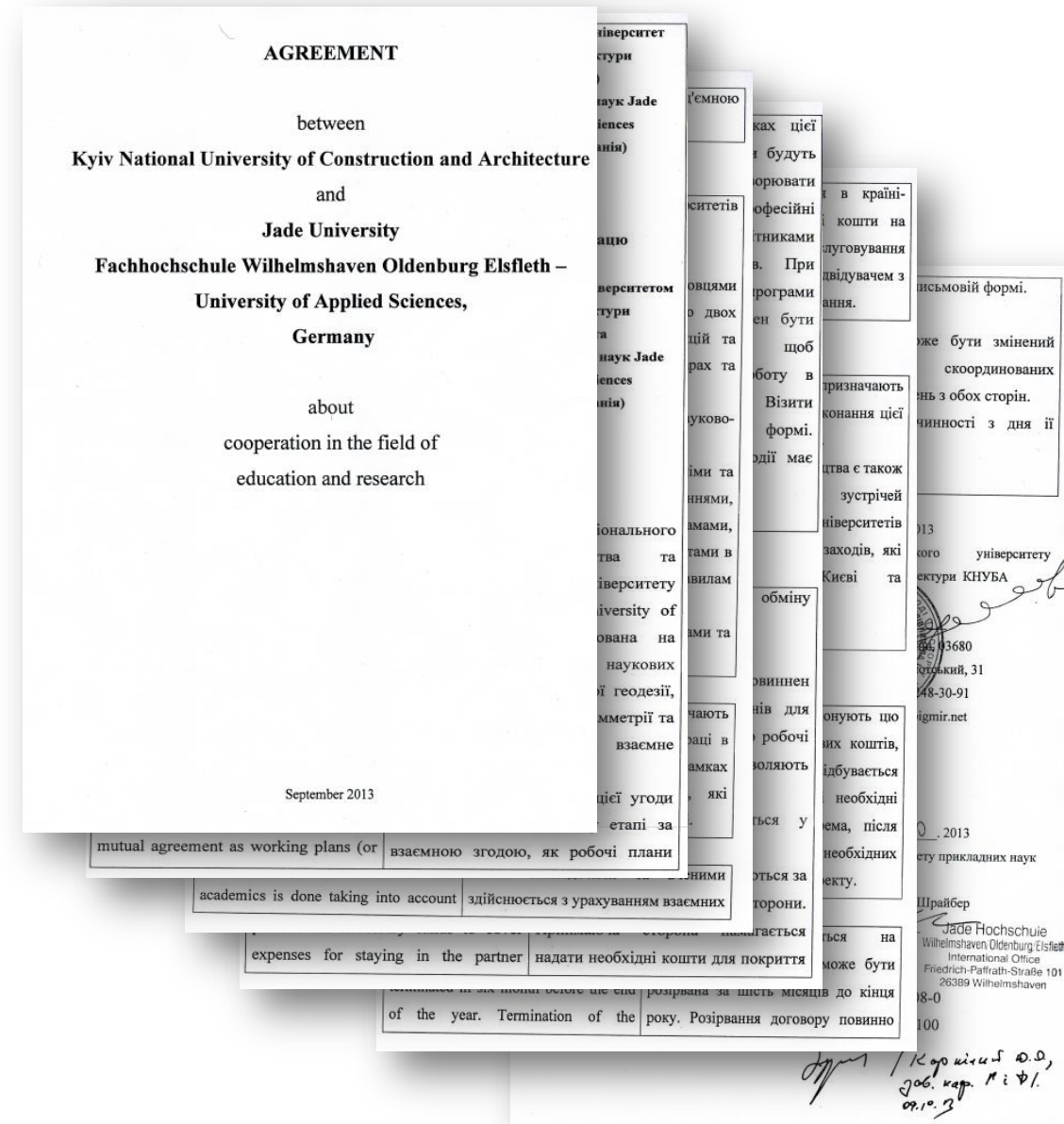


Presentation of KNUCA at IAPG

**The important part of visits was discuss join project between KNUCA and Jade University. The proposition with detail plan of project was prepared**

# THE AGREEMENT ON EDUCATIONAL COOPERATION

- Exchange of lecturers
- Exchange of student
- Cooperative research projects
- Possibilities of broadening cooperation
- Regular staff meeting
- **Start 29.10.2013**



# SCIENTIFIC VISIT TO JADE 2014

The members of the Department of Geoinformatic and photogrammetry Kravchenko Iuliia and Kvartuch Tetiana was invited to scientific-oriented visit at Institute of Applied Photogrammetry and Geoinformatics in Oldenburg for the period of July 1 to August 9, 2014.

## **THE MAIN ACTIVITIES WAS INCLUDING:**

### **Preparing workshop in KNUCA at November 2014**

Preparing Tempus project

### **Discuss exchange students between KNUCA and Jade University in 2015**

Training PhoX

Lecture Remote Sensing at GIF

Training iWitness

Training of modern measurement equipment that included practice of Fringe Projection and Motion Tracking

Training Laserscanning

Training AICON 3D Studio

Training Laser Scanning, includes software for processing data  
Presentation “Research of Remote Sensing and Laser scanning in KNUCA”, Kvartuch Tetiana

Presentation “Infrastructural approach to the creation of modern urban cadaster”, Kravchenko Julia

Visit to Municipality Oldenburg, urban planning, geo-information

Visit to Technical University, Dresden

## **THE MAIN RESULTS INCLUDES:**

Participation KNUCA in Tempus project

Schedule of workshop in KNUCA at November 2014

Defined main direction of activities for realization students' exchange

List themes of Remote Sensing (within workshop in KNUCA at November 2014) according Ukrainian curriculum

Metrological materials for practice labs by PhoX (in English and Ukrainian)

Metrological materials for practice labs by iWitness (in English and Ukrainian)

Metrological materials for practice labs by Laser Scanner (in English and Ukrainian)



# WORKSHOP PHOTOGRAMMETRY AND LASER SCANNING

- Kyiv – 3-7 November 2014
- Prof. Dr.-Ing. habil. Thomas Luhmann
- Participants: students 3th semester of specialty "Geographic Information Systems and Technologies", "Geodesy", "Land management and cadaster
- Main topics: Close-range photogrammetry and Laser Scanning
- Evaluation of results

# WORKSHOP PHOTOGRAMMETRY AND LASER SCANNING

## CLOSE-RANGE PHOTOGRAMMETRY

- Lecturer Professor Thomas Luhmann
- Assistants I. Kravchenko, T. Kvartych

- **Content:**

### LECTURES:

1. Fundamentals and Applications
2. Mathematical Concepts and Camera technology and calibration
3. Image Processing and Modelling

### PRACTICUM

1. Practical exercises of photogrammetry using the program PhoX
2. Camera calibration with iWitness Image acquisition with own digital camera or professional camera
3. Practical work at AICON 3D Studio





# WORKSHOP PHOTOGRAMMETRY AND LASER SCANNING

## LASER SCANNING

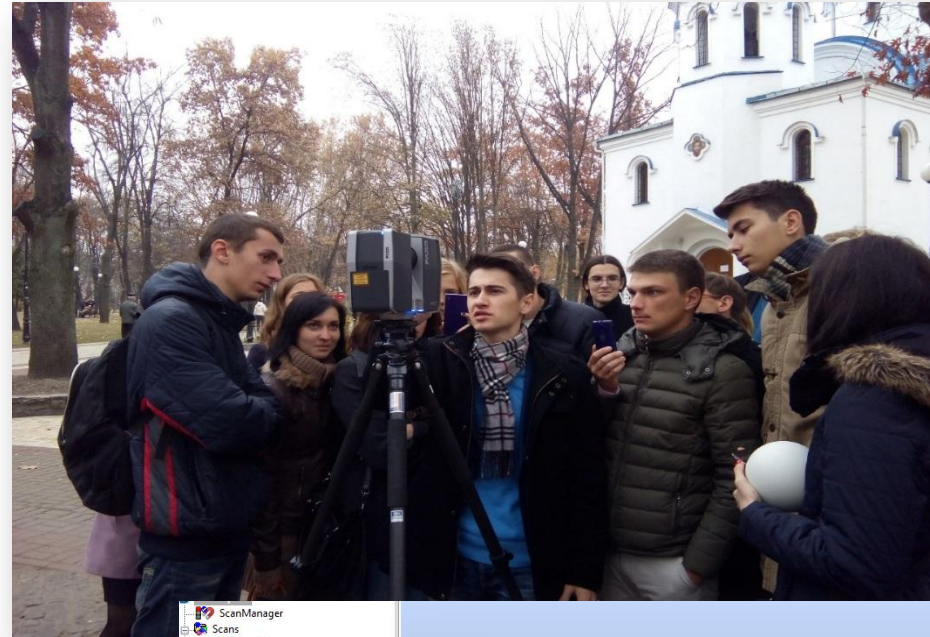
- Lecturer Thomas Willemsen
- Assistant D.Gorkovchuk
- **Content:**

### 1. Lecture Terrestrial Laserscanning

- 1.1. Total station (MS 50, VX)
- 1.2. Basics (Working with Laserscanner, Method of the distance measurements)
- 1.3. Measurement uncertainty of terrestrial Laserscanner
- 1.4. Registration / transformation of the point clouds
- 1.5. Special interests
- 1.6. Impressions (Applications)

### 2. Practicum

Laser scanner FARO Focus 3D 120



# WORKSHOP PHOTOGRAMMETRY AND LASER SCANNING

## • EVALUATION OF QUALITY

1. Is the learning outcome well-defined for the course?
2. How is your background knowledge related to this course?

### Lectures

3. What do you think of the content of the lectures?
4. What do you think of the lecturers' subject competence?
5. Did the lecturers succeed in transferring new knowledge to the students?
6. Did the lectures increase your interests in the subjects?

### Exercises/lab work

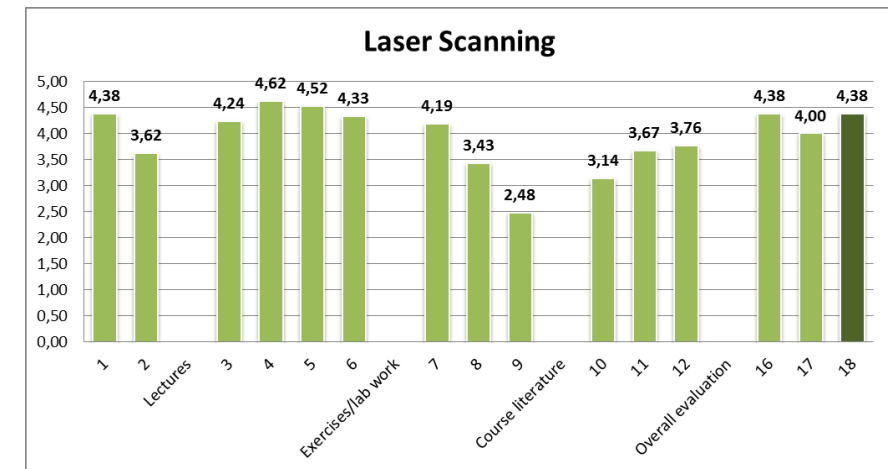
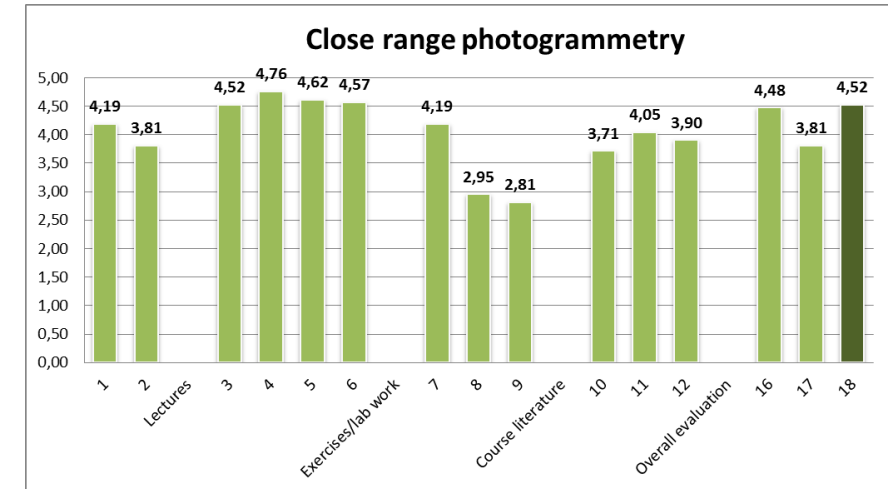
7. How is the content of the exercises?
8. Are exercise problems too difficult? (1=very easy; 5=very difficult)
9. Is the lab facility satisfactory for performing the exercises?

### Course literature

10. Is the course literature/material sufficient?
11. Is the course literature/material easy to understand?
12. How are the written instructions for exercise problems/lab work?

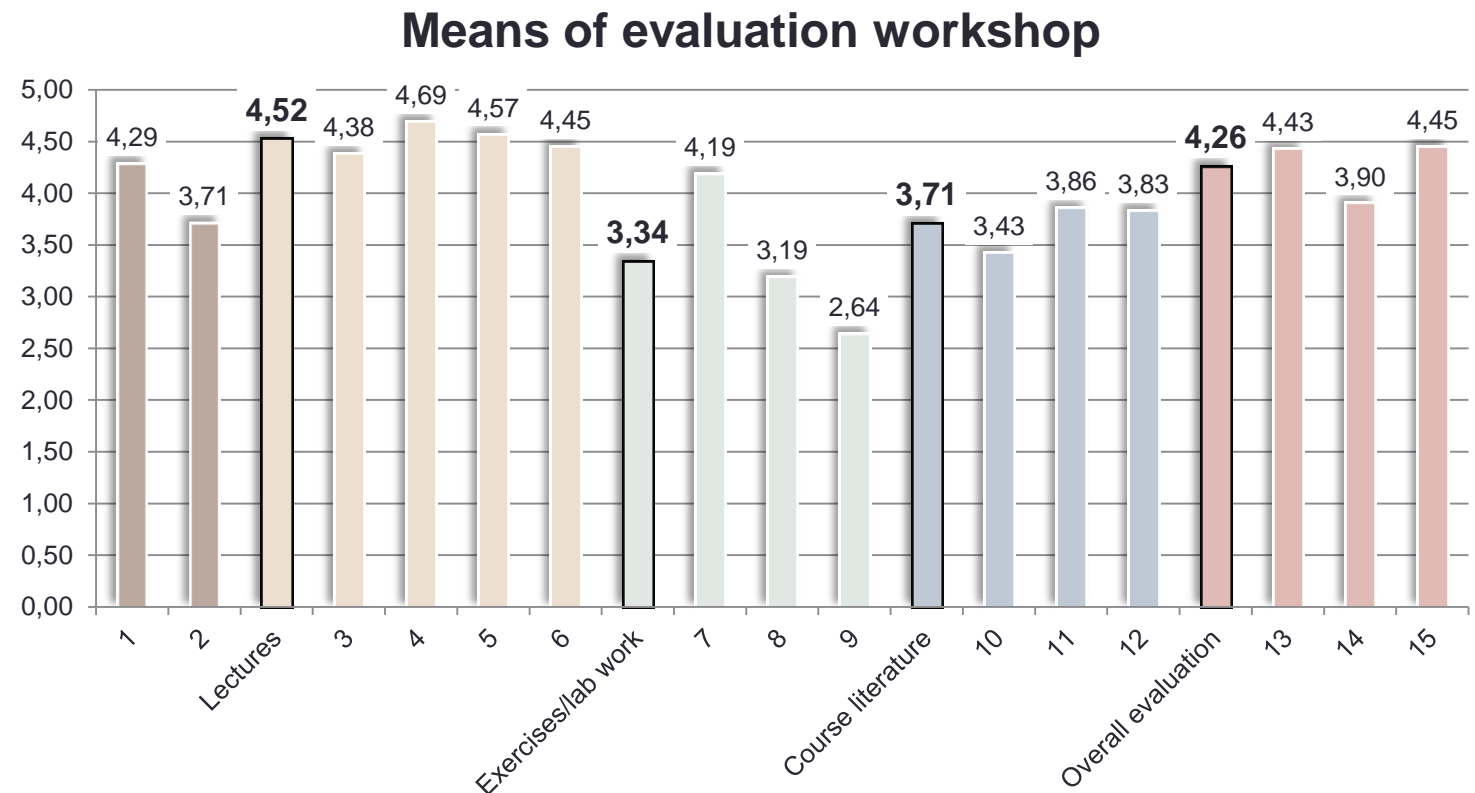
### Overall evaluation of this course

13. Does the course meet your expectation?
14. Has the course achieved the stated outcomes?
15. What is your overall grade for the course as a whole?



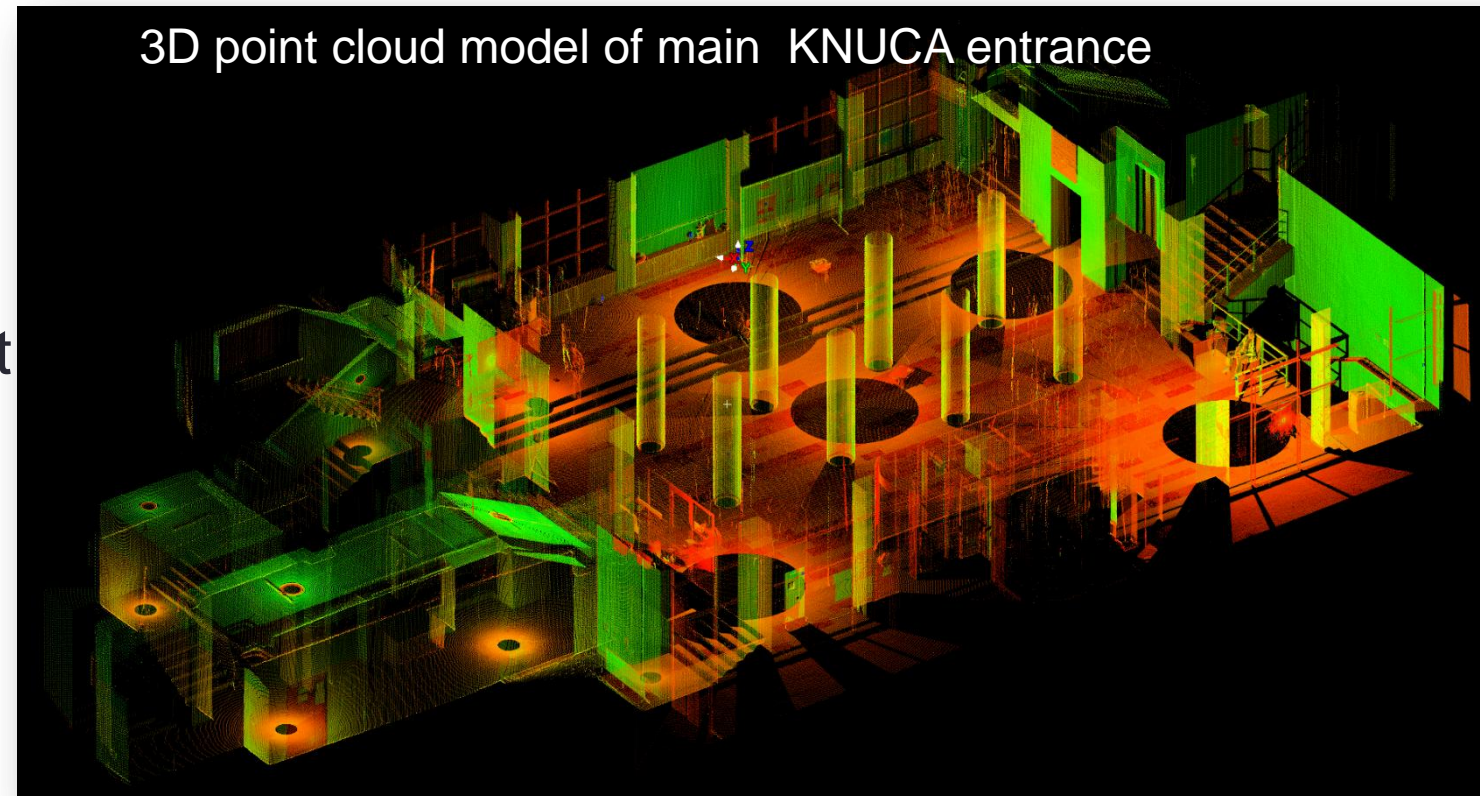
# WORKSHOP PHOTOGRAMMETRY AND LASER SCANNING

- Analysis of the distribution of average total marks indicates a low level of logistical and methodological support
- **We should note highly qualified and professional level of teachers, that confirm high marks on a block of question Lectures.**
- In view of low marks evaluation questions number 10, 11, 12 active work staff of the department should be directed to the development of new teaching materials, textbooks, tutorials etc.



# WORKSHOP PHOTOGRAMMETRY AND LASER SCANNING

- September, 28 – October, 2 2015
- Participants: students 6th semester of specialty "Geographic Information Systems and Technologies", "Geodesy", "Land management and cadaster "
- Interior laser scanning





# THE JOINT TRAINING PROJECT IN THE FIELD OF SURVEYING AND LASER SCANNING

- from 3 to 24 of May
- Students of the 3<sup>rd</sup> year of geodesy and geoinformatics courses.
  - *KNUCA*: Radchenko Symon, Sirenko Julia, Atroshenko Tetiana, Zayika Juliia, Ponomarenko Kseniia, Mozovenko Olha, Nahaliuk Roman
  - *Jade University*: Nabasik Frank, Brandt Tim, Hafner Tim, Sonmezsoy Feyzi, Grodstein Nina, Wycital Christian, Schwarz Steffen, Olberding Helge, Steinkuhle Maik Sebastian
- The project was conducted in two stages:
  - 1) Field work. Held from 3 to 10 of May **at KNUCA university**.
  - 2) Data processing. Was conducted at computer laboratory **of the University of Applied Sciences of Oldenburg** from 17 to 24 of May.



# THE JOINT TRAINING PROJECT IN THE FIELD OF SURVEYING AND LASER SCANNING

## Field work included:

- - creating of geodetic network,
- - photogrammetry ,
- - laser scanning.

Geodetic network was created as a traverse around the main and laboratory buildings of the university. The work was performed with Leica TS06 total station. In parallel, control points of buildings were coordinated. Geodetic measurements were processed in Leica GeoOffice software immediately after the field work for rapid error detection and correction. **Finally the network with 11 stations and more than 100 control points was built. Mean square error of a network was 8 mm.**

Photogrammetry works were performed with cameras Nikon D300, Nikon D3200 and Sony Alpha A57. The pictures of main building, laboratory and architectural departments, sport complex, monument near the main building and church at Ostrovsky park. **About 7000 photos were taken.**

Laser scanning was performed with **Faro Focus3D** and **Leica Scanstation C10** scanners. Left side of the front façade of the main building was scanned with Faro scanner. 17 scans with 280 million points were collected. **The rest of the building was scanned with Leica scanner. The 26 scans with 340 million points were received.**



# THE JOINT TRAINING PROJECT IN THE FIELD OF SURVEYING AND LASER SCANNING

## Data processing included:

- - photogrammetry processing,
- - Laser scanning processing,
- - 3D modeling.

Photogrammetry work were performed in iWitness software. 3D models of the monument, sport complex and parking entrance were created. Main building photos processing was very complicated due to extremely large number of pictures. Creating the model of the church using photos was significantly complicated due to completely white walls, where identifying the specific points is very difficult.

Laser scanning data processing was performed in Faro Scene and Leica Cyclone software for Faro Focus3D and Leica Scanstation C10 scanners respectively. Registration of Faro data was performed during post processing in Faro Scene software. Spherical and black-and-white targets identification was used for registration. Registration accuracy was 4 mm. Registration of Leica data was performed directly in the field during the measurement with scanner software. Only clouds optimization was performed in Cyclone. Registration error was 8mm.

CloudCompare software was used for merging data from different scanners. Cloud-to-Cloud registration method was used. Global registration error was 4 cm. Such gross error is explained with lack of common targets for Faro and Leica scans and “open” scanning network for both scanners.

Point cloud processing was performed in various software:

- 1) PointTools – 3D point cloud visualization, “flight-through” video;
- 2) GeoMagic – point cloud meshing.
- 3) AutoCAD – solid model creation.



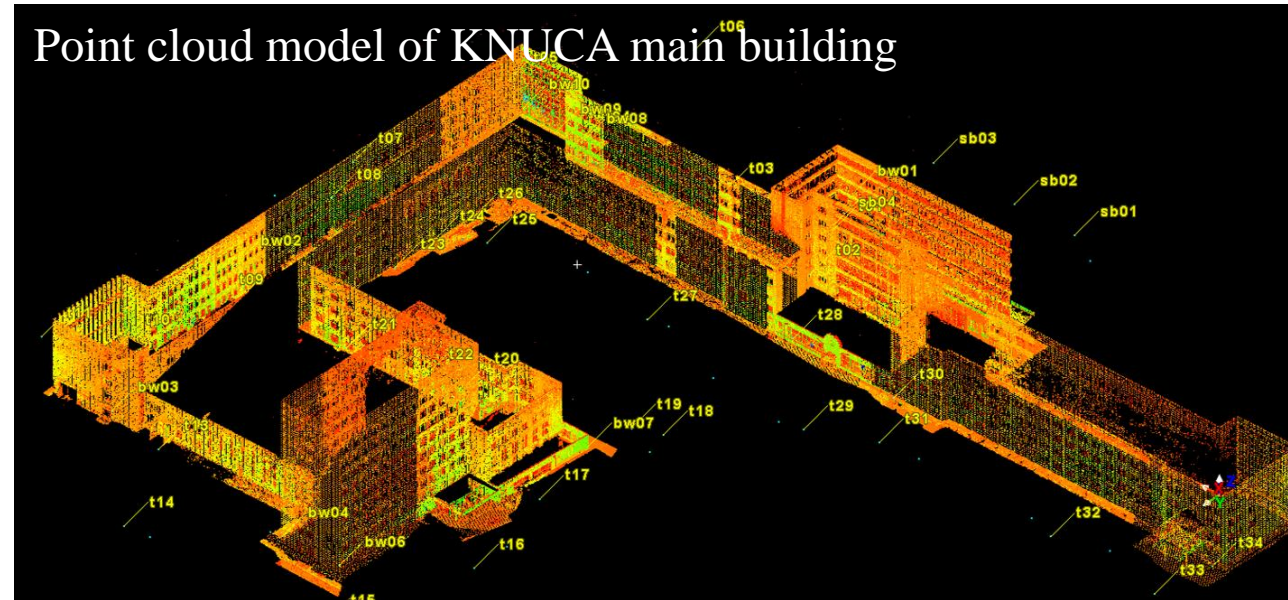


# THE JOINT TRAINING PROJECT IN THE FIELD OF SURVEYING AND LASER SCANNING

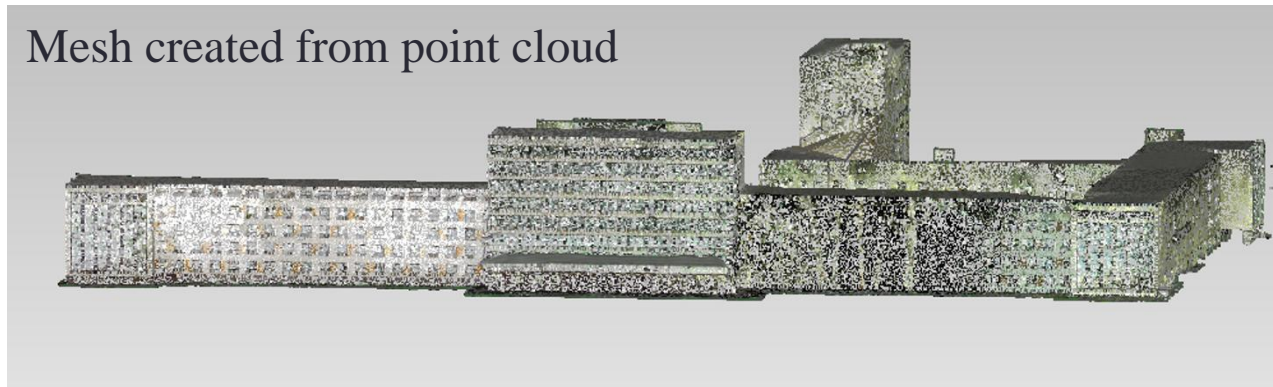
## Main results

About 7000 photos and 40 scan stations with 620 million points were taken during the field work stage. After the processing of data in Faro Scene, Leica Cyclone, GeoMagic and iWitness software students created the 3D models of KNUCA main building and historical monument.

Point cloud model of KNUCA main building



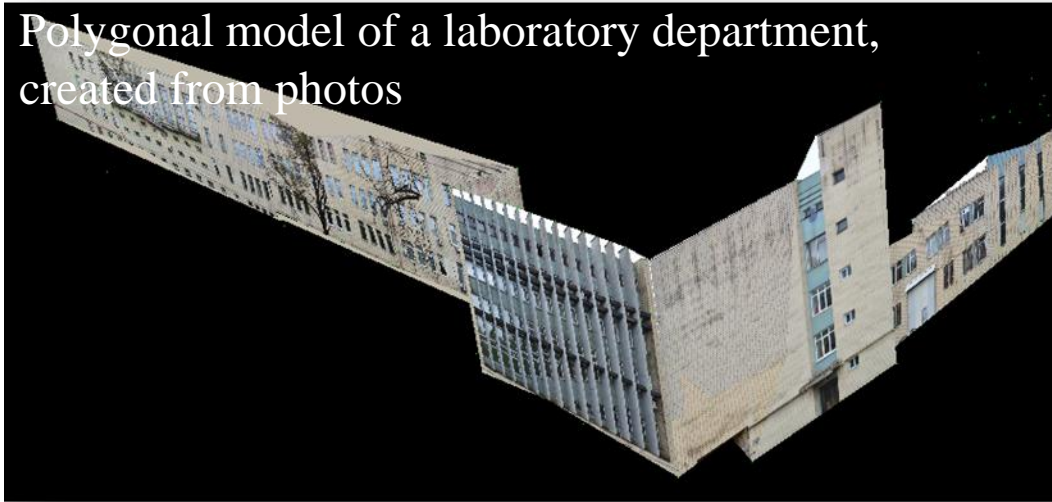
Mesh created from point cloud



# THE JOINT TRAINING PROJECT IN THE FIELD OF SURVEYING AND LASER SCANNING

- Holding practical training in the form of a single practical project within two weeks of training provides a unique opportunity to transfer theoretical knowledge into practice through student self-search solutions and processing.

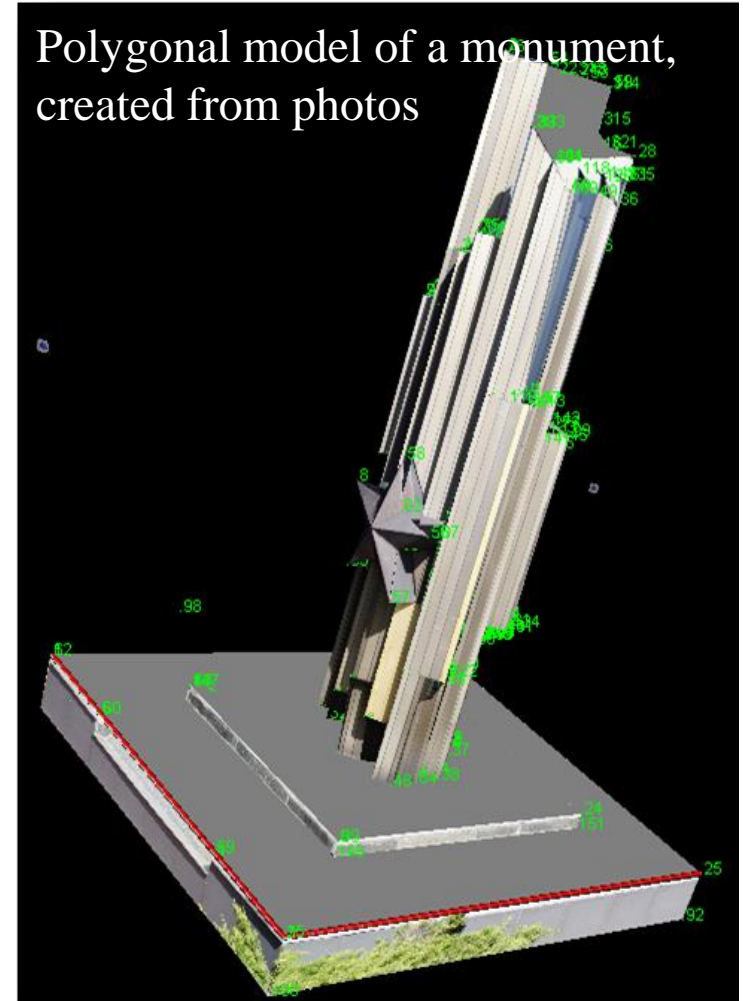
Polygonal model of a laboratory department, created from photos



Polygonal model of a parking entrance, created from photos



Polygonal model of a monument, created from photos





# THE JOINT TRAINING PROJECT IN THE FIELD OF SURVEYING AND LASER SCANNING

## Culture program

- excursions by interesting places of Kyiv, Oldenburg, Bremen, Hamburg;
- boat trip on Dnipro river;
- visit the Museum of Folk Architecture Pirogovo;
- canoe tour;
- visit to Universum museum in Bremen;
- parties at student houses.



Canoe tour



Excursion by Kyiv



# THE JOINT TRAINING PROJECT IN THE FIELD OF SURVEYING AND LASER SCANNING

## Conclusions

- Evaluation of joint educational project results demonstrates the need to improve the methodological training of students, including learning basic level of data processing tools. Due to limited terms of work performance, more attention should be paid to selecting objects, technical preparation of equipment and organizational work at all stages.
- The main results of the students exchange project are acquisition of practical experience by solving applied tasks with the most modern technology and establishment of international links between Ukrainian and German students. This educational integration allows young people to get the professional training at international level and to increase the competence of future specialists.

# EQUIPMENT

University of Applied Sciences (Oldenburg, Germany) transfers the equipment to the ownership to Department of Photogrammetry and Geoinformatics of Kyiv National University of Construction and Architecture free and irrevocable, it costs 1320 €



# PARTICIPATE OF INTERNATIONAL PROJECT

- Tempus proposal – **Applied Photogrammetry and Optical Metrology for Improving Industrial and Engineering Production Processes / PhotoApp, 2014**
- Call for Proposal EAC/A04/2014 – **Modern geospatial methods for improving urban planning, industrial and environmental management processes / GeoApp, 2015**
- Trilateral Partnerships – Cooperation Projects between Scholars and Scientists from Ukraine, Russia and Germany – **Automation of 3D reconstruction of complex surfaces from images and range data, 2015**

# SCIENTIFIC VISIT TO JADE 2015

- The members of the Department of Geoinformatic and photogrammetry Kravchenko Iuliia and Kvartych Tetiana was invited to scientific-oriented visit at Institute of Applied Photogrammetry and Geoinformatics in Oldenburg for the period of July 4 to August 1, 2015

## **The main activities was including:**

Preparing workshop in KNICA at September 2015

Discuss exchange students between KNUCA and Jade University in 2016: analyse results and conclusion

Training Lidar data processing in PostGIS

Training Using of spatial Web-services for publication of spatial data

Training Comparison of effectiveness of DTM creation methods in instrumental GIS and spatial DBMS

Training Advanced querying in Postgres

Participate on GIN-forum Mobile system: Apps, GPS and geodate

## **The main results includes:**

Schedule of workshop in KNUCA at September 2015

Defined main direction of activities for improvements students' exchange

Metrological materials for practice labs by Lidar data processing in PostGIS (in English and Ukrainian)

Metrological materials for course work of Digital Map (in English and Ukrainian)

Metrological materials for practice labs by PostGIS (in English and Ukrainian)

# PERSPECTIVES

- Workshop “Advanced GIS” 2016
- Scientific research in the field of photogrammetry, GIS with presentation in international conference
- Modern educational program
- Double diploma like as union approach of educational system
- Foundational union professional journal in the field of geodesy, GIS, photogrammetry and cadaster