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NEW INTERNATIONAL MASTER PROGRAMME IN CARTOGRAPHY

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ABSTRACT

This paper introduces the establishment of a new international Master program in "Cartography" and describes its background, objectives, a demand analysis, the content and its concept. This Master program will make optimal use of the existing education modules and human resources at 3 universities, TU München (Germany), TU Dresden (Germany) and TU Wien (Austria). Furthermore the KTH Stockholm (Sweden) and the ITC - University of Twente (Netherlands) are cooperation partners. With a very high concentration of scientific competence in cartography in combination with geoinformatics, the program holds a unique feature not only in Europe, but also worldwide. It will be the first Master of Science in "Cartography" taught in English in the participating universities.

BACKGROUND

Cartography with its changing research field

Cartography is often regarded as a traditional discipline rooted in mapmaking technologies and craftsmanship. In combination with Geoinformatics it may well be a prosperous discipline. The rapid technological development with the introduction of computers, powerful data processing algorithms and improved sharing of data, information and knowledge via the Internet, has increasingly blurred the boundaries among these individual disciplines. As a consequence, some interdisciplinary areas such as remote sensing, geoinformatics and cartography have become particularly active or revitalized (Krisp et al. 2009; Peters et al. 2009; Peters et al. 2010).

Cartography can act as an interdisciplinary field as many of the earth related subjects involve the use of cartographic representations. The Commission on Cartographic Education of the International Cartographic Association (ICA) defined Cartography as the totality of investigation and operations - scientific, artistic and technical - which have as their aim the making of maps and as well as the use of maps (ICA 1999).

Cartography may to some extent be linked with concepts of Visual Analytics (Andrienko et al. 2010; Thomas and Cook 2005). As suggested by Andrienko et al., "Visualization and interactive visual interfaces, as an effective way to provide material for human's analysis and reasoning, are essential for supporting the involvement of humans in problem-solving. However, a simple combination of visualization with computational analysis and modeling is not sufficient for facilitating the mutual reinforcement of the abilities of humans and computers" (Andrienko et al. 2010).

The education needs to reflect the emerging methods resulted from a cross-disciplinary research in the fields of geovisualization and information visualization, human–computer interaction, geographic information science, operations research, data mining and machine-learning, decision science, cognitive science, and other disciplines. A synergy of approaches and technologies could lay down a basis for a synergy between humans and computers in supporting complex decision making. (Andrienko et al. 2007)

The growing technical spectrum makes the current cartographic education a non-trivial task as the new emerging ideas of using data representations still have to find the way into the current software tools and into the heads of the researchers, teachers and students.

Changing cartographic education in Europe

The European education reform includes the Bologna Declaration issued in 1999. The three priorities of the Bologna process are: Introduction of the three cycle system (bachelor/master/ to some extent also the doctorate), quality assurance, recognition of qualifications and periods of study. Additionally the Bologna declaration aims at making European higher education more compatible, competitive and attractive for students from European countries and other continents. The Declaration states to promote mobility by overcoming obstacles to the effective exercise of free movement with particular attention. This applies to students, as they should have access to study and training opportunities and to related services and additionally to teachers, researchers and administrative staff, with their recognition and valorization of periods spent in a European context researching, teaching and training, without prejudicing their statutory rights (EUROPEAN-UNION 1999).

Cartography education in Europe changes as the conversion to Bachelor/Master system within the ongoing Bologna process continues. Currently the number of dedicated Bachelor/Master programs in this field has been reduced. There are universities throughout the world where cartography and GIS courses are given, most of them are introductory courses just set up to give a basic idea how to deal with geospatial information and visualize it with the help of some software modules. A limited number of Universities and advanced technical colleges offer a border specialization in cartography and GIS on top of a basic program in geography or in geodesy (Ormeling 2008). To keep the education and research in cartography on a very high level in Europe, it is necessary to bundle the existing competence. An international Master program in Cartography is conceptualized, to which three universities, TU München, TU Dresden (Germany), TU Wien (Austria) jointly contribute with teaching modules that are reasonably integrated into a curriculum.

OBJECTIVES

The primary goal of CARTOGRAPHY Master's Program is to educate future engineers in Cartography in combination with Geoinformatics and prepare them for a scientific career in Cartography. There are a number of points in this new program to outline the knowledge students will acquire in the program, among them are, that students

- Gain fundamental knowledge in spatial data modeling, analysis and visualization of geographic information. Students should be able to
- Use modern theories, methods and procedures relating to the map production and map use in the sense of modern cartography including Geoinformatics.
- Participate in research projects and apply them professionally and economically.
- Gain insight to a number of fields and have the ability to capture, model, manage, analyze and visualize adequate spatial data with space, time and attribute information.
- Are in the position to competently handle databases and geographic information systems and to accomplish adequate graphic data processing for all kinds of user groups.
- Can critically face up to social connecting factors and implications of various techniques and methods for processing and visualization spatial data.
- Are in a position to strongly influence and shape cartography as an independent science with its own research and object of knowledge.

This list is not complete at this point. The main goal of the cartography Master's Program is to educate future engineers in Cartography in combination with Geoinformatics and prepare them either for a scientific career in Cartography or for a career in the industry.

DEMAND ANALYSIS

Cartographic education in Europe changes as the conversion to Bachelor/Master system within the ongoing Bologna process continues. The Bologna declaration of June 1999 stated several administrative reforms to make European higher education more compatible and comparable, more competitive and more attractive for Europeans and for students and scholars from other continents.

Currently there are hundreds of universities throughout the world where cartography and GIS courses are given, most of them are introductory courses just set up to give a basic idea how to deal with geospatial information and visualize it with the help of some software modules. There are only a limited number of Universities and advanced technical colleges where students may specialize in cartography and GIS, on top of a basic program in geography or in geodesy. To keep the level of education and research in cartography on a very high level in Europe, it is necessary to provide a comprehensive education and bundle the existing competence of different universities.

CURRICULUUM CONTENT

The 4-semester English-language Master program has an intake between 15 and 25 students per year. Students obtain altogether 120 ECTS credit points. Target students are high-qualified students from all over the world especially from Asia and Europe, holding a bachelor or diploma degree in cartography or related subjects. One important aspect is an intensive and individual supervision of the students. The program is strongly supported by the ICA - International Cartographic Association.

With the lead at the Technical University Munich (TUM) a new international non-consecutive Master program in Cartography is conceptualized. The academic degree Master of Science attempts to bundle the existing competence from other universities such as Technical University of Dresden and Technical University of Vienna in Austria.

Students will spend their first semester at the TU Munich, the second semester at TU Wien and the third semester at TU Dresden. Writing the Master thesis will be possible in any of the universities. Students need to be very mobile as three universities at different locations are involved in this program.

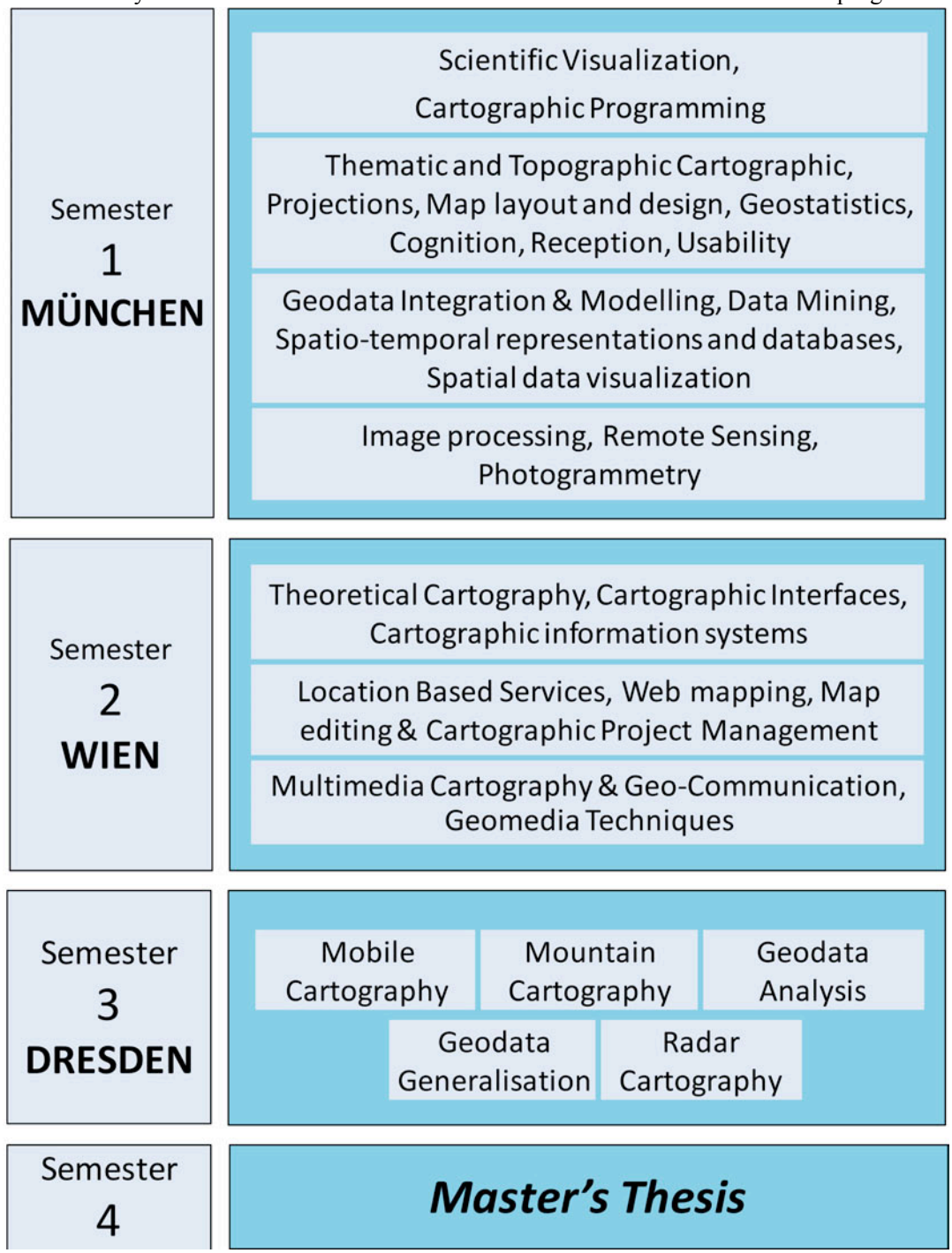

Figure 1: Program structure and content

CONCLUTION

This new Master program in "Cartography and Geoinformatics", with joint contribution from 5 universities will set new standards in international cartography and geoinformatics education and research. Within the Bologna process and both the technological and methodological development in the geosciences there is a high demand for a new Master. With its unique features, it is an innovative and sustainable program and guarantees excellent job opportunities, especially in research fields. The unique curriculum taught by the three cooperating Universities TU München, TU Wien and TU Dresden distinguishes CARTOGRAPHY from other master's programs in related fields. The first principal steps for

the new program are set and the political agreement as well as the industrial and research demand is given. The course will start in October 2011.

REFERENCES

ANDRIENKO, G., ANDRIENKO, N., DEMSAR, U., DRANSCH, D., DYKES, J., FABRIKANT, S. I., JERN, M., KRAAK, M.-J., SCHUMANN, H., and TOMINSKI, C. (2010). "Space, time and visual analytics." International Journal of Geographical Information Science, 24(10), 1577 — 1600.

ANDRIENKO, G., ANDRIENKO, N., JANKOWSKI, P., KEIM, D., KRAAK, M.-J., MACEACHREN, A., and WROBEL, S. (2007). "Geovisual analytics for spatial decision support: Setting the research agenda." International Journal of Geographical Information Science, 21(8), 839 - 857.

EUROPEAN-UNION. (1999). "The Bologna Declaration." Joint declaration of the European Ministers of Education.

ICA. (1999). "Definition of Cartography." ICA International Cartographic Association - Commission on Cartographic Education, http://www.msu.edu/~olsonj/overview.html.

KRISP, J. M., PETERS, S., HEDMAN, K. and MENG, L. (2009) "A Case Study of Education Reform in Earth Observation Technology and Applications." EOGC, Chengdu, China.

PETERS, S., KRISP, J. M., and MENG, L. "Development Of An International Master Program In Cartography And Geoinformatics." Proceedings on the 24nd International Cartographic Conference (ICC), 15.-21. November, Santiago, Chile, pages pending.

PETERS, S., KRISP, J. M., and MENG, L. (2010). "Aufbau eines internationalen Masterstudiengangs in Cartography." Kartographische Nachrichten, Kirschbaum, Bonn, KN 4/2010, 200-204.

ORMELING, F. (2008). "Mapping the Changes in Cartographic Education in the Last 50 Years." Kartographische Nachrichten, Kirschbaum, Bonn, 4.

THOMAS, J. J., and COOK, K. (2005). Illuminating the Path: The Research and Development Agenda for Visual Analytics, National Visualization and Analytics Center, http://nvac.pnl.gov/agenda.stm.