Tashkent Institute of Architecture and Construction

REPORT

on study visit to Salzburg University, Austria in the frame of the Erasmus+ DSinGIS project

(March 19– May 16, 2019)

PhD student: Mr. Otabek Avezbaev

Mentor: Dr. Sabine Hannig

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Content

Introduction

One of the most widely used web service today are web maps. Benefiting from the rapid advances in Information and Communication Technologies web maps offer a broad range of functionalities to lay and expert users to satisfy demands related to professional or personal life. But, for the growing range of map users, usage scenarios, and devices many application do not provide sufficient usability. The literature outlines that the GIScience research community still has too little knowledge on characteristics, needs, skills, and context of current web map users. This refers in particular to the development of web maps used in a cross-cultural context. However, it is widely acknowledged, that web pages with culturally relevant characteristics are more usable, and can increase user satisfaction and work efficiency.

Numerous of young researchers and doctoral students of Uzbekistan have been thinking about applying of GIS, Web GIS and programming in their research topics and field of studies. For implementation of those, mainly advanced knowledge of using software devices and computer technologies as well as theoretical and practical knowledge in the field of study are vital.

In this case, support of highly ranked foreign Higher Educational Institutions and qualification of their well-qualified teachers play crucial role. Erasmus+ "DSinGIS –Doctoral study in Geoinformatics" project has been giving good opportunity for doctoral students and young researchers of Uzbekistan in case of organizing 2 months scientific and practical training courses to improve their knowledge and skills in Geoinformatics.

So far, several researchers and doctoral students from partner HEIs of Uzbekistan have been improved their skills and qualification in their research topic and field of studies at European partner universities. Among them, me, PhD student of the Tashkent Institute of Architecture and Construction also have visited for two months (March 18-May 16) as a researcher to the Interfaculty Department of Geoinformatics – Z_GIS, Salzburg University, Salzburg, Austria under supervision of Dr.Sabine Hannig on the topic of "Cultural-Centered Web Map Design: Background and Recommendation focusing on Uzbekistan".

Study Plan

Before the study visit to Salzburg University of Austria, Study plan had been applied with requested documents. Here, below study plan is given:

Week 1:	Learning literature and resources related to cross-cultural web mapping.
Week 2:	Analyze different web map services (usability, characteristics, widgets…)
Week 3:	Comparing German-speaking countries and Central Asian countries web maps.
Week 4:	Collect data using crowdsourcing with a Survey123 form from community, Presentation at the host institution results of first month
Week 5:	Writing academic paper based on research
Week 6:	Develop prototype web maps with cross-cultural usability
Week 7:	Prepare recommendations to support developers in the implementation of cross-cultural web maps
Week 8:	Finalize and present results of research, submit an academic paper for GISCA conference.

Activities and Outputs of the stay

I worked with Mrs. Sabine during 2 month and spent most of my time in the office of Mrs. Sabine at NAWI. Attention was paid to literature review, IMRAD structure and research methodology.

The increasing number of web map users around the world is affecting for paying more attention by researchers to user-centred web maps design. Many recommendations have been developed to improve the usability and user experience of web map design. But often user-centred web maps design might not be enough. Meanwhile, today it is widely discussed in the context of web design the need to take also into account design preferences based on the cultural background of users.

The User-Centered Design and Culture. Nowadays many researchers (Roth et al., 2015, Fuhrmann and Pike, 2005, MacEachren and Kraak, 2001, Petr, 2012, Hennig, 2017) recommend using the user-centered design for development of interactive maps. From (Norman and Draper, 1986) we know that the term of user – centered design was initially applied in the field of human-computer in 1980. And the user-centered design method concentrated on the usability of computer design, denoted to the requirements and preferences of users. Successful user-centered design begins from identification of target user groups or audience of interactive maps (Roth et al., 2015), enlargement of operativeness and effectiveness of the product is carried out by dynamically implicating of users at all steps of the design (Kahraman, 2010) and the core idea is to create a product for the end user (Petr, 2012). It's true that the user-centered design approach usually helps to save project resources if it applied in conceptual design stages or during prototyping (Krug, 2000) and it has to fulfill the conceptions of usability, user experience, and user-centricity (Atzl, 2015). But, on the other hand, (Reinecke, 2013) stressed the also importance of culture and stated that the user's pleasure and income from the product can rise by adjusting user interfaces to a user's cultural background. (Alostath et al., 2011) mentioned that in the globalization period culture plays a significant role in design usable products and becomes one of the most important factors. (Rimondi, 2015) outlined the path that leads from User-Centred Design to Culture-Centred Web Design and stated that Culture-Centred Web Design can be considered as a branch of User-Centred Design. (Stachon et al., 2018) stated that cultural aspects are only in few cases

becoming the focus of studies on current mapping products and as a consequence to get a better idea how cultures can influence web maps, designers often have to use experiences acquired in connected fields, like cross-cultural web design or cross-cultural psychology. To fill the gap in the lack of knowledge in Culture-Centered Web design, first, need to learn current experiences in the field of Web design and identify what kind of methods can be adapted for web map design.

Culture in Web Design. Culture is a very complex and defined in many ways. Anthropologist Sir Edward B. Tylor (1924) stated that culture is "that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society". Goodenough, (1971) defined culture like "A set of beliefs or standards, shared by a group of people, which help the individual decide what is, what can be, how to feel, what to do and how to go about doing it".

Hofstede (1984) stated that culture is "the collective programming of the mind that distinguishes the members of one category of people from another". Sheridan, (2003) stated that "Culture, in term of web globalisation, means how people from certain cultural orientations view and interpret specific images and messages". Hsiu Ching, (2008) after his investigation previous definitions defined culture as "the collective of specifiable signs, symbols, artefacts, values, behaviours, practices, conventions, beliefs, and norm which represent a cluster of people" and he mentioned that user`s culture influences the way of using web interfaces, because of dissimilar mental models they expect different symbols, colours, graphics, and layouts.

Conventional approaches to catering for culture are restricted to adaptations for specific countries and modify only a limited number of interface components, such as the language or date and time formats. (Reinecke, 2013) argues that a more comprehensive personalization of interfaces to cultural background is needed to appeal to users in expanding markets.

(Alostath et al., 2011) outlined the purpose of cross-cultural website design evaluation approach as identifying cultural differences at the user interface level and using these differences to generate new websites as prototypes that are more sensitive to culture and genre variability. And they stated that the Culture-

Centered Design method identifies the role of culture in the design of user interfaces.

Culture-Centered Design. Russo and Boor, since 1993, in one of the first articles on the importance of cultural aspects in the design of web interfaces, argued that cultural awareness is an aspect of user awareness.

Marcus and Gould (2000, p. 44), reiterated the importance of Culture-Centered Design on the web, stating that 'as the Web continues to develop globally [...] exploring, then exploiting, these dimensions of culture, will become a necessity and not an option for successful theory and practice'.

The goal of Culture-Centred Design is to assure that the user will not be offended or confused by the interface (Russo and Boor) addressing him not only in his own language but in the language of his culture, as far as pertains to information visualization and therefore using metaphors, mental models, navigation and interaction modalities adapted to the culture of the user. Sun, in 2001, stressed the importance of cultural awareness proposing to insert the "Cultural Sensitivity" next to effectiveness, satisfaction, efficiency of use as a metric of usability, considering culture as a semantic space in which action and meaning converge.

As demonstrated by Ito and Nakakoji (cited in Hillier, 2003), cultural factors are involved at every level of communication. It follows that designers will fit into their design numerous elements and norms pertaining to their culture, often in an unconscious way.

As pointed out by Choi, Lee, Kim (2006), according to the cultural iceberg model (Hoft, 1995), the visible characteristics of culture, such as language, represent only a small part (10%) of the cultural characteristics of a target audience. As applications and services are cultural amplifiers (Nakakoji 1996 cited in Choi, Lee, and Kim, 2006), a real localization must take into account 90% of the hidden cultural characteristics. It is therefore essential to bring out the effects of cultural characteristics on User Experience (Figure 1).

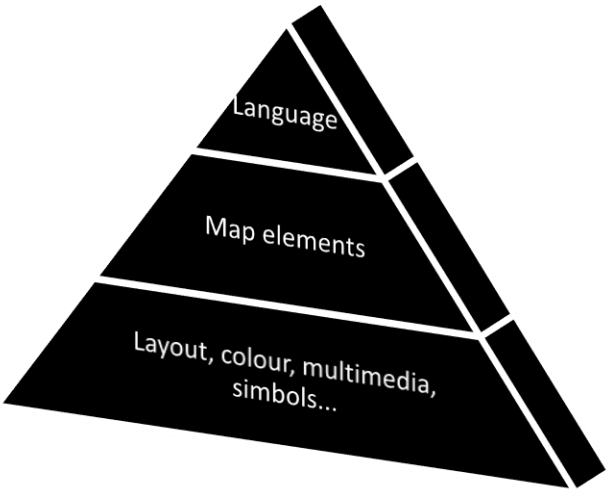


Figure 1. Cultural iceberg modified to Web map design

Based on previous researches in the field of culture-centered web design and user-centered web map design it becomes clear that cultural background plays a significant role in user experience. And if to take into account the fact that web maps are inherently embedded in a web page. It becomes clear that in order to create an aesthetically pleasing graphical interface of a web map, and a culture-centered Web map design it is necessary to take into account cultural markers in both web design and web map design (Figure 2).

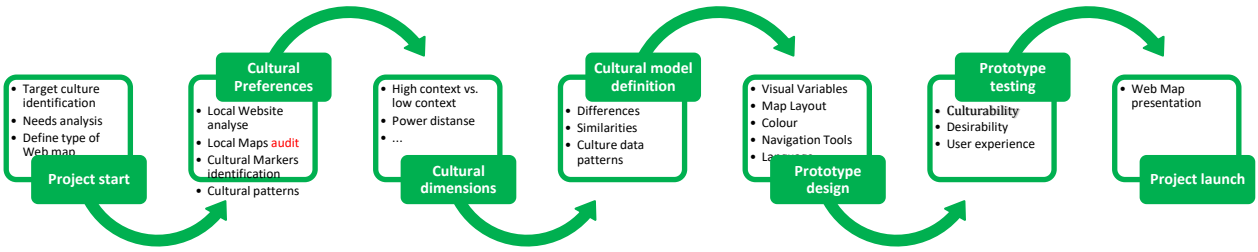


Figure 2. Culture-Centered Web Map Design

Thus, for instance, the arrangement of menu or navigation elements in user interface design for one country is not really convenient to other countries who have differences in culture. In addition, the colours and symbols used in one culture can in some cases react to users either positively or negatively, because in most cases their meanings are different from each other. Accordingly, cultural differences increasingly have been taken into account in web design.

However, in the field of (web) cartography, there is still a lack of knowledge, regarding the culture-centered web map design. The question is, what can a culture-centered web map look like?

To answer this question several methods were applied: literature review and the analysis of existing web sites (governmental, news and media, education). Knowledge and information gained will help to elaborate recommendation of relevance in the context of a more culture-centered web map design for Uzbekistan, which can increase the usability and user experience of web maps for Uzbek users.

During analysis of websites, the focus was on such criteria as dominant colour, colour combinations, text positions and directions, use of images, languages, navigation, and visual elements (Table 1).

Web page characters	**Criteria**	
Colour	Header	Hex Code #
	Background	Hex Code #
	Footer	Hex Code #
	Header Text	Hex Code #
	Body Text	Hex Code #
	Footer text	Hex Code #
Layout	Menu placement	Vertical
		Horizontal
		Combination
	Logo placement	Left Top
		Middle Top
		Right Top
	Image	Top
		Left
		Right
		Middle
		Bottom
Navigation	Menu	Pop down
		Pop right
		Fixed
	Links	Type
		Number
	Search	Position
Multimedia	Text movement	From top to bottom
		From bottom to top
		From right to Ieft
		From left to right
	Slide show	Number of photo
Text	Header Font	Theme Fonts
		Size
	Body Font	Theme Fonts
		Size
	Footer Font	Theme Fonts
		Size

Table 1. The Criteria list applied to selected Uzbek websites

Here it becomes obvious that the Uzbek sites demonstrate clear preferences in terms of the use of certain colour combinations, types of pictures and the number of links used.

Cultural markers like Menu Placement, Menu type and colours were found by comparing our results with the results of research Juric et al., 2003. Graph 1 demonstrates the differences in menu placement between the UK, South Korea, and Uzbek websites. This result shows that Uzbek users are used to working with a horizontal menu more rather than vertical or combination.

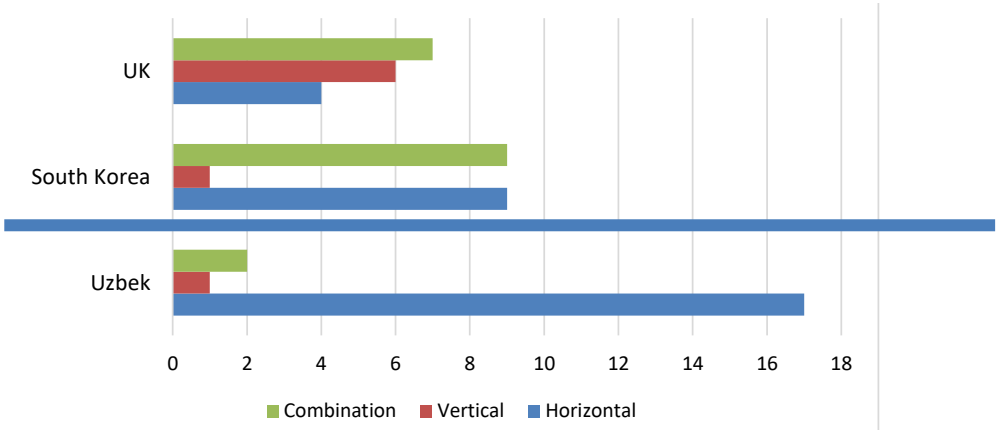


Figure 1. Compared Uzbek web sites Menu Placements with the research results of (Juric et al., 2003). 20 websites from each country.

Fixed Menu type is more popular in the UK and Uzbek websites, but pop down menu more preferred in South Korea (Figure 2).

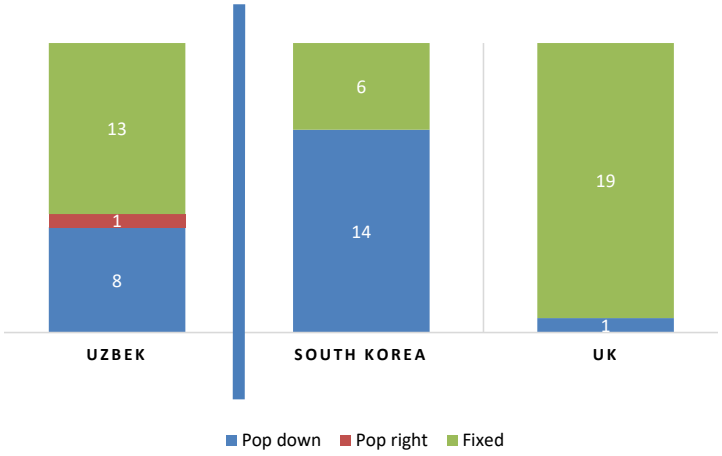


Figure 2. Web Interface tendency.

Cultural markers. Title and body text colours compared in Table 2.

Colour	Uzbek	South Korea	UK
Title text	Blue: 1 Cerulean: 1 Dark Jungle green: 3 Davy grey: 1 Dodger blue: 1 Lapis Lazuli: 2 Teal blue: 1 White: 7 Zinnwaldite brown: 1	Blue: 5 Black: 10 Grey: 2 Green: 1 Red: 1	Black: 8 Blue:6 White:3 Yellow: 1
Body text	Black: 4 Dark Jungle green: 3 Dark Lava:4 Davy grey:4 Dim Gray: 3 Rifle green: 1 Saint Patrick Blue: 1	Black: 5 Dark grey: 1 Grey:2 Green: 1 Orange: 1	Black: 10 White:3 Blue: 1

Table 2. The colour types of typography in the selected Uzbek websites, compared with the results of Juric et al., 2003

Table 3, demonstrates the preferred colours which were used for headers, backgrounds, and footers in Uzbek websites. Based on the popularity and attendance of web sites, it can be assumed that these colours are more convenient for perceptions of Uzbek users. If to pay attention to the pattern of use of colours in these web sites, it turns out that different types of blue and grey are often used in the header and footer.

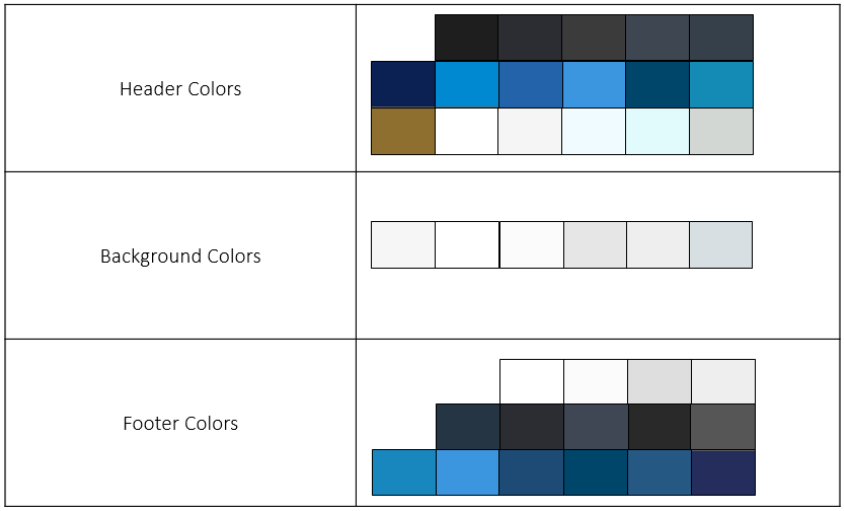


Table 3. The colour palette in the selected Uzbek websites

Knowledge and information gained will help to elaborate recommendation of relevance in the context of a more culture-centered web map design for

Uzbekistan. This can increase the usability and user experience of Uzbek web maps users. This might also be useful for developers of web maps not only in Uzbekistan but also in other Central Asian countries.

After presentation at “Selected topics” class, we started working on the paper oriented to the GISCA 2019.

Photo 1-2. Presentation of my results at the “Selected topics” class of Prof. Josef Strobl.

Writing a paper for GISCA 2019. During my 2 months training I was able to send my abstract and register to the GISCA 2019 conference.

Preliminary Agenda of the GIS in Central Asia Conference – GISCA 2019

"From Spatial Data to Spatial Intelligence", May 30 - June 1

Kyrgyz State University of Construction, Transport and Architecture (KSUCTA), Bishkek, Kyrgyzstan

May 30, THURSDAY	
09:00- 17:00	OSM Mapping Party. KSUCTA, Room 3-114 / Drone Survey Workshop. KSUCTA, Room 3-113
18:00-20:00	***Icebreaker*** - Welcome event for all registered delegates ***Venue:*** KSUCTA, Maldybaev street, 34 "B", Conference Hall

May 31, FRIDAY - PLENARY SESSION Conference Hall of KSUCTA	
8:30	Registration of conference participants and Exhibition
09:00	Welcome Addresses: - ***Prof.Dr. Akymbek Abdykalykov*** - Rector of KSUCTA - ***Prof.Dr. Kudayberdi Kozhobekov*** - Deputy Minister of Education and Science, Kyrgyzstan - ***Academician, Prof.Dr. Murat Dzhumataev*** - President of the National Academy of Sciences, Kyrgyzstan - ***Mr. Albert Momo*** - Director Institutional Business Development, Trimble
09:20	*Keynote speaker* – ***Academician, Prof.Dr. Josef Strobl, ZGIS, University of Salzburg (PLUS), Austria.*** From Spatial Data Infrastructures to Spatial Analyses
09:50	Concert by students of KSUCTA
10:10	Coffee break
10:40	*Keynote speaker* – ***Mr. Albert Momo, Trimble.*** Transforming how Central Asia works through geospatial technologies
11:10	*Keynote speaker* – ***Mr. Mike Kim, Geo2, Korea.*** GIS visualization through O2Live LIS Analysis
11:40	***Mr. Almaz Abdiev, DCRRIP SRS KR.*** Land Information System of the Kyrgyz Republic
12:00	**Lunch**

May 31, FRIDAY - PARALLEL SESSIONS

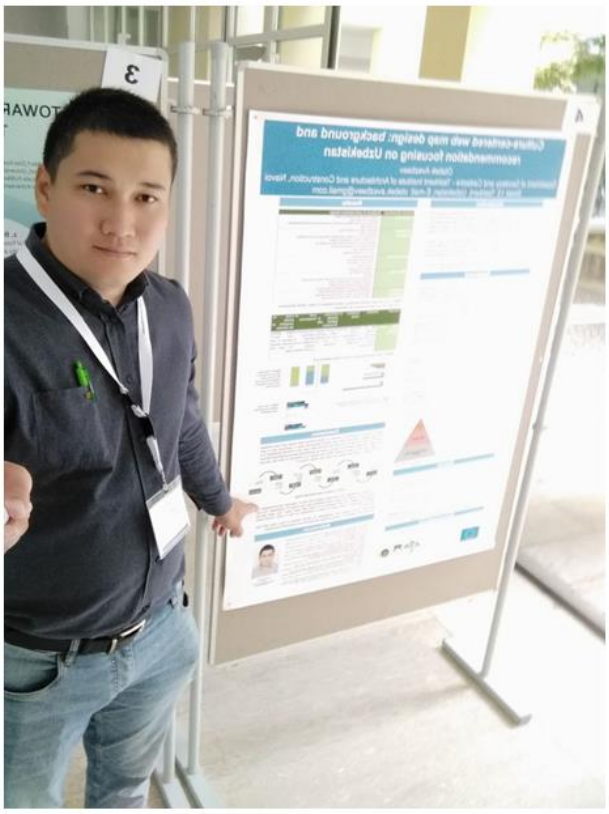
Session 31-1: Geospatial Education	Session 31-2: New Technologies in Geodesy and Surveying
Date: Friday, May 31, 14:00 – 15:20 *Venue:* Conference Hall *Chair:*	*Date:* Friday, May 31, 14:00 – 15:20 *Venue:* Room 1-101 *Chair:*
Sabine Hennig. Benefits and challenges of eLearning in Central Asia	**Yury Sakovich.** Technology Trends in Geospatial industry
Eldar Kurbanov. Jean Monnet center of excellence in the field of forestry and ecology: research and education	**Dilbarkhon Fazilova.** Accuracy assessment of Digital Elevation Model of the Tashkent geodynamical polygon using GPS
Otabek Avezbaev. Cultural-Centered Web Map Design: Background and Recommendation focusing on Uzbekistan	**Akylbek Chymyrov, Nurbek Chymbyldaev.** Evaluation of the modern Earth Gravitational Models over Kyrgyzstan

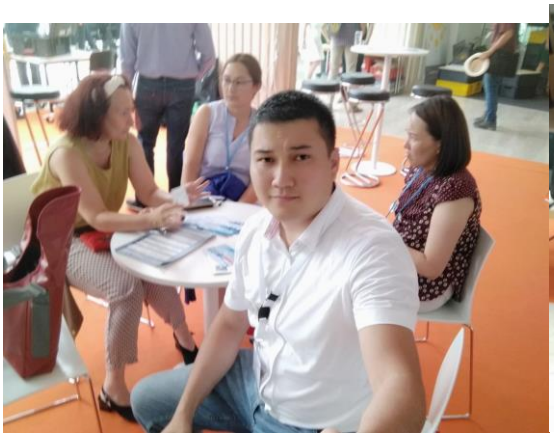
Photo 3. Preliminary agenda of the GIS in Central Asia Conference – GISCA 2019

After accomplishing the 2 months training in Salzburg and arriving to Uzbekistan, I went to Bishkek from May 30- June 1, 2019 to demonstrate our result to the GIS community and participated in the GISCA 2019.

Photo 4-5. Participation in the GISCA 2019, Bishkek.

Also during training in Salzburg University with help of my supervisor Dr. Sabine Hannig I prepared the poster for the GI-Forum 2019 and July 2-3 participated at the Forum.





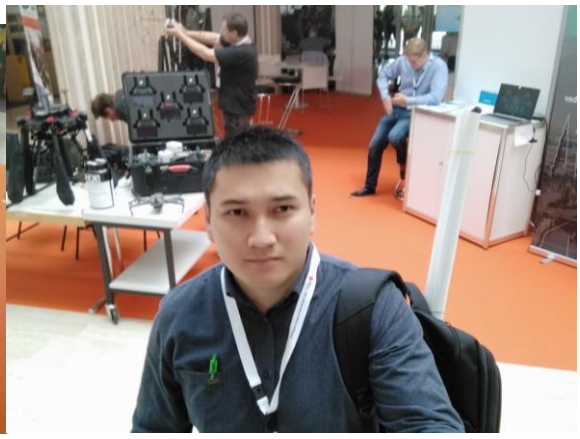


Photo 5-6. Participation in the GI-Forum 2019, Salzburg

Conclusions and future plans

Erasmus+ "DSinGIS –Doctoral study in Geoinformatics" project has been giving good opportunity for doctoral students and young researchers of Uzbekistan in case of organizing 2 months scientific and practical training courses to improve their knowledge and skills in Web GIS and programming.

I had a great chance to visit to one of the highly ranked the Geoinformatics Z_GIS department at the Paris Lodron University of Salzburg, Austria.

I strongly believe that this research has the potential to contribute to the scientific understanding of web maps in Uzbekistan, but even more, it may impact wider society and decision maker sector as well. In the future based on the use of the user-culture-centered design and usability engineering methods I will identify and analyze design elements and characteristics relevant for creating web maps that can be used more efficiently throughout the world. And I am going to continue my PhD, and work on the topic – *"Creation of an enterprise geographic information system (GIS) based on open source tools for organizing the efficient use of land resources"* where the part of web mapping and UI design will be developed according to my knowledge which I got during my training in PLUS.

Acknowledgements

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