

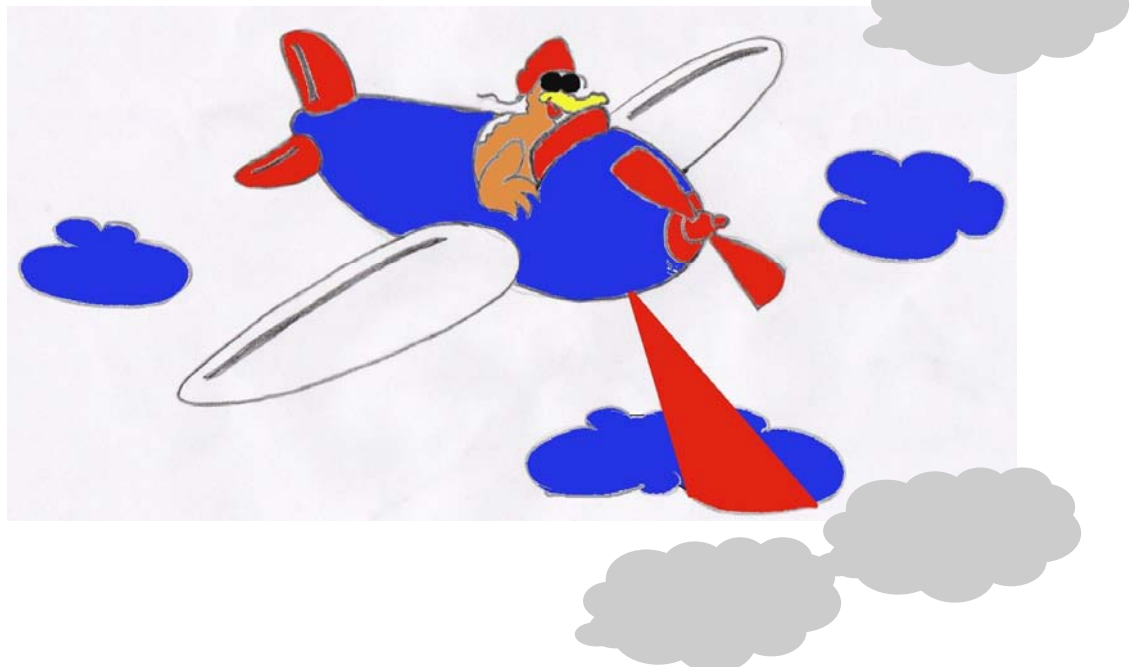


ISPRS WG VI/5 AND STUDENT
CONSORTIUM
2ND SUMMER SCHOOL

THEORY AND APPLICATION OF LASER SCANNING

1-7 JULY, 2007

LJUBLJANA, SLOVENIA



PROGRAM BOOK



PROGRAM BOOK ISPRS VI/5 & SC Summer School
Theory and Application of Laser Scanning
July 1-7, 2007, Ljubljana, SLOVENIA

ISPRS WG VI/5 – Promotion of the Profession to Students and Student Consortium
Slovenian Geodetic Student Organization (DŠGS)
www.isprs.org

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Ljubljana, June-July, 2007

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Ljubljana, 29 June 2007

Dear summer school participants, dear colleagues,

We are very glad to welcome you in Ljubljana, at our Faculty of Civil and Geodetic Engineering of the University of Ljubljana, on the occasion of the ISPRS summer school »Theory and application of laser scanning«.

It took us all a lot of effort to organize this event, but we accepted this with pleasure and awareness that it is for good and very positive purpose – to promote the profession among the students and to transfer the knowledge from the experts to the youth. Due to very fast technology development, university programs are not always able to follow it with renewals of programs and to provide expensive equipment, data, specialized knowledge and new teaching materials. Summer schools could thus be a good supplement to upgrade and deepen the knowledge students may receive at their universities. The ISPRS working group VI/5: Promotion of the Profession to Students and the Student Consortium are the driving force for realization of such activities within the ISPRS.

The decision for the topic of this summer school was not accidental because it is the fact that the technology of laser scanning is inevitably entering the everyday surveying practice. The needs from the practice are big and enterprises employing young professionals expect that they are well acquainted with latest development when finishing their study. The main purpose of this summer school is thus to provide an intensive and educational week with training activities for the students and young researchers in the topic of laser scanning, in addition to establishing international social contacts.

We deeply thank the ISPRS Council, who confirmed and co-sponsored this event, as well as all sponsors for their financial support. Last but not least, we cordially thank all the lecturers in this summer school for their preparedness to contribute and share their knowledge with young people interested in the profession.

We wish you all pleasant stay in Ljubljana, stimulating social gathering and a fruitful work!

Prof.dr. Bojan Majes,
Faculty dean

Anka Lisec,
ISPRS WG VI/5 secretary



Mojca Kosmatin Fras
ISPRS WG VI/5 chair

Urša Renko
Assoc. of Slovenian students
of Geodesy, presid.

Ladies and gentlemen,
Dear participants,

I would like to thank you for inviting me to contribute to this second edition of the summer school organised by the Society for Photogrammetry and Remote Sensing.

Europe must invest in its youth. The young are the future, and timely and effective investment in youth is the key to making that future prosperous, both economically and socially.

For many years, we have recognised the importance of making young people aware of the necessity of learning about science and technology and we have therefore supported various activities in the field of science education.

Science will play an ever increasing role in the development of our societies. Therefore activities such as the organisation of this summer school on "Theory and Application of Laser Scanning" are essential for stimulating the personal development of potential future scientists and young researchers.

Indeed, providing an intensive and educational week of training activities conducted by eminent scientists is for many young scientists and future researchers an excellent basis for deploying their ideas and thus contributing to innovation in science and technology. Giving students and young researchers the opportunity to take part in training activities, such as this summer school, is key to the development of a European knowledge society, and for young people it is often an important step towards an international career in science.

Moreover, the importance of practical work alongside the theory and lectures is indisputable. "Learning by doing" is a key element in the learning process and activities such as this one should therefore be encouraged and promoted.

There is another important aspect we must not forget: the social fabric that binds us. Initiatives such as this also have an important social impact on those who take part - meeting and exchanging ideas with like-minded people from other parts of the world provides the basis for future international cooperation. Bringing together people from across Europe and beyond, allows them to experience first hand the richness of cultural diversity, which is an essential ingredient in the formulation of our common policies.

At the European Commission we cover the whole spectrum of science education: from supporting "hands-on" experience of science in primary schools; activities and initiatives aimed at secondary school level and above; and a system of grant support to university level students and postdoctoral students.

Since its creation in 2005, this summer school has proven to be a great success and I am convinced this year's will be no exception. It gives many students and young researchers the opportunity to get involved in real science and creates a basis for cooperation which will undoubtedly contribute to shaping Europe's future.

I wish you a successful and fruitful summer school and all the best for the future.


Janez Potočnik
European Commissioner for Science and Research





1 ISPRS VI/5 and Student Consortium

1.1 International Society for Photogrammetry and Remote Sensing

ISPRS (International Society for Photogrammetry and Remote Sensing) is an international non-governmental organization devoted to the development of international cooperation for the advancement of knowledge, research, development and education in the Photogrammetry, Remote Sensing and Spatial Sciences, their integration and application, to contribute to the well being of humanity and sustainability of the environment. The ISPRS membership comprises national organizations and professional Societies representing over 100 nations and regions covering all continents. The scientific and technical work of the ISPRS is accomplished by 8 Technical Commissions, whose work is organized in several working groups (www.isprs.org).

1.2 ISPRS VI/5 and Student Consortium

Working group ISPRS VI/5 – Promotion of the Profession to Students acts within ISPRS Commission VI – Education and Outreach. The main purpose of the WG VI/5 is stimulation to scientific and research work, and promotion of the ISPRS profession to talented graduate, post-graduate students and young researchers. Furthermore, it presents the main link between the students from different countries and ISPRS. WG VI/5 offers support to the student coordinators of the Student Consortium (SC), which acts within the framework of the WG VI/5 (<http://www.commission6.isprs.org/wg5/>).

Terms of reference:

- Promotion and support of international student activities including the ISPRS Student Consortium.
- Encouragement of active participation of students, especially undergraduate students, in ISPRS events and promotion of reduced fees and stipend for their participation.
- Collection and maintenance of a database on persons who are involved in the promotion of the profession to students, including the members of ISPRS Student Consortium and educators.



The participation of the SC members at the Technical Commission VI Symposium "E-Learning and the Next Steps for Education", Tokyo, Japan 2006

The Student Consortium presents the main student group, who share the same interest in photogrammetry, remote sensing and spatial information sciences, and has been established in the framework of the ISPRS TC VI in 2004. It provides a platform for exchange of information and organise student-specific events either independently (e.g. summer schools) or within larger ISPRS events. The Student Consortium is an important connection between students and ISPRS



professional activities, way to get students familiar with and interested in ISPRS activities. The SC coordinators are trying to cooperate with other international student organisations, such as IGSO (International Geodetic Student Organization).

SC mailing list and newsletter are the main forms of informing SC members about the activities of the WG and SC members, their research, international projects, exchange possibilities, conferences etc. The SC members prepare the other forms of promotion material such as conferences videos, interviews etc.

Summer Schools present one of the most important approach of the WG VI/5 and SC for the promotion of the science among the young researchers. The purpose of "Summer Schools" is to provide an intensive and educational week with training activities for the students and young researchers in ISPRS's work fields. Each Summer School has scientific topics of its own, selected from the wide variety of the topics treated within ISPRS. In addition to learning the theory in the lectures, the aim of summer schools is also to demonstrate the participants practical and laboratory works. Not less important, such meetings have a special social meaning in order to exchange ideas and provide base for further international cooperation. This year the Summer School is going to take place in Ljubljana, Slovenia (1-7 July, 2007).

The first ISPRS Summer School took place at Istanbul Technical University's Maslak campus, Turkey, during 19-26 of June 2005. The next year's summer school is planned in Nanjing, China, just before the ISPRS Congress in Beijing, June 27 – July 1, 2008, jointly with the biannual Chinese Doctoral Students' Forum in GIS. Please, for more information visit the Congress web page: <http://www.isprs2008-beijing.org>.



2 Program of the 2nd ISPRS WG VI/5 & SC Summer School

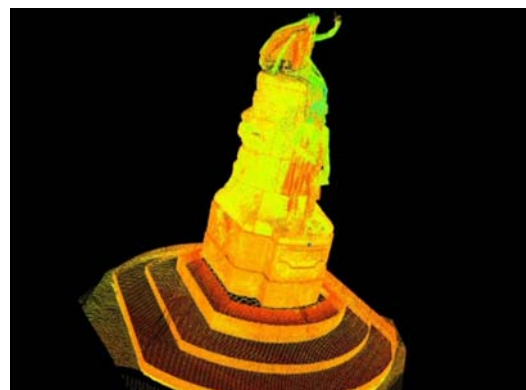
2.1 Topics – Theory and Application of Laser Scanning

This summer school is a joint initiative of the ISPRS WG VI/5 and ISPRS Student Consortium and is designed for well-motivated, advanced graduate and post-graduate students, as well as young researchers, thus it will be didactically adapted. The general topic of ISPRS Summer School is "Theory and Application of Laser Scanning".

The technology of laser scanning is inevitably entering the everyday surveying practice. On the other hand, the faculty programs are not always able to follow the quick development of the profession, due to expensive equipment, data, specialized knowledge and teaching materials. This summer school is thus meant to upgrade and deepen the general knowledge in the technology students may receive at their faculties, and to practice the theory on real data. Although there are quite many workshops recently organized in this topic, this summer school will be adapted to the targeted audience – students and young researchers.

The lecturers are coming from acknowledged international research and education institutions, making this summer school a truly professional experience. Tutorials in form of lectures are combined with a lot of practical exercises theory will be demonstrated with variety of applications. A special module on scientific and research approach is included in the program. All teaching material is provided on digital media. In order to stimulate active participation of students and young researchers, call for young author papers on presenting their research results has been announced. The authors of the selected papers have opportunity to present their work in a special session.

The working language of the Summer school is English. In order to assure active participation of all students a high level of English is prerequisite.



Prešeren's Monument at the Prešernov trg square in Ljubljana (The 2nd ISPRS Summer School "Theory and Application of Laser Scanning" takes place in Ljubljana, Slovenia).

The aim of the summer school is not only to give participants good knowledge and skills in the selected topics, but also to provide time for social gathering in different forms (welcome party, technical tours, trips to beautiful Slovenian spots, etc.).



2.2 Program schedule at a glance

	1 July 2007 Sunday	2 July 2007 Monday	3 July 2007 Tuesday	4 July 2007 Wednesday	5 July 2007 Thursday	6 July 2007 Friday	7 July 2007 Saturday
8:30							
9:00		Opening Ceremony	ALS data processing tutorial C. Lemaire	DS/MDTM filtering N. Pfeifer	Overview of TLS systems ⁵ N. Pfeifer	Practical aspects of TLS N. Studnicka	
9:30		Requirements for generating... ¹ P. Friess	refreshment break	refreshment break	refreshment break	refreshment break	
10:00		Requirements for generating... ¹ P. Friess	ALS data processing tutorial C. Lemaire	Info. extraction from ALS data ³ G. Vosselman	Overview of TLS systems ⁵ N. Pfeifer	Practical aspects of TLS N. Studnicka	
11:00		refreshment break	lunch (Faculty canteen)	lunch (Faculty canteen)	lunch (Faculty canteen)	lunch (Faculty canteen)	whole day excursion (included in registration fee)
12:00		Requirements for generating... ¹ P. Friess					
13:00		lunch (Faculty canteen)		Info. extraction from ALS data ³ G. Vosselman	Point cloud co-registration D. Akca	Student session	
14:00		ALS-Applications & operation ... ² A. Rohrbach		refreshment break	refreshment break	refreshment break	tourist visit of Slovenia: Postojna karst cave, Piran dinner: Sečovlje
15:00			Half-day excursion: technical visit: trip to Bled	Applications of laser s. in forestry ⁴ C. Straub	3D modelling, texturing... ⁶ D. Akca	TLS practical exercise G. Bilban	
16:00	registration, accommodation (Hostel Vič – for hostel guests)			Free afternoon		refreshment break	
17:00			dinner	dinner (Hostel Vič – for hostel guests)	Ljubljana tour old centre virtual museum	SC Assembly	
18:00					dinner	Closing	
19:00						dinner (Hostel Vič – for hostel guests)	
20:00		welcome party (Faculty Entrance hall)					social evening
21:00							

¹ Requirements for generating a geometrically correct point cloud
² ALS - Applications & operation with latest generation of scanners
³ Information extraction from ALS data
⁴ Applications of laser scanning in forestry
⁵ Overview of TLS systems, overall processing and applications
⁶ 3D modelling, texturing and applications in cultural heritage

LEGEND:

Theory	Practice	Excursions	WG and SC	Student session	Social events
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2.3 Program of the 2nd ISPRS WG VI/5 and SC Summer School

MONDAY, 2 July 2007	
9:15-10:00	Opening of the summer school <i>Festive room, 2nd floor</i>
10:00-11:30	REQUIREMENTS FOR GENERATING A GEOMETRICALLY CORRECT POINT CLOUD – 1st part Lecturer: Peter Frieß <i>Lecture room, II/6, 2nd floor</i> Contents of the 1st and 2nd part: Introduction: Principle of airborne laser mapping (ALM), Characteristics of ALM (e.g. multiple returns, density, intensity, wave form), Products and product quality (e.g. laser point accuracy, DTM accuracy) Mathematical model for laser point computation: Functional model (basic), Stochastic model (error propagation), Lab calibration, Effects of model (calibration) parameters on laser points, Extended functional model Laser point block adjustment: Description/definition, Mathematical model, Parameter determinability, Empirical results Summary/Conclusions
11:30-12:00	Refreshment break
12:00-13:30	REQUIREMENTS FOR GENERATING A GEOMETRICALLY CORRECT POINT CLOUD – 2nd part <i>Lecture room, II/6, 2nd floor</i>
13:30-14:30	Lunch <i>Faculty canteen, 2nd floor</i>
14:30–16:00	AIRBORNE LIDAR SENSING - APPLICATIONS & OPERATION WITH LATEST GENERATION OF SCANNERS Lecturer: Arthur Rohrbach <i>Lecture room, II/6, 2nd floor</i> Contents: typical applications, flight planning, execution & evaluation, costing, examples of projects (using features & possibilities offered by latest generation of Airborne LIDAR)
19:00–22:00	Welcome party <i>Faculty entrance hall</i> Contents: Cultural program, dinner, music & dancing

TUESDAY, 3 July 2007	
8:30-10:00	AIRBORNE LASER SCANNING DATA PROCESSING TUTORIAL – 1st part Lecturer: Charles Lemaire <i>Computer room, I/5, 1st floor</i> Contents of the 1st and 2nd part: Tutorial about processing lidar data using the INPHO products line: DTM master /DTMMaster stereo and SCOP++ LIDAR package
10:00-10:30	Refreshment break
10:30-12:00	AIRBORNE LASER SCANNING DATA PROCESSING TUTORIAL – 2nd part <i>Computer room, I/5, 1st floor</i>



12:00-13:00	Lunch <i>Faculty canteen, 2nd floor</i>
13:30-21:00	Technical visit and trip <i>departure from the hostel Vič</i> Contents: Departure from the hostel Vič; visit to FlyCom Enterprise in Lesce airport: helicopter and lidar equipment, presentation of some projects; trip to Bled - a famous tourist resort, walk around the lake; dinner in Žirovnica;

WEDNESDAY, 4 July 2007	
8:30-10:00	DSM/DTM FILTERING Lecturer: Norbert Pfeifer <i>Lecture room, II/6, 2nd floor</i> Contents: DSM/DTM; Problem definition; Approaches to ALS data filtering, exemplified by implemented algorithms
10:00-10:30	Refreshment break
10:30-12:00	INFORMATION EXTRACTION FROM AIRBORNE LASER SCANNING DATA – 1st part Lecturer: Georg Vosselman <i>Lecture room, II/6, 2nd floor</i> Contents of the 1st and 2nd part: Segmentation of point clouds: Methods for extracting smooth surfaces, Methods for extracting parameterised surfaces Detection of buildings: Usage of segmentation for building detection, Usage of multiple echoes for building detection, Change detection 3D modelling of buildings: Model based approaches, Data driven approaches, Map guided approaches 3D modelling of roads: Reconstruction of smooth road surfaces, Combining roads, trees and buildings in a city model, Modelling of complex road junctions
12:00-13:00	Lunch <i>Faculty canteen, 2nd floor</i>
13:00-14:30	INFORMATION EXTRACTION FROM AIRBORNE LASER SCANNING DATA – 2nd part <i>Lecture room, II/6, 2nd floor</i>
14:30-15:00	Refreshment break
15:00-16:30	APPLICATIONS OF LASER SCANNING IN FORESTRY Lecturer: Cristoph Straub <i>Lecture room, II/6, 2nd floor</i> Contents: Introduction to the Application of Airborne Laserscanning in Forestry Applications of Laserscanning - Single Tree Delineation - Forest Stand Mapping - Estimation of Forest Characteristics Software Demonstration
16:30-19:00	Free afternoon
19:00	Dinner in hostel (for hostel guests)



THURSDAY, 5 July 2007	
8:30-10:00	<p>OVERVIEW OF TERRESTRIAL LASER SCANNING SYSTEMS, OVERALL PROCESSING AND APPLICATIONS – 1st part Lecturer: Norbert Pfeifer</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p> <p>Contents of the 1st and 2nd part: Overview of terrestrial laser scanning technology: range measurement and beam deflection, Relative and absolute orientation of laser scanning point clouds, Overview on modelling approaches with real world examples, Overview on applications with selected examples</p>
10:00-10:30	Refreshment break
10:30-12:00	<p>OVERVIEW OF TERRESTRIAL LASER SCANNING SYSTEMS, OVERALL PROCESSING AND APPLICATIONS – 2nd part</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p>
12:00-13:00	<p>Lunch</p> <p style="text-align: right;"><i>Faculty canteen, 2nd floor</i></p>
13:00–14:30	<p>POINT CLOUD CO-REGISTRATION Lecturer: Devrim Akca</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p> <p>Contents: The laser scanning is one of the major data acquisition methods of the 3D modeling tasks. While high density pointcloud data in very short acquisition time is the main advantage of the method, the post-processing needs skilled operators and specialized software. This lecture puts the emphasis on the pointcloud co-registration, which is the first step of the whole processing chain. The methods in the literature are briefly touched. An algorithmic extension of the 2D image matching to the 3D case is explained in detail. Different examples and applications including the change detection and accuracy analysis studies are given.</p>
14:30-15:00	Refreshment break
15:00–16:30	<p>3D MODELLING, TEXTURING AND APPLICATIONS IN CULTURAL HERITAGE Lecturer: Devrim Akca</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p> <p>Contents: This lecture is application oriented. 3D surface meshing and texture capabilities of the available commercial software packages are discussed. Some cultural heritage examples, carried out by ETH Zurich, and gained experiences are given. Two mostly used 3D modelling softwares (PolyWorks and Geomagic) are compared in a practical work and the capabilities are addressed.</p>
17:30–22:00	<p>Ljubljana tour Contents: old centre, Ljubljana castle, along Ljubljanica river, dinner</p>

FRIDAY, 6 July 2007	
8:30-10:00	<p>PRACTICAL ASPECTS OF TERRESTRIAL LASER SCANNING – 1st part Lecturer: Nikolas Studnicka</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor, and outdoor measurements</i></p>



	<p>Contents of the 1st and 2nd part: Outdoor laser scanning, processing of data; examples of different application (e.g. mobile laser scanning, forensic applications, archaeology)</p>
10:00-10:30	<p>Refreshment break</p>
10:30-12:00	<p>PRACTICAL ASPECTS OF TERRESTRIAL LASER SCANNING – 2nd part</p> <p>Lecturer: Nikolas Studnicka</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p>
12:00-13:00	<p>Lunch</p> <p style="text-align: right;"><i>Faculty canteen, 2nd floor</i></p>
13:00 –14:30	<p>STUDENT SESSION: Oral presentations of young author papers Session chair-person: Ms. Anka Lisec</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p> <p>Presenters and papers: M. Alshawa: ICL: <i>Iterative closest line, a novel point cloud registration algorithm based on linear features</i> A. S. Woodget: <i>Estimation of growth rates at Kielder forest using airborne laser scanning</i> G. Jóźków: <i>Moving polynomial in filtering of airborne scanning laser data</i> C.Ő. Kivileim: <i>An undergraduate project with terrestrial laser scanner for purpose of architectural survey</i> M. Bitenc: <i>Analysis of airborne laser scanning data and products in the Neusiedler see project</i></p>
14:30-15:00	<p>Refreshment break</p>
15:00– 16:30	<p>TLS PRACTICAL EXERCISE Lecturer: Gregor Bilban</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p> <p>Contents: Demonstration of laser scanning, processing of data; examples of projects</p>
16:30-17:00	<p>Refreshment break</p>
17:00– 18:00	<p>STUDENT CONSORTIUM ASSEMBLY AND FINAL DISCUSSION</p> <p style="text-align: right;"><i>Lecture room, II/6, 2nd floor</i></p> <p>Session moderators: Mojca K. Fras (WG VI/5 chair), Anka Lisec (WG VI/5 secretary), Emmanuel Baltsavias (ISPRS Second Vice President), Student Consortium representative</p>
19:00-22:00	<p>Dinner and social evening in hostel Vič</p>

SATURDAY, 7 July 2007	
7:00-23:00	<p>TOURIST VISIT TO SLOVENIAN KARST AND COASTAL REGION</p> <p style="text-align: right;"><i>departure from the hostel Vič</i></p> <p>Contents: Postojna karst cave, Piran, dinner in Sečovelje</p>



2.4 Lecturers' CVs

Lecturers – alphabetical order:



AKCA, Devrim (1975) was born in Mersin, Turkey. He received his both B.Sc. and M.Sc. degrees at the Department of Geodesy and Photogrammetry Engineering, Karadeniz Technical University, in Trabzon, Turkey in 1997 and 2000, respectively, and his Ph.D. degree in Photogrammetry, Swiss Federal Institute of Technology (ETH) Zurich, Switzerland in 2007. He is currently research associate at the Institute of Geodesy and Photogrammetry (IGP), ETH Zurich.



BILBAN, Gregor (1975) was born in Kranj, Slovenia. He received his B.Sc. degree in Electrical Engineering with thesis »Global Positioning System«. Since 1999 he works for the company Geoservis, a Leica Geosystems authorized distributor and service workshop, as a technical support. He took part in establishing the first Slovenian permanent reference station which was included in EUREF Permanent Network and also in establishing the first Slovenian GNSS station. He gained experience in TLS on various Technical trainings at Leica Geosystems and on different laser scanning projects in Slovenia. At the company Geoservis he is also responsible for ISO 9001 certification. He is currently attending M.SC. geodesy study at the Faculty of Civil Engineering and Geodesy in Ljubljana.



FRIESS, Peter (1960) was born in Dieburg, Germany. He received his M. Eng. degree in Geodesy in 1984 from Darmstadt University. In 1985 he joined the Institute of Photogrammetry at Stuttgart University and participated in the research project "High Precision Navigation" under the direction of Prof. Dr. Ackermann. In 1990 he was awarded the Ph.D. with honours by Stuttgart University for the thesis "Kinematic Positioning for Aerial Triangulation with the NAVSTAR Global Positioning System". He worked at INPHO GmbH Stuttgart on the development of GPS processing software until he co-founded TopScan GmbH in 1992. For 10 years he has been Managing Director of TopScan. In 2002 he accepted the position of Director for Geodetic Applications R&D at Optech International in the US. In 2006 he returned to Germany and is since then active as an independent consultant for Optech International. Peter Friess received the Award of the Society of Friends of the University of Stuttgart (1990), the Hansa Luftbild Award (1991) and the Carl Pulfrich Award by Carl Zeiss Oberkochen (1997).



LEMAIRE, Charles (1979) was born in Chinon (France) in 1979. He received M.Sc. degree in surveying engineering in 2003 from the INSA in Strasbourg. In 2003 he joined the support and sales team of INPHO GmbH. Since 2006 he is employed as an application engineer. He is currently working on the enhancement and quality assurance of the photogrammetric and Lidar products (INPHO GmbH).



PFEIFER, Norbert (1971) was born in Vienna, Austria. After his studies of surveying engineering he worked as research assistant studying airborne laser scanning from 1997 at the Vienna University of Technology. He earned his Ph.D. (with honours) in 3D terrain modelling combining approaches from computational geometry and photogrammetry. Thereafter, 2003, he went as PostDoc to Delft University of Technology, the Netherlands, in the Section of Photogrammetry and Remote Sensing where he became Assistant Professor in 2005. The research field widened to terrestrial laser scanning. In 2006 he took the position of senior researcher at alpS, Centre for Natural Hazard Management, in Innsbruck, Austria, where he lead a project on airborne and terrestrial laser data management and modelling with specific attention given to modelling alpine natural hazards. Later in 2006 Norbert Pfeifer took the position of Professor in Photogrammetry at Vienna University of Technology. He is an active member of the ISPRS, International Society of Photogrammetry, Remote Sensing and Spatial Information Sciences, where he is co-chair of the working group V/3 on Terrestrial Laser Scanning. The research interests are topographic and 3d modelling, laser ranging and scanning, and photogrammetry, covering all aspects from data acquisition to modelling to application.



ROHRBACH, Arthur, Leica Geosystems AH



STRAUB, Christoph is coming from Albert-Ludwigs University Freiburg, Department of Remote Sensing and Landscape Information Systems, Germany. He studied "Forestry" at the Rottenburg University of Applied Forestry, Germany. He earned his Master degree at international Master Course "Photogrammetry and Geoinformatics", Stuttgart University of Applied Sciences, Germany. Thereafter, he has been working at the Department of Remote Sensing and Landscape Information Systems (University of Freiburg) and the Forest Research Institute Baden-Wuerttemberg to work with LIDAR data in different projects.



STUDNICKA, Nikolaus (1965) was born in Mistelbach, Austria. He graduated at the Technical University Vienna, Austria and since 1994 he has hold a degree in communications and radio-frequency engineering. In the 1995-1999 period, he was working at RIEGL Laser Measurement Systems GmbH, Sales and Marketing. After two years of working at LORO GmbH he joined RIEGL Laser Measurement Systems GmbH as Manager, International Sales. His most significant publications are related to laser scanning, terrestrial and airborne laser scanning, cultural heritage documentation by combining near-range photogrammetry and terrestrial laser scanning, laser scanning and photogrammetry for archaeological fieldwork, integrated hybrid sensor based on photogrammetry and laser scanning for architectural representation etc.



VOSSelman, George (1963) was born in Ommen, the Netherlands. He graduated with honours from the Delft University of Technology, the Netherlands, in Geodetic Engineering in 1986 with an M.Sc.-thesis on the precision of digital camera's. After his graduation he worked as researcher at the Institute of Photogrammetry of the Stuttgart University, Germany, until 1992. In 1991 he obtained his Ph.D.-degree with honours from the Rheinische Friedrich Wilhelms University of Bonn, Germany, on the topic of relational matching. After a year as visiting scientist at the University of Washington, Seattle, U.S.A., he was appointed professor of Photogrammetry and Remote Sensing at the Delft University of Technology in 1993. In 2004 he joined ITC as professor of Geo-Information Extraction with Sensor Systems. George Vosselman is recipient of the Hansa Luftbild Award (1993) and the ISPRS Otto von Gruber Award (2000). As of 2005 he is Editor-in-Chief of the ISPRS Journal of Photogrammetry and Remote Sensing.

Over the years George Vosselman taught many courses in photogrammetry, remote sensing and laser altimetry, both at undergraduate and graduate level. He gave guest lectures, tutorials and courses at universities and conferences in Austria, Bangladesh, Belgium, Finland, Germany, Italy, Saudi-Arabia, Turkey, and U.S.A.. He has been supervisor of about 40 MSc students. From 1999 till 2002 he was programme director for the study in Geodetic Engineering at the Delft University of Technology. He is author/editor of chapter 6 of the ASPRS Manual of Photogrammetry (5th edition).

2.5 University of Ljubljana, Faculty of Civil And Geodetic Engineering



The University of Ljubljana is an institution with a very rich tradition. It was established in 1917 on the foundations of a long-established pedagogical tradition. With over 40.000 regular students, 7.000 students 'from work' and almost 1.000 postgraduate students participating in more than 130 graduate and 110 postgraduate study programs it ranks among the biggest universities in the world scale.

Faculty of Civil and Geodetic engineering

Faculty of Civil and Geodetic Engineering is one of the faculties of the University of Ljubljana. Historical overview of Faculty of Civil and Geodetic Engineering:

1919 – 1942	Technical Faculty
1945 – 1958	THS – Faculty of Civil Engineering and Geodesy
1958 – 1994	Faculty of Architecture, Civil Engineering and Geodesy
1995 -	Faculty of Civil and Geodetic Engineering

The Faculty of Civil and Geodetic Engineering consists of two departments: Department of Civil Engineering and Department of Geodetic Engineering. It offers study programs leading to the awards of degrees:

- University degree of civil engineering
- University degree of geodetic engineering,



- University degree of water management and communal engineering,
- Professional higher education degree in civil engineering,
- Professional higher education degree in geodetic engineering,
- Master's degrees and
- Ph.D. degrees.

The teaching, research and professional work is being carried out in teaching-research units of both departments. The teaching-research units are chairs and institutes which unite the employees of the same or related disciplines. At the Department of Geodetic Engineering are six chairs:

- Chair of Geodesy,
- Chair of Cartography, Photogrammetry and Remote Sensing,
- Chair of Geoinformatics and Real Estate Cadastres,
- Chair of Spatial Planning,
- Chair of Engineering Geodesy and
- Chair of Mathematic and Physical Geodesy and Navigation.

The teaching and research workers at the Faculty of Civil and Geodetic Engineering cooperate actively at the development of science and scientific disciplines by taking active part at domestic and international projects. These activities are closely interconnected and unavoidable for quality educational activity. Nonetheless they also enable better material ground for teaching, research and professional work at the Faculty. As said before, at the Department of Geodesy, there are 2 graduate study programs (University and High Technical study) and 1 postgraduate study program with some specializations.

The Professional Higher Education Study of Geodetic Engineering (6 semesters)

The Professional Higher Education Study of Geodetic Engineering consists of three years of organized study activities or 2250 hours, that means 375 hours/semester, and offers two study orientations:

- Engineering Geodesy and
- Spatial Information Science.

In the first two years the study is common for both orientations. In the third year there are 405 hours covered by both orientation, and 345 hours by one or the other orientation. There are two practical trainings in the framework of the study program as well: 1 month after 4th semester and 4 months after 6th semester. The aim of the Professional Higher Education Study of Geodetic Engineering is education of geodetic engineers oriented into practice, trained for solving of practical and development tasks.

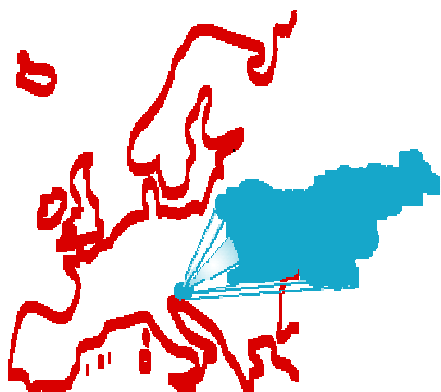
The mission of the Geodetic Department, Faculty of Civil and Geodetic Engineering, is primarily in the following:

- qualifying experts for the practical problem solving especially in the field of sustainable management of physical space,
- educating experts for research work in the fields of physical space management, integrated management of the real estates and sustainable physical planning,

providing initiative and support for the candidates, whose field of endeavour is oriented to teaching and academic duties in the fields of physical space management, integrated management of real estates and continuous physical planning.



3 Some facts about Slovenia, Ljubljana



3.1 General information about Slovenia

The Republic of Slovenia has been a sovereign state since 1991 and a member of the United Nations from 1992. The new Central European country of Slovenia is situated on the sunny side of the Alps between the Adriatic Sea and the Pannonian Plain. It occupies barely 8.000 square miles (20.551 km²) and is about half the size of Switzerland. The capital of Slovenia is Ljubljana, a town with about 300.000 residents and it lies in the central part of the country. Most of the Slovenes live within the borders of the independent country of Slovenia, and there are substantial Slovene minorities in the border regions of Italy (100.000), Austria (50.000), Croatia (25.000), and Hungary (6.000).

Slovenia has only had short statesmanship from 1991 onwards, but a long national history. Our ancestors settled the territory of Eastern Alps in the middle of the 6th century. Karantanija (Carinthia), the first independent state on Slovenian territory and the first democratic society was formed in the middle of the 7th century and was probably the first Slavic state in history. But in 8th century Karantanija was taken by Francs and pagan Slavic people were christianised. Later the land was gradually divided into several provinces, ruled by various feudal families in the 11th and 12th century. By the end of the middle ages, the whole territory of present Slovenia came under the rule of the Austrian family of Habsbug. Throughout the 15th and 16th century Slovenian territory acted together with Croatian territory as an important zone against Turk conquest. With the protestant influence the first Slovenian book was published in 1550. Following the end of the World War I and the fall of Austro-Hungarian empire, Slovenia was included into Yugoslav kingdom. After the Second World War Slovenia became a part of new Socialist Federative Republic of Yugoslavia in 1945. In 1991, after downfall of former Yugoslavia, Slovenia became an independent state.

After settling the area between the Adriatic Sea, the Eastern Alps, the Danube River, and Lake Balaton, the Slovenes lost two thirds of their ethnic territory during the Middle Ages to Germanization in the north and the colonization of the Pannonian Plain by the Hungarians. The centre of the Slovene state, formerly in Zollfeld (Gospodsvetsko polje) in Karantanija, was forced to shift over time to the Ljubljana Basin. Despite such historical, political and social pressures Slovenes have saved their arable land, forests and culture. The historical attachment of the Slovene people to Austria, Italy, and Hungary is still reflected in their dialects, customs, and thinking.

Relatively small but very diverse, Slovenia contains everything that larger countries have. As different and attractive the geographical pictures are, the varied the nature is too. This is caused by changeable climatic inflows from Alpine, Mediterranean and continental sources from East Europe, and to very heterogeneous relief with naturally different regions. Slovenia is one of the most forested European countries (60% of the land). The forests once provided shelter, firewood, and food, and now, apart from their role in maintaining the ecological balance, have great importance as a source of raw material for the wood processing industry. In the Kočevje region, natural scientists can study a virgin forest and giant trees while hunters can track deer, wild boar, wolf, lynx, and bear.



3.1.2 Main Regions

The Slovenian coast (Primorska), the Karst

Slovenia has 47 km of coastline in the south-west part of the country, and presents the extreme north of the Mediterranean – on the Adriatic Sea. Sečovlje salt-works were built on the delta Dragonja river already in the roman time. Salt is now taken only from the part of the pans, most of the area is now abandoned and provides fascinating natural habitat for salt loving plants and very diverse birds-life. More to the north, the scenery is completely different – there are the highest flysch cliffs on the Adriatic coast. Although the Slovene coast is only forty-seven kilometres long, for Slovenia it represents a true gateway to the world with the harbour in Koper and a nice holiday destination at the Adriatic coast.

Going eastwards from the coast region, through a hilly landscape filled with orchards and vineyards, one is suddenly faced with the next stage – a dark grey limestone wall. This is the edge of the Karst, around 100 m high cliff offering the great contrast to the coastal flysch landscape. In Slovenia, there is near 44 % of the elementary Karst, named by the original land of Karst in SW Slovenia with more than 6000 caves, from which 27 are accessible and open for tourists. Among the most interesting caves on the classical Karst are those at Škocjan, inscribed since 1986 in the UNESCO list of the world cultural and natural heritage. Outstanding among the caves is Postojna cave with the famous olm (*Proteus anguinus*), already famous for more than 700 years. Another exceptional Karst region is connected with Ljubljanica river, which disappear several times under the ground and creates a system of Karst polje and valleys. Cerknica lake is no less famous, an occasionally filled Karst polje in the system of Ljubljanica river. The lake starts to disappear in spring and leaves behind a polje.



Soča river

The Alps, Carniola (Gorenjska)

The tourist slogan “The Country on the Sunny Side of the Alps” is a valid label for Slovenia from the meteorological point of view as well since the easternmost part of the Alps is the first to receive the morning sun. Slovenia’s alpine world covers the high mountain world of the Julian Alps (Triglav, 2864 m), the Kamniške-Savinjske Alps (Grintovec, 2558 m), and the Karavanke Mountains (Stol, 2236 m). Mount Triglav, the highest mountain in Slovenia, is a symbol of Slovene identity. It is only an hour by car

Bled – famous island with church



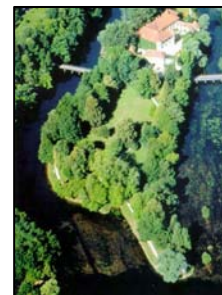
from the capital of Slovenia to the warm Adriatic Sea and the Bay of Trieste. A wide area around was declared as a national park (Triglavski narodni park). Three rivers cut into Triglav massif: the Soča, the Sava Dolinka, and the Sava Bohinjka. Soča river is one of the last five best preserved rivers in the entire Alps. On the western edge of Julian Alps lies Bled with picturesque island in the middle of the lake and famous castle on the cliffs near the lake.

Towards the south (Dolenjska)

The southern Slovenia with Kočevje and Snežnik forest is the large forest region in Slovenia. Continuing south-eastwards from Alps and Ljubljana the landscape changes into undulating hills. The Alpine foothills are still cut with deep valleys, and Dolenjska is already open. Here is the world



of the Krka river with its lazy current. There is only a few remnants left of the former extensive swamp forest – Krakov virgin forest. The centre of this peaceful landscape is Novo mesto, above the green river Krka. To the south, there are Gorjanci, a mountain ridge in which a number of myths and tales are still extant today. The southern slopes run through vineyards into Bela Krajina, recognizable by its birch trees. Bela krajina is bounded towards Croatia by the river Kolpa, which is here already a tranquil lowland river. The eastern Slovenia is dominated by the river Sava, where the landscape is passing on to Pannonian plain in the east.



Otočec castle – island on Krka river

On the edge of Pannonian plain (Štajerska)

In addition to its distinctive Adriatic, alpine, and karst regions, Slovenia is also characterized by the Pannonian hills and plains found along the lower reaches of the Drava, Kolpa, Mura, and Sava rivers in the eastern part of the country. These hills and plains cover more than one fifth of Slovenia, and three quarters of this land lies less than 300 meters above sea level. Pohorje lies along the northern border, with its crystalline massif rounded and covered with forests. Maribor, the second largest Slovenian city lies at its foothills. On the shores of the river Drava, there is a plain called Dravsko polje. It is the agricultural region, surrounded by small hills - Slovenske gorice, Haloze and Kozjansko. Sensitive to climate changes, grapevines are planted on sunny slopes in the so-called “thermal zone” where temperatures in the autumn are higher than in surrounding areas. Winegrowing not only influences the appearance of the landscape and the orientation of the economy but also the way of life, the openness and eloquence of the people, their sense of humour, and the gentle spirit in general. Here, on the river Drava, is the oldest Slovenian city - Ptuj, first established in Roman time beside the old crossing over Drava. Along the Mura river, in the most eastern part of Slovenia, is the broad expanse of the Pannonian plain. Not so much in the flat landscape, but especially in the unusual melancholy, mixed with temperamental hospitality. These are feelings, brought on by lazy inertia of Mura, endless fields, storks nest and, of course meeting the local inhabitants. The further east we go, the more melodious Prekmurje dialect mixes with Hungarian, which is spoken by the minority. Murska Sobota is the centre of the region.

3.1.3 Climate

Slovenia lies in the region where the climate ranges from Alpine through Continental to Mediterranean. On average, January temperatures in the continental part of Slovenia range from -10°C to 0°C, whereas in July they are around 25°C to 30°C. The nights are usually cooler. The temperatures in the mountain region are typically lower by 5°C, and at the seaside one can expect some 5°C more. Humidity ranges between 70 and 85 %. There is a yearly average rainfall of 800 mm, mostly in spring and autumn months.

3.1.4 Language

Slovene had and still has a huge role in keeping Slovenian nation alive and united as a culture over centuries. It is a South Slavic language closely related to Croatian and Serbian and written in Roman alphabet. About 50 dialects and sub-dialects are spoken in Slovenia. Most people also speak at least one other language. Among younger is the preferred language English which is also taught in schools. A lot of people in Primorska speak Italian and in Štajerska and Koroška you can find people speaking German.



For foreigners it is not easy to speak Slovenian language but we Slovenians will be happy to help you with basic words.

France Prešeren is the greatest Slovene poet. His poetry is symbol of longing for love and freedom, which is why one of his poems (Zdravljica) became the national anthem. Prešeren's monument is now situated in the centre of town (Prešeren square) and is the central meeting place in Ljubljana for inhabitants and tourists.

France Prešeren monument

3.1.5 Money

Slovenia has changed the currency at the beginning of this year (2007). We have replaced 239,64 sit (tolar) by 1 Euro. Motives of the coins:



*1 cent:
Stork*



*2 cents
Duke's throne*



*5 cents
Sower*



*10 cents
Plečnik's project of
Slovenia's parliament*



*20 cents
Lipizzaner*



*50 cents
Triglav*



*1 EURO
Primož Trubar*



*2 EURO
Plečnik's project of
France Prešeren.*

3.2 Ljubljana – the capital of Slovenia

Ljubljana is a medium sized city, situated 298 m above sea level, located in the heart of Slovenia. Together with its suburban neighbourhoods and green areas, which reach almost right into the centre of the city, it covers an area of 272 km² and has less than 300.000 inhabitants. The climate is Central European with Mediterranean influences. Ljubljana is smaller than one would expect from a capital with a government and parliamentary building, all administrative services and foreign embassies and the university with 43000 students, which encompasses 41 institutes, from the Josef Stefan Institute to the UNESCO Centre for Chemical Studies, the Clinical Centre and the World Trade Centre. Indeed, it is the political and cultural heart of Slovenian nation. Ljubljana is home to numerous theatres, museums and galleries, and boasts one of the oldest philharmonic orchestras in the world.

A short history

Ljubljana's geographical position has governed its colourful past. A brisk migration of nations flowed through the Ljubljana Gateway, part of the natural entrance from Central Europe to the



Mediterranean, the Balkans and to the East. So is not surprising that settlements of pile dwellers, and later Illyrians and Celts, grew up in this region more than 5000 years ago. It has managed to retain traces from all periods of its rich history; from the legacy of Roman Emona; through to the Renaissance, Baroque and Art Nouveau periods characterized in the house fronts and ornate doorways of the city centre, the romantic bridges adorning the Ljubljanica river, the lopsided rooftops and a park reaching deep into the city centre. Here eastern and western cultures met; and the Italian concept of art combined with the sculptural aesthetics of Central European cathedrals.

At the time of Roman hegemony, in the year 15 A.C. Roman soldiers built a military base on the left bank of the river Ljubljanica. The settlement got a name Iulia Emona and was surrounded with 6 meters high wall. A part of the wall on Mirje street is still seen today. Because of the geographical position, Emona was frequently invaded by the barbarians and in 452 A.D. was finally destroyed by the Huns. The Slavs began to settle in this territory in the 6th century A.D. Ljubljana is first mention in written sources from 1144, its historical rise beginning in the 13th century when it became the Capital of the Province of Carniola. In the 16th century, the time of Slovene Protestantism, Ljubljana was the meeting place of the national conscious. In that time Primož Trubar gave the Slovenes the first book Ljubljana had an important role in Napoleonic times – it was the capital of entire Illyrian provinces. In 19th century Ljubljana got a railway, which link the city with Trieste and Vienna.

There are few cities on which a single artist has left such a strong personal impression as the architect Jože Plečnik had done to Ljubljana. By offering monumentality and beauty he attempted to nurture the feeling of self – confidence in its inhabitants. He designed The Triple bridge near Prešeren Square, a market alongside Ljubljanica, university library, sport stadium, cemetery and he restored the open air theatre Križanke.



After the World War I., the Austro-Hungary disintegrated and Slovenia joined the new state – Kingdom of the Serbs, Croats and Slovenes. After the World war II., Slovenia became on of the six republics of the Socialist Republic of Yugoslavia. In December 1990 people of Slovenia voted for independence and sovereignty and in June 1991 The Republic of Slovenia proclaimed its independence – Ljubljana became a capital of the new republic.

Why Ljubljana?

To date, historians have not yet agreed about the origin of the city's name. Some claim that the city was named after an ancient city deity that the early Slavs called Laburus. Others maintain that the name derives from Latin and that the city was named after a flooding river "aluviana", or that the name derives from the word "Laubach", meaning "a swamp". Those who like the playwright and historian Anton Tomaž Linhart – are fond of the city believe that its name can only derive from the Slavic word "luba", meaning beloved.



The legend of the Ljubljana Dragon

There is a legend about the founder of Ljubljana – a Greek prince Jason, together with his companions from the ship Argo stole the golden fleece from the Colchian King. In an effort to escape its pursuers the ship took a wrong turn and, instead of sailing south on the Aegean Sea, it found its way from the Black Sea up the



Danube and there was no way to turn back. Therefore, the way continued from the Danube river into the Sava river, and finally from the Sava into the Ljubljanica. At the source of the Ljubljanica they stopped, took the ship apart, put the pieces on their shoulders and thus carried the ship to the Adriatic Sea, where they put it back together and continued their way back home. Between the present-day Vrhnika and Ljubljana the Argonauts found a big lake surrounded by a marsh. It was here that Jason came across a terrible marsh monster, which he fought and eventually slew. This monster was the Ljubljana dragon, which became the symbol of the city and you can see it on the Ljubljana coat of arms and statue of the dragon on the Dragon Bridge.

Life in Ljubljana

A new spirit has revitalised the streets of the historical centre without corrupting it. The splendour of old houses of well-to-do families remained untouched. The city centre salvages fragments of former stories and opens the door ahead to the future and back to the past at the same time. Between the old walls there are many quiet places to sit, take a rest and drink a good coffee. Ljubljana enjoys itself in the Central



European way – therefore with less noise and more relaxation. This doesn't mean that cafés close their doors at dusk. On the contrary, this is the time when the city opens itself up to night birds of all kinds. To those with a more gentle evening in mind, the city offers restaurants and arty cafés, the legacy of the old coffee shops. You can find a lot of lively discos, and numerous restaurants where you can enjoy fine food and drink good wine into the early hours, as well. Ljubljana is a city that people often return to, because of work or because of pleasant memories of previous visits. It is similar to a number of other pleasant European cities – yet it is different and if you want to be fully assured that Ljubljana is an interesting, pretty and friendly place, than just ask the locals, they love it.

Indeed, wherever you go from Ljubljana, you will not have more than a two-hour drive to state border. Within this brief distance, almost at the doors of the city, Slovenia's beauty awaits you – almost perfect landscapes with villages nestling under hills or at the foot of the mountains, the Škocjan and Postojna Cave, the Karst region with the Lipica Stud Farm, the sea coast, alpine ski resorts, the lakes of Bled and Bohinj, mountain rivers etc.

3.3 Trip to Primorska - Saturday

Primorska is the region in the southwest part of Slovenia, which is one of the most beautiful places in Slovenia especially because of Karst with magnificent caves and Adriatic Sea with old cities as Piran is.

Our first stop is Postojna Cave (Slovenian: Postojnska jama). It is a 20,570 m long Karst cave system near Postojna, Slovenia. Postojna Cave is the longest cave system in the country as well as one of its top tourism sites. The caves were created by the Pivka River. The cave was first described in the 17th century by Janez Vajkard Valvasor, and a new area of the cave was discovered accidentally in 1818 by local Luka Čeč, when he was preparing the then known parts of the cave for a visit by Francis I, the first Emperor of Austria. In 1819, the caves were opened to the public, and Čeč went on to become the first official tourist guide for the caves. Electric lighting was added in 1884, preceding even Ljubljana, the capital of Carniola, the Austro-Hungarian province the cave was part of at the time, and further enhancing the cave system's popularity. In 1872 rails were laid in the cave



along with first cave train for tourists. At first, these were pushed along by the guides themselves, later at the beginning of the 20th century a gas locomotive was introduced. After 1945, the gas locomotive was replaced by an electric one. 5.3 km of the caves are open to the public, the longest publicly accessible depth of any cave system in the world. The caves are also home to the endemic olm, the largest trogloditic amphibian in the world. Part of the tour through the caves includes a pool with some olms in it, making this the only place in the world where the olm can be seen by tourists.



Postojna cave

We will visit Adriatic coastline where you can enjoy walking or sitting along the coast. The hilly landscape of the coastal interior with its rich cultural heritage is occasionally compared to French Provence. Characteristic Mediterranean vegetation flourishes under the hot Mediterranean sun, and much effort is devoted to the production of olive oil and wine; indeed, the vineyards extend practically to the shoreline. This region supplies the rest of Slovenia with early fruits and vegetables. The Municipality of Piran, our next stop, is renowned as the most tourist developed municipality in Slovenia.

Tourism, however, has not always been the main economic activity in the municipality, and preserved documents testify to the region's rich and varied economic and social life. We can thank our town archivists, past and present, for the preservation of centuries-old municipal archives, including some rarities such as the statutes from 1274. The archives reflect a rich historical tradition that reaches back to the Roman Empire. In the past, the primary occupations were linked with the sea and the soil, and the production of salt in Sečovlje, Strunjan, and Lucija placed its stamp on the economics of the past. In the Napoleonic period, large storehouses for salt were built in Portorož and stimulated an extensive sea trade. With its favourable Mediterranean climate, the interior of the municipality offered suitable conditions for the production of vegetables, wine, and olives-products



for which the municipality is still famous today. Here we should mention two autochthonous wines, the white Bela Malvazija and the red Refošk, and connoisseurs maintain that our olive oil is among those of the highest quality.

Piran – Slovenian mediterranean city



4 Organizers, Sponsors of the ISPRS VI/5 & SC Summer School



4.1 Organizing team

International:

- ISPRS WG VI/5
- ISPRS Student Consortium

Local host:

- Faculty of Civil and Geodetic Engineering at University of Ljubljana

Local organizers:

- Slovenian Geodetic Student Association
- Association of Slovenian Surveyors, Section of Photogrammetry and Remote Sensing

Local organizing team:

ISPRS WG VI/5:

- Mojca **K. FRAS**, ISPRS WG VI/5, chair
- Anka **LISEC**, ISPRS WG VI/5 secretary

Students from the Faculty of Civil and Geodetic Engineering

- Urška **RENKO**, DŠGS
- Mateja **ZALOKAR**, DŠGS
- Žiga **ARBEITER**,
- Janja **AVBELJ**,
- Julijana **BARKOVIČ**
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- Vid **PETERMAN**,
- Gregor **STAVBAR**,
- Mojca **TAMŠE**,
- Ana **URBAS**,
- Peter **TOMAŽIČ**,
- Anja **VREČKO**...



4.2 Sponsors of the Summer School in alphabetical order



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FLYCOM d.o.o.



**GEODETSKI INŠTITUT
Slovenije**



**GEODETSKI ZAVOD Celje
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**GEOFOTO
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GEOLOŠKI ZAVOD Slovenije



GEOSERVIS d.o.o., Ljubljana



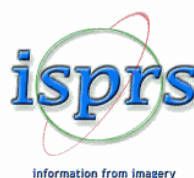
GIZ geodetskih izvajalcev



IGEA d.o.o., Ljubljana



INPHO GmbH, Stuttgart



ISPRS Council



IZS – matična sekcija geodetov



KMETIJSKA ŠOLA GRM,
Novo mesto



LEICA GEOSYSTEMS AG,
Heerbrugg,



Ljubljanski geodetski biro d.d.



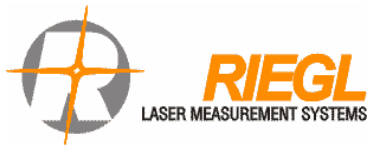
LUZ d.d., Ljubljana



Poslovni sistem Mercator d.d.



Radeče papir Muflon, Radeče



RIEGEL LMS, Horn

**Študentski svet Fakultete za
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**University of Ljubljana
Faculty of Civil and Geodetic
Engineering**



5 Useful Information

5.1 Little dictionary

OSNOVA ---- **basic**

JA ---- **yes**

NE ---- **no**

KAKO SI? ---- **How are you?**

HVALA ---- **thank you**

OPROSTITUTE --- **I am sorry**

PROSIM ---- **please**

IZVOLITE ---- **here you are**

DOBRO ---- **good**

RAZUMEM ---- **I understand**

DOBER DAN ---- **good afternoon**

ZDRAVO/ŽIVIJO ---- **hi (informal)**

NA SVIDENJE ---- **Goodbye**

DOBRO JUTRO ---- **good morning**

DOBER VEČER----**good evening**

LAHKO NOČ ---- **good night**

IME ---- **Name**

POTNI LIST ---- **Passport**

NA POMOČ! ---- **Help!**

HRANA ---- **food**

zajtrk ---- **breakfast**

kosilo ---- **lunch**

večerja ---- **dinner**

kruh ---- **bread**

mleko ---- **milk**

sir ---- **cheese**

jajca ---- **eggs**

sadje ---- **fruit**

meso ---- **meat**

riba ---- **fish**

sol ---- **salt**

poper ---- **pepper**

juha ---- **soup**

sladkor --- **sugar**

zelenjava ---- **vegetables**

PIJAČA ---- **drinks**

voda ---- **water**

mineralna voda ---- **mineral water**

sadni sok ---- **fruit juice**

brezalkoholna pijača ---- **soft drinks**

limonada ---- **limonade**

čaj ---- **tea**

kava ---- **coffee**

kapučino ---- **cappuccino**

vino ---- **wine**

pivo --- **beer**

IZGUBITI SE ---- **getting lost**

zgoraj ---- **up**

spodaj ---- **down**

naravnost --- **straight**

za ---- **behind**

nasproti ---- **opposite**

sever ---- **north**

levo ---- **left**

desno ---- **right**

jug ---- **south**

vzhod ---- **east**

zahod ---- **west**

tu ---- **here**

tam ---- **there**

iščem ---- **I'm looking for**

Kje je? ---- **Where is?**

5.2 Other useful information

Time zone

Central European Time zone (CET), i.e. one hour ahead of Greenwich Mean Time (GMT+1). Please note that Daylight Saving Time is effective during the summer (DST = GMT+2).

Drinking water

The water is safe and drinkable throughout the country.



Electricity

Voltage in Slovenia is 220V at 50Hz. Electric sockets only accept round-pin plugs. Appliances designed to operate on 110/120V need a voltage converter and a plug adapter.

Currency and Banking, Credit Cards

The currency in Slovenia is euro. Money can be easily exchanged at banks and exchange offices, travel agencies, hotels, airports, railway stations, and some post offices. The usual banking hours are Weekdays 9.00-12.00 and 14.00-17.00. Exchange offices are usually open on Saturdays, too.

All major credit cards, such as Visa, Mastercard - Eurocard, Diners, American Express etc. are accepted in most hotels, restaurants and shops.

City transport - Ljubljana

Ljubljana is not as big as other European capitals. So it is possible to get to the centre by foot in half an hour almost from any place in Ljubljana. Other possibilities are:

City buses

Ljubljana's public transport system is run by LPP. There are 22 lines: lines 1, 2, 3, 6 and 11 are main lines and are running from 3.15 till 24.00 every day. Buses on these lines drive about every 15 minutes (frequency depends on the day time). Buses are clearly marked. You can pay on board, which costs **1,6 Euro** or you can buy a token - "ŽETON" in newsstands or kiosk usually near the bus stop, which costs **0,79 Euro**. The price does not depend on length of the drive. To get to your accommodation at *Hostel Vič* you have to take bus no. **1** which drives in direction "Mestni log" and leave it at stop "Gerbičeva". If you want to drive from *Hostel Vič* to the centre you also have to take bus no. **1** but now it has to drive in direction "Vižmarje" and leave at stop "Pošta". Our faculty is also by line 1. To go to the faculty you leave the bus at stop "Tobačna". The faculty is a high grey building with a lot of windows placed behind the parking. To the train and bus station you can come by buses no. 2, 9, 12 and 17 at stop "Kolodvor".

Taxi

Taxis can be hired on street near the train station, at the tourist information centre or in front of hotel Slon (Slovenska cesta). You can also call a taxi on numbers: 9700, 9701, ..., 9709.

But you have to know it can be quite expensive.

Rent-a-bike

Ljubljana is a city of cyclists and there are bike lanes everywhere. It is possible to rent a city bike for only **1 Euro** on the *Prešernov trg*.

Important phone numbers

Police 113

Fire-brigade 112

International dialling code in Slovenia is **00**, i.e. to make an international phone call from Slovenia you have to dial 00 first.

Country code of Slovenia is **386**, i.e. to make an international phone call to Slovenia you have to dial international dialling code in your country first, then 386, then local area code in Slovenia without leading zero and finally local phone number.



Detailed map – from Hostel Vič to the faculty



Map of Ljubljana Vič. You sleep at Hostel Vič marked with an arrow; faculty is also marked with an arrow.

Important addresses

Hostel Vič:
Dijaški dom Vič
Gerbičeva 51/a
1000 Ljubljana

Faculty of Civil and Geodetic Engineering:
Fakulteta za gradbeništvo in geodezijo
Jamova 2
1000 Ljubljana



6 Notes



