Abstract Book

5th Annual International Conference on Engineering Education & Teaching

1-4 June 2020, Athens, Greece

Edited by
Gregory T. Papanikos

2020

Abstracts

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(In Alphabetical Order by Author's Family name)

Preface

This book includes the abstracts of all the papers presented at the *5th Annual International Conference on Engineering Education & Teaching (1-4 June 2020)*, organized by the Athens Institute for Education and Research (ATINER).

A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into 6 divisions and 37 units. Each unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together. Specific individuals are listed on the following page.

Gregory T. Papanikos
President

5th Annual International Conference on Engineering Education & Teaching, 1-4 June 2020, Athens, Greece

Scientific Committee

All ATINER's conferences are organized by the Academic Council. This conference has been organized with the assistance of the following academic members of ATINER, who contributed by chairing the conference sessions and/or by reviewing the submitted abstracts and papers:

1. Gregory T. Papanikos, President, ATINER & Honorary Professor, University of Stirling, U.K.
2. Nicholas N. Patricios, Professor & Dean Emeritus, School of Architecture, University of Miami, USA.
3. Theodore Trafalis, Director, Engineering & Architecture Division, ATINER, Professor of Industrial & Systems Engineering and Director, Optimization & Intelligent Systems Laboratory, The University of Oklahoma, USA.
4. Clara Germana Gonçalves, Researcher, CITAD (Centro de Investigação em Território, Arquitectura e Design), Lusíada University and Associate Professor, ISMAT (Instituto Superior Manuel Teixeira Gomes), Portugal.
5. Virginia Sisiopiku, Associate Professor, The University of Alabama at Birmingham, USA.
6. Mike Mavromihales, Academic Member, ATINER & Senior Lecturer and Course Leader, University of Huddersfield, UK.

FINAL CONFERENCE PROGRAM
5th Annual International Conference on Engineering Education & Teaching, 1-4 June 2020, Athens, Greece

PROGRAM

Monday 1 June 2020

10.30-11.20
Registration

11.20-12.00
Opening and Welcoming Remarks:
- Gregory T. Papanikos, President, ATINER
- Nicholas N. Patricios, Professor & Dean Emeritus, School of Architecture, University of Miami, USA
- Clara Germana Gonçalves, Researcher, CITAD (Centro de Investigação em Território, Arquitectura e Design), Lusíada University and Associate Professor, ISMAT (Instituto Superior Manuel Teixeira Gomes), Portugal.
- Virginia Sisiopiku, Associate Professor, The University of Alabama at Birmingham, USA.

12.00-12.30
Giulia Pellegri, Associate Professor, Vice Dean of Polytechnic School of Genoa, University of Genoa, Italy.
Title: Urban Planning in Italy between the 19th and 20th Centuries. The Drawing of the City: The Case of Via XX Settembre in Genoa. (PowerPoint)

12.30-13.00
Francesca Salvetti, Adjunct Professor, University of Genoa, Italy.
Title: Reading the Visible and Perceived Aspect of Urban Construction: Comparison Methodologies. (PowerPoint)

13.00-13.30
Michela Scaglione, Adjunct Professor, University of Genoa, Italy.
Title: The Landscape Drawing in the Design Process. (PowerPoint)

13.30-14.00
Lothar Fickert, Emeritus Professor, Head, Institute of Electrical Power Systems, Graz University of Technology, Austria.
Title: Flipped Classroom – TU Graz Way. (PowerPoint)

14:00-14:30
Jelena Culin, Associate Professor, University of Zadar, Croatia.

Title: MARPOL Annex V-Related Deficiencies Recorded in the Paris MoU Mediterranean Ports. (PowerPoint)

14:30-15:00

Rebecca Heckmann, Researcher, Stuttgart Technology University of Applied Sciences, Germany.

Madeleine Bode, Research Assistant, Stuttgart Technology University of Applied Sciences, Germany.

Title: An Autonomous Electrified Cargo Robot to Support Walkability of Cities: Post-Mining Lakes. (PowerPoint)

15:00-15:30

Sigrid Reiter, Professor, University of Liège, Belgium.

Antoinette Marie Reine Nishimwe, PhD Student, University of Liège, Belgium.

Title: Spatial Energy Modelling of a Residential Building Stock Based on GIS: A Case Study of the Walloon Region in Belgium. ((PowerPoint))

15:30-16:00

Simona Zapolskyte, PhD Student, Vilnius Gediminas Technical University, Lithuania.

Title: The Smart Mobility System and its Infrastructure Evaluation Factors and Indicators. (PowerPoint)

16:00-16:30

Vaida Vabuolyte, PhD Student, Vilnius Gediminas Technical University, Lithuania.

Title: Planning Practice of Industrial Parks in Lithuania by the Measures of Country Development Level of Infrastructure. (PowerPoint)

16:30-17:00

Aaron Yair, Research Assistant, The Hebrew University of Jerusalem, Israel.

Title: The Complex Relationships among the Average Annual Rainfall, Surface Properties and the Spatial Redistribution of Water Resources in a Sandy Area Located in the Northern Negev Desert, Israel. (PowerPoint)

17:00-17:30

Ousmane Ag Dalla, Assistant Professor, International University of Grand Bassam, Côte d'Ivoire.

Title: Contributions of Participatory Mapping in the Implementation of Local Politico-Economic Projects: Experience in a Rural District of Mali. (PowerPoint)

17:30-18:00

Saskia van Kampen, Assistant Professor, San Francisco State University, USA.

Title: Building "Working with, not for" into Design Studio Curriculum. (PowerPoint)

Tuesday 2 June 2020

10:00-10:20
Sara Eriche, Researcher, Department of Architecture and Design, University of Genoa, Italy.
Title: Cultural Heritage in Advanced Representation (PowerPoint)

10:20-11:00
Vibhash Chandra Jha, Professor, Visva-Bharati University, India.
Title: Geography of Buddhism: A Global Connectivity. (PowerPoint)

11:00-11:30
Thomas Bisiani, Adjunct Professor, University of Trieste, Italy.
Title: Porto Vecchio and Trieste: Urban Regeneration and Development between Infrastructure and Innovation. (PowerPoint)

11:30-12:00
Otto Ellonen, Research Assistant, University of Vaasa, Finland.
Title: Experiences on Development and Design of STACK Problems for Circuit Analysis. (PowerPoint)

12:00-12:30
Silvio Carta, Head of Art and Design, University of Hertfordshire, UK.
Ian Owen, Lecturer, University of Herefordshire, UK.
Title: Agent Based Modelling and Social Inputs: A Few Case Studies. (PowerPoint)

12:30-13:00
Amatya Agarwal, Student, PES University, Bangalore, India.
Title: Making Travel inside Central Business Districts Efficient using Accelerated Moving Walkways and Periphery Parking Framework. (PowerPoint)

13:00-13:30
David Michael Kretzer, PhD Student & Research Assistant, ETH Zürich, Switzerland.
Michael Walczak, PhD Student & Research Assistant, ETH Zürich, Switzerland.Title: The Impact of Vertical Densification on Public Lighting in Informal Settlements: Using Virtual Environments as Evaluation Tool for Policy-Making. (PowerPoint)

13:30-14:00
Nisrine Mezher, PhD Candidate, Université Paris 1 Panthéon-Sorbonne / Lebanese University, France / Lebanon.
Title: The Interface in the Urban and Social Fabric of Beirut. (PowerPoint)

14:00-14:30
Mario Pagano, PhD Student, University of Catania, Italy.
Title: Geological Risk Monitoring of Road Network by Use of Combined Multi-Temporal InSAR and GIS-based Derived Information: The Example of Giarre (PowerPoint)

14:30-15:00
José Miguel Álvarez Romero, PhD Student, Polytechnic University of Madrid, Spain.
Title: Research-Based Learning: Projects of Educational Innovation within MUSE (Mater on Space Systems) Academic Plan. (PowerPoint)

15:00-15:40
Bhuvanachithra Chidambaram, Post-doc Research Assistant, TU Dortmund University, Germany.
Title: Commuter Acceptance of TDM Measures in Hyderabad, India – A Post Experimental Focus Group Analysis. (PowerPoint)

15:40-16:10
Alexander Kolpakov, Senior Research Associate, Center for Urban Transportation Research, University of South Florida, USA.
Title: Implications of Market Penetration of Electric and Autonomous Vehicles for Florida State Transportation Revenue. (PowerPoint)

Ousmane Ag Dalla
Assistant Professor, International University of Grand Bassam, Côte d'Ivoire

Contributions of Participatory Mapping in the Implementation of Local Politico-Economic Projects: Experience in a Rural District of Mali

The hegemony of states as well as that of customary authorities in the implementation of local socio-economic activities and in the processes of decision-making in general is increasingly challenged, long before the formalization of decentralization policies in West Africa began. In addition, several speeches including those agents and institutions involved in local development argue for the participation and strengthening of decision-making powers of grassroots populations. The "ordinary citizen" invited himself/herself to play a greater role in the development of basic socio-economic policies and in the processes of territorial construction. However, in our context, the institutional powers struggle to cohabit with the traditional powers and that continuously builds a big gap between these different powers and grassroots populations who aspire to greater transparency in local development policy processes. Local spatial knowledge and the products that come from it, maps of course, but also other data collection tools are put forward to contribute to a better involvement of the grassroots actors in the political and economic management of their territory. Our experience in the rural district of Alafia (Timbuktu-Mali) focuses on an articulation of participatory processes and good governance with technologies related to geographic information. It proposes a methodological protocol for supporting local actors based on a stakeholder mapping approach (SMA) and the computer-based techniques. It involves the organization of a permanent activity of data collection and participative management of spatial and territorial information to help better formulate the territorial problems that arise and to integrate ideas on the various situations.

Amatya Agarwal
Student, PES University, Bangalore, India

Making Travel inside Central Business Districts Efficient using Accelerated Moving Walkways and Periphery Parking Framework

The dense central business districts which are often the city centers are getting extremely crowded and vehicles are taking up a lot of crucial space which can be utilised for other activities. These central business districts are often the economic engines of the city and they house the major business and markets. Car parkings and vehicular movement take up a substantial amount of high value real estate which can be better utilised for other economic activities. These dense central business districts are also heavily polluted by low air quality and high vehicular noise pollution. High pollution levels, traffic jams, road rage, difficulty in finding a parking spot etc., make central business districts a difficult place for any city dwellers. The key thought of this examination is to ideate a combination of Accelerating moving walkways (AMWs) with the periphery parking framework as a viable solution for the decongestion of the city centers and make travel faster. The goal of the research is to make travel faster and more efficient with AMWs, as a solution for traffic in central business districts, and thereby reclaiming the streets for the people.

José Miguel Álvarez Romero
PhD Student, Polytechnic University of Madrid, Spain

Research-Based Learning: Projects of Educational Innovation within MUSE (Mater on Space Systems) Academic Plan

Nowadays most universities are focused in the finding and use of innovative educational programs, in a search for improvement in their academic plans. Within innovative educational techniques, Research Based Learning (RBL) is focused on the generation of didactic experiences based on the scientific method (question formulation, finding of answers and solutions, resolution of problems and analysis of results). This method makes engineers and researchers to face problems in a structured manner through the search of innovation and novel solutions to the problem out of the common standards. The inclusion of the scientific method within the academic load is performed through the definition of study cases, a subject within the academic plan of the Master in Space Systems (MUSE of the Universidad Politécnica de Madrid, UPM). The study cases and the RBL employed methodology supports the theoretical contents of the other subjects included in the MUSE's academic plan. In the IDR/UPM Institute, different lines of research have been developed to involve students into space projects, in several study lines. Although these lines of research were initially related to the PhD programs integrated within the academic plan of the university, the increasing interest among the bachelor and master students on research and projects linked to the most advanced engineering techniques, prompted the IDR/UPM academic staff to offer some specific projects to their Master students The disciplines included in the presented experience are related to several topics related to space engineering. (i) System engineering, where students are involved into the preliminary design phase 0/of space missions using Concurrent Engineering. (ii) On board computers design, by the selection and study of specific solutions providing novel knowledge in the field of space mission computers. (iii) Smart design methodologies applied to graphic engineering where students focused their effort in the development of alternative design techniques for space applications, including manufacturing, assembly and integration processes. (iv) Analysis of power systems for space applications, by the study and use of systems currently employed in the space sector. At last, (v) design of attitude control systems, where the students are involved in the development and implementation of a simulated

attitude control system based on Arduino. The disciplines included in the presented experience are multidisciplinary and the RBL methodology implemented is transversal to several engineering practices, which allow their application to other fields different from space engineering. The learning concept presented here leads to an increase of the students' motivation by involving them in actual research projects that support the theoretical concepts, by mixing theory with practical knowledge. Throughout the research practice, students acquire an outstanding set of tools of high value for their future professional life and, in addition, the use of RBL leads to an increase in the quality of teaching.

Thomas Bisiani
Adjunct Professor, University of Trieste, Italy

Porto Vecchio and Trieste: Urban Regeneration and Development between Infrastructure and Innovation

Both infrastructure and research and innovation make possible communications and exchanges between increasingly distant places, so that the geographical position and administrative division of states are less and less significant than the polarities of individual cities. Europe is trying to keep pace with this vision, European cities with higher growth rates are already "planning the revolution". The growth trend also concerns medium-sized cities, the UN forecasts growth for 96% of European cities with more than 300 thousand inhabitants in the next 15 years. Trieste, from the point of view of the port and infrastructure system, can approach this model by strengthening the two drivers of development, quality of life and job opportunities. Until yesterday considered at the centre of Europe, today it is conceptually repositioned through the Belt and Road Initiative, at the western end of a Eurasian system. A specificity to be investigated is the complex system that combines port infrastructure and logistics with scientific research and innovation promoted, among others, by the International Centre for Theoretical Physics, the International School for Advanced Studies, the University of Trieste, AREA Science Park. In a recent monitor by Intesa Sanpaolo, the ICT cluster of Trieste stands out among the 24 Italian high tech areas for its performance in the export of electronic components, semiconductors and computer hardware for TLC. Three cases demonstrate how an ecosystem made up of infrastructure and innovation can generate both development conditions and crisis situations, and consequently it cannot only exist but must be managed: 1 SAIPEM – leader in the energy and infrastructure sectors, has set up the Submarine Robotics Pole in Trieste. Where it was built and has its operational base the OIE (Offset Installation Equipment). This is the latest and highest technology in the world to avoid environmental disasters from underwater oil spills. 2 Java Biocolloid – Indonesian company among the main producers of red algae extracts for the food and pharmaceutical industry, in Trieste has established its European headquarters, the location favours distribution in Europe, Middle East and USA and offers the opportunity for development and innovation with the scientific bodies in the area. 3 Coltan – the so-called "blue gold" is a superconductor with large storage capacities for electrical charges. In March 2019 a 5t container was seized in the port of Trieste

for violation of the regulations on the use of radioactive material. This example also confirms the existence of a model that rewards the infrastructure endowment and the vocation for innovation, but it also highlights critical issues related to opaque traffic and the exploitation of rare earths and resources of the planet. Starting from these bases, the study wants to highlight scenarios of regeneration of port areas in a vision of Trieste as an incubator of innovation. The objective is to define a landscape of activities with high added value, able to affect quality of life and job opportunities, exploiting a new position of port centrality.

Silvio Carta
Head of Art and Design, University of Hertfordshire, UK
&
Ian Owen
Lecturer, University of Herefordshire, UK

Agent Based Modelling and Social Inputs:
A Few Case Studies

This paper presents a number of recent student projects that investigate the notion of personal space and public space through digital technologies and computational methods (Carpo 2013). The projects are primarily based on agent-based simulations (Chen 2012) or modelling (ABM), where relevant social inputs are factored in the system (Gehl 2004). Whilst these projects propose a new urban model for the analysis and design of public spaces, within the context of this paper we focus on the pedagogic aspects of the activities carried out by the students and teaching staff. This paper is divided in three parts. Firstly, we discuss the relevance of some of the digital and computational urban design models to which our projects refer. We critically discuss these in relationship to the ongoing debates on future frameworks for urban design, including parametricism (Schumacher 2009), Senseable Cities (Ratti 2010) and City Information Modelling (CIM) (Beirão, Montenegro and Arrobas 2012). Secondly, we describe and comment some case studies (student projects) within the context of the discussion framed in the first part, where new ways of producing publicness are considered (Carta, Onafuye and deKock 2019). Some preliminary findings have been published in Liu, Carta and Sopeoglou (2018) and Carta, Owen, Hay, Liu and Giuffrida (2019). Finally, we reflect on the consequences that such activities have for the learning experience of our students and the ways in which our design studios have been restructured in order to underpin the contents of the projects. This paper contributes to the Conference's topics of "Urban theories, policies, and modeling" in presenting and discussing a new computational framework for urban design and city analysis of public spaces, and to "Urban studies and planning pedagogy and research" in discussing an ongoing research about teaching methods where students are increasingly engaged in the observation of publicness in the city through digital methods.

Vibhash Chandra Jha

Professor, Visva-Bharati University, India

Geography of Buddhism: A Global Connectivity

Geography of Buddhism which sprung from the intense ritualistic practices of Hinduism, brought in its fold an opportunity for regional development to all places that it spread. Europe and South-East Asia in general and the Thailand in particular saw a marked change in its Culture and the travel of Buddhist monks to spread the religion brought knowledge about the geographical surroundings. The intermingling of Cultures was the immediate impact and soon the simplicity of this religion attracted the interest of all segments of society who were encompassed soon its fold. The location of monasteries in remote, undisturbed locations, ordaining of monks from common people led to mobilisation of people to these sites. Sites which were popular flourished, yet lesser known sites faded. Now the geospatial techniques i.e. Remote Sensing, GIS,GPS in modern times have helped to unearth or locate these lesser known sites along with the popular one's and has led to preparation of a unique Buddhist Map with interlinking all the sites as a Buddhism Sites Circuit Map facilitating travel for both religion as well as Cultural Mission which has left a message of hope, peace and honesty. In this paper, an attempt has been made to analyse and map some of the important Indian Buddhist Sites using Remote Sensing, GIS and GPS. Impetus of these Sites have been noted in the regional development of Europe and South-East Asia in terms of Population, Religion, Tourism, Landuse, Transport and Peace and Self Reliance.

Bhuvanachithra Chidambaram
Post-doc Research Assistant, TU Dortmund University, Germany

Commuter Acceptance of TDM Measures in Hyderabad, India – A Post Experimental Focus Group Analysis

Commuter acceptance is a crucial prerequisite for the successful implementation of traffic measures in emerging megacities like Hyderabad, India. It helps policymakers to evaluate the exposure of traffic measures beforehand, and the considerable investments in restructuring the existing system are avoided in this way. However, commuter acceptance of traffic measures depends on their problem awareness and their perceived effectiveness of such measures. Building on the two attitude theories Theory of Planned Behaviour (TPB) and Theory of Cognitive Dissonance (TCD), this paper reports the findings of post-experiment focus group analysis (204 participants), examining associations between the commuter attitudes and their acceptance of travel demand management measures. Commuters' perception of traffic congestion and their acceptance of the various push-pull traffic measures (supply and demand based) were analysed for three groups of commuters: car users, two-wheelers and bus commuters. The results showed that car users exhibit the planned behaviour – rational consideration towards the acceptance of supply-based measures, whereas the two-wheelers experience the cognition discomfort due to traffic congestion – accept the demand-based measures. This means commuters often vary in their perception on traffic congestion problem and assess the suitability of traffic measures based on their varied perception on the problem. Both TPB and TCD attitude theories support profoundly in understanding the commuters' attitude towards their acceptance of traffic measures. The 'planned behaviour' concept of TPB identifies the rational considerations of the car drivers. This rational behaviour controls their choices and behaviour towards the acceptance of supply-based traffic measures. The 'cognition discomfort' concept of TCD highlights the state of dissonance experienced by the two-wheelers due to the problem of traffic congestion. This acts as a motivational drive to alter the existing situation by accepting demand-based traffic measures. This provides an insight to the policy approach towards increasing the overall commuter acceptance of demand management measures from both supply and demand sides. From the supply side, sustainable projects, such as the provision of sufficient infrastructure for non-motorised modes like bicycle, provision of pedestrian- friendly environment, improving the alternative sustainable

mode, such as public transport, are to be implemented. From the demand side, education of the commuters by creating awareness, public campaigns, and providing more information about the positive benefits should be initiated.

Jelena Culin
Associate Professor, University of Zadar, Croatia

MARPOL Annex V-Related Deficiencies Recorded in the Paris MoU Mediterranean Ports

The Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development can`t be achieved without a significant contribution of the maritime community. One of the necessary steps to attain a more sustainable shipping is a proper handling of ship-generated garbage. Therefore it is important to ensure the successful implementation of the relevant international measures, including IMO instrument MARPOL Annex V. During the Port State Control visits on board a ship, fulfilment of MARPOL Annex V requirements is checked and ship may be detained in the cases of significant non-compliance. Identification and elimination of ships contributing to the pollution of the Mediterranean Sea by garbage is particularly important because the concentration of marine litter in it is one of the highest in the world. In this paper inspections performed in the Mediterranean Paris MoU ports in the period from 1 July 2016 until 30 July 2019 are analyzed. During 600 inspections (out of 8883 performed in that period), deficiencies related to MARPOL Annex V were recorded. 92 (13%) detained ships had 96 defects relating to the ship's garbage treatment, and in 20 cases they were ground for detention. It seems that there is a need to raise awareness of the need for meeting of MARPOL Annex V requirements among seafarers.

Otto Ellonen
Research Assistant, University of Vaasa, Finland

Experiences on Development and Design of STACK Problems for Circuit Analysis

STACK (System for Teaching and Assessment using a Computer algebra Kernel) is an open-source assessment system for mathematics and related fields. At University of Vaasa, STACK has been used in courses of Mathematics and now it has been implemented in Electrical Engineering. This paper discusses experiences on development and design of various Circuit Analysis problems in STACK environment including student feedback. The starting point for developing problems here is that they do not include much calculation, instead the problems focus more on the representation of equations. The problems are designed to provide essential visual assistance to the students by drawing pictures, such as circuit diagrams by using JSXGraph library that is supported by STACK. With the help of JSXGraph, designer can draw various geometrical figures according to IEC 60617 standard. One important function in STACK is, that it immediately gives automated feedback to the students depending on their answers. For this reason, a so-called potential response tree (PRT) is created for every problem. The PRT usually consists of several nodes, which compare whether specified conditions are fulfilled. The PRT can further be developed into a more complex one, which examines not only systematic but even rare errors made by students. These assets and learning tools seem to create a powerful basis for interactive learning process, where visual aids are used in solving Circuit Analysis problems.

Sara Eriche
Researcher, Department of Architecture and Design, University of Genoa, Italy

Cultural Heritage in Advanced Representation

The 3D digital representation of reality has opened a world of possibilities, which grow every day with the emergence of new challenges and concepts, such technologies applied to the field of cultural heritage have brought to the emergence of new concepts such as virtual heritage. The article aims to identify the "design" path that advanced representation aims to knowledge for the fruition, enhancement and management of cultural heritage. Through a computerized procedure, the research proposes an experimentation to compare not only the data taken and collected for individual processes made as homogeneous as possible also in terms of their visualization, but also the main cultural and methodological matrices underlying the critical selection of the same data, and taken as the first reference in order to make them as comparable and cross referenceable as possible. The multi-transversality disciplinary is an essential element in a research process aimed at enhancing the digital and virtual scenario in the field of representation. From this point of view the research, in constant evolution, shows in the declination of interdisciplinary methods, with reference to the holography that represents an original visualization solution, also in future application s of gestural interaction on a scale ever closer to reality.

Lothar Fickert
Emeritus Professor, Head, Institute of Electrical Power Systems, Graz University of Technology, Austria

Flipped Classroom – TU Graz Way

Flipped Classroom is a teaching model in which the students go through an individual ICT-supported learning phase by using video clips. After this they come with already 70% expertise, as experience has shown, come to the class. In the subsequent presence phase (previously "class time"), a seminary-type further consolidation of the subject takes place with active participation of the students. In the TU Graz Flipped Classroom concept 1 lecture of 45 minutes requires the creation of 1 "nugget" (video of appr. 6 minutes) which, as experience has shown, can cover appr. 70% of the lecture's content in condensed form. The remaining 30% of the content are mastered by means of students' involvement, seminar type. The experience with 3 realized courses shows the high efficiency of this method, especially when the student collectives are less than 30 students. An indication of the effort on the side of the teacher concerning the production of the videos is given as well as the methodology in determining the teaching/learning efficiency. The curricular position of the Flipped Classroom is given by the guidelines of Graz University of Technology, by which, when using flipped classroom methodology, there is "teaching time discount" of 25% or more. As extensive investigations of the learning and examination performance have shown, appr. 70% of a lecture's content can be presented in condensed form with a cognitive penetration depth of 70%. flipped classroom, teaching efficiency, learning efficiency, methodology.

Rebecca Heckmann
Researcher, Stuttgart Technology University of Applied Sciences, Germany
&
Madeleine Bode
Research Assistant, Stuttgart Technology University of Applied Sciences, Germany

An Autonomous Electrified Cargo Robot to Support Walkability of Cities: Post-Mining Lakes

Walking is, especially on shirt distances, a neglected means of transport (Wigan 1995, Proff 2014). The door-to-door comparison of urban transport shows that walking is up to 1.5km faster than bus, train and car (Environmental agency of Germany, 2014). Walking, in contrast to other means of transport, mainly public transport and cars, has two major advantages: it is a form of active exercise that promotes human health, such as strengthening the cardiovascular system (Abu-Omar, Rütten 2006). The second advantage is that walking does not cause harmful air or greenhouse gas emissions if the production and disposal of footwear that wears through walking is neglected (Pfaffenbichler, Lemmerer, Winder 2016). Looking at the historical further developments of public transport, cars and bicycles, all three show significant technical innovations and improvements. Whether it is the development of public transport from the horse-drawn carriage to the ICE, the car from the first Benz patent motor car to today's electric and autonomous vehicles and the bicycle from the former wheel to today's e-bikes. No comparable development can be observed at walking. There are only developments of shoes or recently of hoverboards worth mentioning. E-scooters as a relatively new trend often even replace walking. Studies show that in 49% of all cases this is used for a distance that would otherwise have been covered on foot (Hollingsworth et al. 2019). The question therefore arises: how can walking as such become more attractive through technical solutions, so that it is perceived and used as a means of transport? Studies investigating the reasons why road users choose a means of transport show that baggage transport is relevant and that limited baggage transport is an obstacle when walking (e.g. Pez 1998). In the case of bicycles, this problem was recognized and a solution was offered in the form of load wheels. This paper presents a solution for walking. An electrified, autonomous robot functions as a mini transporter for taking luggage along on foot. The robot is supposed to be an uncomplicated human companion. It can be

carried as a backpack and, thanks to the lightweight construction principle, can be easily carried anywhere. If the person wants to transport luggage, the robot can simply be folded out of the backpack, set up and load luggage into it. With the help of a sensor it recognizes its owner and will follow him at a fixed distance and transport the luggage for him. The robot is electrically driven, but can also be pulled when the battery is empty. Whenever the robot is no longer needed, it can be folded up again and carried on its back. It allows a high flexibility and quick operational readiness. This paper describes the problems which can be solved by the robot, explains the technical functionality and structure and deals with potentials for urban mobility systems.

Alexander Kolpakov
Senior Research Associate, Center for Urban Transportation Research, University of South Florida, USA

Implications of Market Penetration of Electric and Autonomous Vehicles for Florida State Transportation Revenue

Electric vehicle (EV) and autonomous vehicle (AV) technologies represent what seems to be beneficial, but also potentially disruptive, shift in the way people and goods are transported. Wider use of battery electric vehicles offers an opportunity to reduce harmful emission from mobile sources, while widespread adoption of AV technologies has the potential to significantly improve vehicle safety, reduce congestion, impact vehicle ownership and travel habits. There are lots of uncertainties regarding how these technologies will develop, when they will dominate the market and what changes to the transportation system they will ultimately bring. Transportation officials are particularly interested in forecasting the impact that these new technologies may have on traditional sources of infrastructure funding, such as gas tax revenue. Unlike traditional vehicles with internal combustion engines, electric vehicles do not consume petroleum fuels and, thus, do not contribute to gas taxes that are used to fund transportation infrastructure. Additionally, an increase in the number of EVs raises average fuel efficiency of the fleet, resulting in the reduction in fuel consumption and gas tax collection. With EVs currently representing a rather small share of vehicle fleet, gas tax losses are minor. However, as the market penetration of EVs increases in the future, legislative bodies will encounter continuous pressure to address growing funding shortfall in transportation infrastructure funding. Potential policy options may include imposing EV fees and taxes, adjusting motor fuel excise taxes to better reflect the energy content of fuels, mileage-based transportation fees or other models to fund transportation infrastructure. One of the main benefits of AVs is the expected increase in roadway capacity due to the ability of vehicles to travel closer to each other and the reduction in collision-related congestion. At the same time, AV technologies can fundamentally impact travel behavior and vehicle ownership trends. Finally, accommodating the increased adoption of AV technologies may require special infrastructure considerations such as road markings and signage, managed/dedicated AV lanes, intelligent transportation system roadside devices to enhance vehicle-to-infrastructure

capabilities and other strategies. The current paper presents the analysis of projected impacts of EV and AV technologies on federal, state, and local transportation tax revenue collections in the state of Florida (USA), and their effects on generating additional future demand for transportation infrastructure investments over the 30-year period. While gas tax revenue losses in Florida are currently rather small, by 2048, the increased substitution of internal combustion engines with electric propulsion is projected to result in the losses of $1.2 billion annually for Florida transportation fund. Tax revenue loss from AVs is projected to be insignificant until 2035 but will accelerate in later years, reaching $969 million per year in 2045. The combined cumulative effect of increased EV and AV market penetration on total transportation revenue collection in Florida is projected to reach $18.3 billion by 2048, including $9.7 billion loss from state taxes, $5.3 billion loss from federal taxes and $3.3 billion loss from local transportation taxes.

David Michael Kretzer
PhD Student & Research Assistant, ETH Zürich, Switzerland
&
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The Impact of Vertical Densification on Public Lighting in Informal Settlements: Using Virtual Environments as Evaluation Tool for Policy-Making

There are a variety of reasons to support the premise that public lighting is beneficial to urban communities. However, the provision of public lighting in informal settlements is challenged by their constant physical transformation. The aim of this paper is to evaluate Virtual Environments' (VE) application in lighting planning and policy-making. Even though VEs offer the opportunity to explore an environment by freely navigating through it, including environments which change over time, this feature is rarely taken into account in decision-making processes. A VE-based analysis tool for informal settlement lighting based on a case street in the informal settlement Caracolí in Bogotá is presented. A household survey, spatial measurements, participant's observations, and luminous intensity distribution curves constituted the main data basis for the VE scenarios. Time-related data on the incremental construction of Caracolí's informal dwellings were collected by the household survey, and those data then projected into past, present and future night-time scenarios. Customized game engine technology and GPU computing was used, which allowed for real time visualization of various lighting scenarios. This setup therefore enables fast iterative feedback loops with regards to current and future lighting policy scenarios and the resulting lighting design. On the one hand, a VE can illustrate well how the current lighting policy results in a significant delay of lighting provision in the early stage of a settlement. Furthermore, that there is a mismatch between lighting technology and the built environment during the vertical densification phases. On the other hand, the VE is able to show alternative lighting technology and policy approaches as well as the resulting lighting effects. This allows for a visual comparison of different policy scenarios over several decades. It will be concluded by arguing that the dynamic VE technology seems to be a promising decision-making tool to illustrate potential planning and design shortcomings, in layman's terms, to policy stakeholders.

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The Interface in the Urban and Social Fabric of Beirut

The main objective of this research is to revisit the paradigm of the previous studies on the city of Beirut. It aims to contest the view of Beirut as a compound of fragmented territories by approaching the city as a space of interactions, conflicts, and renewal between several communities. By combining cross-disciplinary frameworks in geography, planning, architecture and sociology, the functioning of the metropolitan space of Beirut is analyzed from an original perspective: the concept of interface.1 This work aims to investigate how the interface operates and how it affects the materiality of the city and its social practices. It mainly examines three adjacent neighborhoods (Tarik el Jdide, Ghobeiry, Chiah, Furn el Chebak) where communities from different cultural and religious backgrounds reside. The search is based on a review of planning policies, followed by an urban analysis of the different districts of the city. I also use ethnographic methods to observe the residents' daily interactions and how they combine into interfaces. The review of previous planning policies highlights slight contrasts in the urban morphology of the different districts of the city; nevertheless it shows strong major differences in the urban semiotic of those spaces. These differences reflect more or less intentional border practices that are the result of the spatial strategies and tactics of the different political actors of the city. However, the ethnographic observations underline a less polarized perception of Beirut; it identifies non-intentional spatial practices that are built on interaction and interdependence between the different communities of the city. Additionally, it detects more global and less territorialized tendencies of the appropriation of the city. In conclusion the study highlights a great complexity of territorial systems and presents the city as a confluence of heterotopias. This approach is today as relevant for Beirut as for other cities, because it deconstructs the binary and simplifying readings of the great fragmentation of urban spaces and metropolises.

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Geological Risk Monitoring of Road Network by Use of Combined Multi-Temporal InSAR and GIS-based Derived Information: The Example of Giarre

The present work shows how the contribution of the satellite infrastructure monitoring performed through the Rheticus® cloud platform integrated with specific GIS based derived information tools can be useful for monitoring the geological risk in a road network. The adopted monitoring infrastructure capable of assigning a level of geological risk to the different roads of the municipal area of Giarre (eastern Sicily, Italy), was designed with the aim of creating semi-automated pre-alerting systems , able to delineate potentially risky sites. This cyber infrastructure is based on computation of vulnerability to geological, hydrological and geomorphological issues and on the occurrence of active faults, introducing successively the exposure computation as a function of the vehicles flow. The identification of the potential dangerous areas was done by collecting bibliographic data and consulting online databases such as the IFFI project (/www.progettoiffi.isprambiente.it/), the PAI cartography www.sitr.regione.sicilia.it/pai/pai/) and the Civil Protection department database (www.protezionecivile.gov.it/). The boundaries of some areas were redefined through photo interpretation process and through the harmonization of much data in a GIS project, such as geological, geomorphological and hydrogeological maps. Some derived maps have also been created: TIN model, hillshade, slope and aspect charts. These charts are important ancillary data to support the interpretation of the velocities and displacements values provided by the MTI measurements. Exposure is another fundamental parameter that significantly contributes to the risk value. In a road network, the exposure value corresponds to vehicles flow density in each road. This value was calculated by creating two models: the first one is based on a source destination matrix, built starting from demographic map and from a collection of every point of interest, weighted according to their level of attractiveness; the second one is based on Google Traffic data and takes into consideration the variability of traffic values at different times. One of the most important phases of the work concerns the processing of the Sentinel 1 images performed through the Rheticus® cloud platform that implements the SPINUA Multi Temporal InSAR (MTI) algorithm and the analysis with the additional GIS derived

information. This study was carried out in collaboration with two of the leading companies in this sector, Planetek Italia S.r.l. (Bari) and Planetek Hellas E.P.E (Athens); tE.P.E (Athens); the aim is to monitor and identify the displacements of the earth's surface and to try to prevent landslides and ground instability, which can damage infrastructures like buildings and roads. The radar interpretation process, through the analysis of Vlos anos and the displacements time series of the two different geometries (descending and ascending orbits), crossing the data with the ancillary ones described above, allowed to identify the areas in elevation and those in subsidence. So, the study was focused on the search for possible precursor elements of instability phenomena and the evaluation of the state of activity of the already recognized instability areas. In this view, the use of MTI technique represents an important contribution to redefine the dangerous areas identified in the first phase of the work, increasing the accuracy of the final risk definition for the road infrastructure.

Giulia Pellegri
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Urban Planning in Italy between the 19th and 20th Centuries. The Drawing of the City: The Case of Via XX Settembre in Genoa

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Sigrid Reiter
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&
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Spatial Energy Modelling of a Residential Building Stock Based on GIS: A Case Study of the Walloon Region in Belgium

Nowadays, we are all concerned by the world global warming. Cities are looking forward for creating tools that will help to reduce their energy consumption. This research is funded by ERDF (European Regional Development Fund) and it addresses the energy challenge of developing a strategic decision support tool dedicated to multi scale and dynamic energy mapping as well as the analysis of energy data for integrated energy management on the Walloon region territory in Belgium. The study uses a GIS combined with energy models to map the energy consumption of the whole residential building stock of Wallonia. This involves heating consumption, heat demand, electricity consumption and cooling consumption of all residential buildings in Wallonia, including 1,520,650 dwellings. Each building is characterized by its energy consumption. Heating, cooling and electrical consumption are spatialized on the whole territory of Wallonia at various representation scales, namely the neighborhood, municipality and urban region scales. This article presents used methods, produced multi scale maps and statistical analysis of the results in terms of energy consumption in the Walloon residential built environment. These results will help the strategic decision makers to see where to focus in order to reduce the energy consumption in cities and take strategic decisions. Our methodology can also be applied to other cities and regional territories.

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Reading the Visible and Perceived Aspect of Urban Construction: Comparison Methodologies

The visible and perceived aspect of the building, in its volumetric, drawing and chromatic characteristics, which due to its mutation, subject to continuous transformations in the urban environment, still remains a fertile field for studies and evolutions on possible approaches that allow an even more evident and immediate connection with what is the perception of the urban landscape in its entirety. Perception that specifically of a historical centre is generated by well-defined boundaries, by neighbourhoods that subdivide and identify the area, by main and secondary interiors, by squares and urban voids. The perceptive analysis of these elements, according to a scientific methodological approach, must take place not only through photographic investigation and two-dimensional representation, but through three-dimensional visualization. The representation of the building, described both as a whole and in the single details through a digital three-dimensional model, can be observed with a rapid change of scale and through multiple visualizations. The three-dimensional reading, facilitates the greater immediacy and understanding of the spatiality and future transformations of the built environment. If the general lines of the building remain stable over time those that change are the design and chromatic details that play a decisive role in the identity image of that place, in particular in the internal spatial relationships of the paths and squares.

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The Landscape Drawing in the Design Process

Drawing plays a fundamental role in the design process of architecture in general; it is the place of invention, the space where ideas are born and developed. Traditionally linked to the training of the architecture student, drawing is the basic tool for knowledge of architecture: Vitruvius, the Renaissance treatise (Serlio, Vignola, Leon Battista Alberti, …) the students of the Grand Tour used drawing and relief as means to know, study and transmit architecture. Even today, despite the advent of photography in the Twentieth Century and the digital revolution that affected architecture in the 90s, drawing remains a fundamental tool for generating new ideas. Drawing with its graphic signs is a language while representation is a method, a process by which content of perceptions, imaginations, judgments and concepts presents itself to consciousness. If representation is the process through which perceptions are reworked and interpreted, representing the landscape is, therefore, a fundamental step for its knowledge also for the relationship between perception/landscape as highlighted in the definition given by the European Convention of the Landscape (Florence 2000). The Convention defines, in fact, the landscape as "a specific part of the territory, as it is perceived by the populations, whose character derives from the action of natural and / or human factors and their interrelationships" by putting the landscape in close relationship with the perception or with a complex mental synthesis and interpretation of reality that involves all the senses, not just sight. The design of contemporary landscape architecture has undergone significant and rapid changes connected mainly to information technology, opening up the development of new and interesting design and representative paths, but, it remains clear that hand drawing is a necessary skill for an architect who wants to express, experiment, explore and develop their ideas. Hand and digital drawing are not necessarily mutually exclusive, but together they contribute to achieving an essential and useful knowledge of architecture to design the contemporary landscape and subsequently to transmit and communicate the idea. This article will focus, through examples of contemporary representation of the landscape, on analogical and digital drawing: the goal is to understand how the contemporary landscape is represented and what role the representation plays in the design process.

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Planning Practice of Industrial Parks in Lithuania by the Measures of Country Development Level of Infrastructure

One of the most important objects of Lithuania is to create a more efficient economy and raise labor productivity. Industrial park territories are being developed for such a purpose. The creation of industrial parks requires significant investments in its construction. More than 56 million euros, from the budget of the country and European Union support, have been already invested in the development of these zones in Lithuania. Such amounts would not be significant if these territories would achieve its' goals, which is mainly to attract major investors. However, there are many proofs of such investment projects failure in Lithuania and even more around the world. From the scientific point of view, there are many kinds of researches on the topic of industrial zones, but it still lacks the answers, why one projects thrive, and others fail to succeed. This work aims to analyze the spatial planning features of the existing industrial parks of regions of Lithuania in the context of the development level of country infrastructure. In this context, we question the rationality of the spatial position for some of these zones. The object of the research is industrial parks and free economic zones in the Republic of Lithuania. In this article, using statistical and spatial analysis (GIS) methods, we assess the infrastructure development level of industrial zones in Lithuania. We compare different industrial parks and their infrastructure development level, as well as how industrial parks are changing, i.e. expanding or diminishing. The results prove that in the context of Lithuania, free economic zones type are more successful than industrial parks. The paper provides insights into the development of industrial park territories.

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Building "Working with, not for" into Design Studio Curriculum

Are ethics intrinsic to the discipline of design or do we as instructors need to teach students how to enact it? The initial findings from a phased research project being conducted in local communities throughout Toronto, Ontario, have demonstrated that communities are still being left out of decision-making processes that directly affect them and their living conditions. This is exacerbated when disenfranchised and underserved communities are denied resources when they attempt to make grassroot-level changes within their own neighborhoods. Undergraduate students in design courses are required to work on assignments that mimic "real-world" project briefs but are trapped within classroom and studio environs. Even if the assignment is designed to be ethically and socially responsible, answering issues of homelessness, poverty, food insecurity, social justice… does not automatically give them access to communities, social context, and insights for which they are interpreting needs and preparing designs. This perpetuates the idea that design is done "for" and not "with" communities. Demonstrating social conscience is ethically desirable in beginning design education but if this is not taught in an ethical manner, or students are not given the tools required to work with communities through respectful and collaborative processes then we are training the next generation of designers to continue a form of hegemony and design practice that is undesirable. The research project Design Wo/Manifesto 2020 is a participatory research project which is working with communities in Toronto to uncover stories of grassroots placemaking and community building that is done through creative practice. With this data the researchers are creating opportunities for students to work with community members, with the data collected from community forums and with social justice practitioners to prepare the next generation of designers to be ethically and socially responsible when working on projects that aim to support communities that they might not be a part of.

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The Complex Relationships among the Average Annual Rainfall, Surface Properties and the Spatial Redistribution of Water Resources in a Sandy Area Located in the Northern Negev Desert, Israel

Dryland areas are regarded as highly sensitive to climatic changes. A positive relationship rainfall and environmental factors is often assumed (water availability, species diversity, etc.) for areas with an average annual rainfall of 100-300 mm. This assumption disregards the fact that a climate change in arid areas is not limited to climatic factors. It is often accompanied by a pronounced variability in surface characteristics. Needless to say, the spatial variability of surface properties may have variable effects on water resources and related environmental variables. The present work deals with the complex relationships among the average annual rainfall, surface properties and the spatial redistribution of water resources in a sandy area located in the Northern Negev Desert. Two case studies are considered, the first deals with the hydrological effects of biological topsoil crusts on the water regime, along a rainfall gradient (90-180 mm). This study is based on five monitoring sites where the following data has been considered (rainfall, runoff, soil moisture, surface properties, characteristics of the biological elements, and survival of the perennial shrubs along the rainfall gradient). Data obtained shows a decrease in water availability with increasing annual rainfall. The findings are attributed to the decisive role played by the non-uniform properties of the topsoil crust along the rainfall gradient. The second study deals with the negative environmental effects of loess penetration into a semi-arid area, during a wet climatic phase.

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The Smart Mobility System and its Infrastructure Evaluation Factors and Indicators

One of the strategies for efficient transport service management is to implement advanced technologies for managing urban transport systems. Countries develop and exist under different socio-economic conditions. As a result, there is no universally accepted system of evaluation indicators for the smart mobility system and its infrastructure that can be applied in any country or city. Nowadays, there is a little research on comparing smart mobility systems in different cities. This article proposes a framework for comparing the smartness level of the mobility system and its infrastructure. The literature analysis was performed and the most important factors and indicators having the greatest influence on the smart mobility system and its infrastructure were selected. The influence of individual factors and indicators describing the smartness level of the mobility system varies. Moreover, different authors distinguish different factors and indicators when evaluating a smart city mobility system, which usually do not duplicate. The paper divides the factors of the smart mobility system into five groups: motor travel and congestion reduction measures; pollution abatement measures; travel safety and accident reduction measures; traffic management tools and services; smart infrastructure measures. Each of the listed group is distinguished by a number of specific measures. A model has been developed to compare the smart mobility system of individual cities and their infrastructure.