BOOK OF ABSTRACTS

ISTAR-IUL Winter School 2018

Applied Transdisciplinary Research

5th – 9th February 2018

ISTAR IUL

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Instituto Universitário de Lisboa (ISCTE-IUL)

Information Sciences, Technologies and Architecture Research Center (ISTAR-IUL)

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ISTAR-IUL WINTER SCHOOL 2018

Applied transdisciplinary research

The central idea of the Winter School 2018 is the free exchange of information, experiences and results of recent research and development activities, in a number of topics related to multidisciplinary area of applied computing , between researchers from the ISTAR-IUL of the University Institute of Lisbon (ISCTE-IUL), as well as from other national and international academic institutions.

The Winter School aims at achieving a greater mutual understanding between those same researchers and the creation of real synergies that enhance fundamental, applied and transdisciplinary research projects, in the short, medium and long terms, in various scientific areas that are part or are somehow linked with applied computing, targeting successful proposals production (H2020, P2020, FCT and others R&D project).

This winter school aims at i) strengthening research synergies between the ISTAR-IUL members from computer sciences, architecture and mathematic and between them and external researchers and ii) reaching national and international MSc and PhD students.

The central theme of this Winter School is "Applied transdisciplinary research" and three related sessions will occur: Group synergies, Ignite talks and Birds of a Feather. Besides the exchange of information the aim of these sessions is to enhance synergies and transdisciplinary research. Three workshops exploring new research tools and methods are also part of the programme.

Keynote delegate is Richard Jennings from the faculty of Science of the Liverpool John Moores University that will talk about the Arches Heritage Inventory and Management.

The Winterschool 2018 of is the first one that unites all the research groups and researchers from ISTAR-IUL. It evolves from the past three events of the Summer Workshop of Microsoft and ISTAR on Applied Computing (SUWMIAC) 1st, 2nd (Digital Living Spaces) and 3rd (Engineering our world) developed in collaboration with Microsoft.

ISTAR-Information Sciences and Technologies and Architecture Research Center

The Information Sciences and Technologies and Architecture Research Center (ISTAR-IUL) is a ISCTE-IUL unit that has the mission to carry out applied and multidisciplinary research in the convergence of areas like Computer Science and Information Technologies, Mathematics (applied to computational problems), Architecture and Urbanism (in its digital dimensions, either conceptual, modelling, simulation or fabrication).

The mission of ISTAR-IUL is to create knowledge and understanding for human, organizational and societal problems, bringing together digital and information technologies in new design methods and solutions.

ISTAR-IUL aims to become a reference research unit in the application of digital and computing approaches to problems of individuals, organizations and society. ISTAR-IUL values quality in research, multidisciplinary work, and innovation in the design of solutions, explanations and models for real life problems. ISTAR stimulates flexibility in its structure, diversity and cross-fertilization of scientific and technological ideas.

ISTAR-IUL is concerned with the analysis, design, and construction of human–based systems, focusing, in its creation, on the design of digital living spaces, on the design and construction of information systems and software, and on complexity studies and computational modelling as understanding tools.

The multidisciplinary nature of ISTAR-IUL is induced by a strong link to IUL School of Technology and Architecture (ISTA) that gathers ISCTE-IUL academic departments of the related scientific domains. ISTAR-IUL is organized in four flexible research groups, a structure that is essential to foster innovation, learning and organizational development. Complementary to this group structure, the unit projects the activity in two thematic lines strongly guided by the EC Horizon 2020 Programme.

The unit team profile is composed by 34 integrated researchers and associates 30 more PhD students and 35 collaborator, with the aim of extending the network of collaborations and facilitating future integrations based on shared scientific interests and opportunities.

Programme

Opening Session

February 7th, 14:30-18:30

Rector of ISCTE-IUL, Professor Luís Reto (to be confirmed)

Dean of the School of Technologies and Architecture, Professor Ricardo Fonseca

Director of ISTAR-IUL, Professor Sara Eloy

Session 1: Group synergies

February 7th, 15:00-18:30

The group synergies session aims at describing current research and foster new research opportunities among the members of ISTAR-IUL's four research groups. In this session we aim at having shorts talks, by members of different groups. Those talks are divided into two types that describe past or present research: i) talks about research among integrated members that led or are planned to lead to R&D project proposals to submit to exterior funding; ii) talks about research in the scope of PhD and Master thesis that may lead to R&D project proposals. With this session ISTAR-IUL aims at creating ideas to develop joint multidisciplinary and transdisciplinary research among their members and other stakeholders.

Chair: Sara Eloy

Session 2: Birds of a Feather

February 7th, 18:30-19:30

The Birds of a Feather (BoF) session aims to match researchers with shared interest for informal and hopefully productive discussions. In this workshop different researchers propose topics on the research areas of ISTAR-IUL: Digital Living Spaces, Information Systems, Software Systems Engineering, and Complexity Computational Modelling. Winter School attendees are supposed to subscribe on site to a topic that arises their interest and are willing to discuss.

Chairs: Manuela Aparício & Ricardo Resende

Get Together

February 7th, 19:30

After the first day of talks the Get Together is a time for all the ISTAR-IUL researchers discuss what was presented while relaxing in a more informal way with snacks and drinks. The aim of this event is to broaden network opportunities that will lead to fruitful collaborations.

Session 3: Ignite Talks

February 8th, 14:30-19:00

The ISTAR Winter School Ignite Talks Sessions are addressed to all ISTAR-IUL PhD students. Each student does a presentation of no more than 5 minutes and then discussion follows. A highly recommended format for this type of presentation is the presenter to get 20 slides, which automatically advance every 15 seconds. The result is a fast and fun presentation which last just 5 minutes.

The goal is to create an environment conducive to the interaction between the participants, making each one take notice of the projects of others, hoping that this results in new ideas leading either to new projects or to the enrichment of the current ones. In the case of ISTAR-IUL, it is also expected, with these sessions, to attend to one of the repairs of the audit committee that recently visited us, noting the lack of interaction between ISTAR-IUL PhD students.

Chair: Manuel Alberto M. Ferreira

Workshop 1: Graphical Abstracts

February 5th | 9:30-13:30

Workshop Tutor: Marco Neves

Session that seeks to demonstrate the importance of a visual format, which accompanies the communication of research results. In this workshop the elements of visual order of greater relevance in scientific dissemination are presented. The main criteria of graphical composition to be considered in the development and execution of graphical abstracts, as well as the initial understanding of the info graphic language and the synthesis of complex information are explained.

Chair: Manuela Aparício

Workshop 2: À descoberta do conhecimento com Data Mining em R (Workshop in Portuguese)

February 9th | 9:30-13:30

Workshop Tutor: Sérgio Moro

This program aims to be an introduction to the analysis and modelling of data through data mining, a comprehensive concept that aims, through analytical models, the extraction of knowledge that can translate into a competitive advantage for any real world problem. To do this, it is necessary to: (1) understand the problem as well as the variables that characterize it, analyse them; (2) prepare the data for modelling; (3) apply modelling techniques (e.g. decision tree and neural networks); (4) evaluate the results. The goal is for participants to gain sensitivity to data mining, and understand its potential and applicability, as well as the inherent challenges.

Workshop 3: Arches Heritage Inventory and Management

February 9th-10th | 9:30-18:00

Workshop Tutor: Richard Jennings

The workshop runs over two days. In the morning of the first day Richard Jennings gives a presentation of Arches* and outline its potential application in the heritage management sector and beyond. This is followed by a discussion of how to start planning to work with Arches v4 and what makes for a good project design. Jennings continues addressing the CiDOC CRM. In the afternoon participants go through the steps involved in setting up an Arches Project. On the first day participants use existing Arches datasets to pursue these steps and to demonstrate its potential. On the second day we aim to get participants started on their own Arches projects in order that they can continue to develop them on completion of the Workshop.

*The Arches project is a collaboration between the Getty Conservation Institute (GCI) and World Monuments Fund (WMF) to develop for the international heritage field an open source, web- and geospatially based information system that is purpose-built to inventory and manage immovable cultural heritage. Learn more at

http://www.getty.edu/conservation/our_projects/field_projects/arches/

Chair: Soraya Genin

GROUP SYNERGIES

The group synergies session aims at describing current research and foster new research opportunities among the members of ISTAR-IUL's four research groups. In this session we aim at having shorts talks, by members of different groups. Those talks are divided into two types that describe past or present research: i) talks about research among integrated members that led or are planned to lead to R&D project proposals to submit to exterior funding; ii) talks about research in the scope of PhD and Master thesis that may lead to R&D project proposals. With this session ISTAR-IUL aims at creating ideas to develop joint multidisciplinary and transdisciplinary research among their members and other stakeholders. In this book we include 12 research themes that are underdevelopment and planned to be developed by circa 24 ISTAR's members and other collaborators both national and international.

Chair: Sara Eloy

Segmentation and classification of agriculture crop fields from satellite imagery with deep learning

João Oliveira (ISTAR-IUL, Software System Engineering)

Maurício Breternitz (ISTAR-IUL, Digital Living Spaces)

Abstract

One of the goals of modern agriculture is to control the amount of water spent in irrigation. The decision to water is usually dependent on many factors, including the weather, the amount of water in the soil and the state of health of the plants.

There are already mathematical models that consider various sources of information, such as weather, stage of cultivation, amount of water in the soil, slope, sun exposure, etc. The use of these models requires the installation of sensors near the plants, which makes these solutions costly.

However it is possible to use satellite images as an alternative to the use of sensors. There are several European satellites that provide hyperspectral images from which it is possible to infer the information needed. In this work we will supervise a master's student addressing the following problems with deep learning:

1) Identification and segmentation of crops using satellite images (e.g. maize)
2) Classification of the crop health status.

The work will involve the study and adaptation of several deep learning techniques and frameworks, namely convolutional neural networks, transfer learning and frameworks such as Tensorflow [1].

The final objective of the work is to obtain information about the areas in the crops that need to be irrigated at a higher (or lower) intensity.

References

[1] http://www.tensorflow.org

Customizing mass housing: a dual computer implementation design strategy based on shape grammars

Filipe Santos (ISTAR-IUL, Digital Living Spaces)

Ana Almeida (ISTAR-IUL, Software Systems Engineering)

Bruno Taborda (ISCTE-IUL)

Sara Eloy (ISTAR-IUL, Digital Living Spaces)

Abstract

This research aims at developing a system for automatic generation of designs that allows housing customers to participate in the design of their house by using mass-customization design. The proposed system is based on shape grammars and will allow future owners to acquire houses that fit their needs while simultaneously complying to a language of design (Stiny 1980). Such a system will enable to deliver design solutions with quality (Eloy et al. n.d.) and at affordable prices improving satisfaction of clients and their quality of living. The system encodes knowledge on housing design principles (sizes of rooms, types of rooms and there preferable connections) as well as in the construction techniques that underlies the shape composition principles.

To make the system available for future inhabitants a computer implementation is being developed so that it could be made available online or at the housing construction company. The envisage design tool will: i) deliver design solutions answering the client's' requirements based on a design grammar therefore maintaining a language of design, ii) be feasible to be used by non-designers (e.g. clients, sales staff of a construction company). With the aim of finding a good technical solution to satisfy users' needs we have been developing computational tools for shape computing and working on its application in the generation of urban and architecture designs. For this aim two strategies of implementation are being developed simultaneously and in close collaboration. One is based in shape grammars supplemented with processes (Santos et al. n.d.) and the other based in genetic algorithms (de Almeida et al. 2016).

Research in mass-customized design using shape grammars have been developed over the years and several shape grammars have addressed the housing problem and the need to make available design systems that respond to the inhabitants needs (Duarte 2005; Benrós et al. 2011; Eloy & Duarte 2015). The main difficulty to fully use these systems in design practice is the delay of the computer implementation of architectural design processes, namely by the use of shape grammar logics. Computerized design tools that offer design alternatives supporting the design ways of thinking and working are still rare.

The case study used is this research is mass construction of wooden houses in Poland (Kwieciński & Slyk 2014). Timber construction systems are very popular in several countries like Poland and the construction industry provides future owners a catalogue of standardized solutions for them to choose. Those solutions are restricted to a small number of possibilities and the act of choosing is based on looking to all solutions and not to the ones that may respond to the clients need. In this research we aim at developing automated design systems that allow users to play with the house design tool enabling them to find the best fit house to their own personal wishes.

ISTAR team combines several expertise: Filipe Santos develops the shape grammar tool supplemented with processes; Ana Almeida develops the genetic algorithm application approach together with Master student Bruno Taborda; Sara Eloy collaborates with the architecture perspective on design processes and the use of shape grammars for architecture.

Krystian Kwiecinski is a PhD student from Warsaw University of Technology that collaborates in this research. The project evolved recently to a submission to FCT transnational projects in a collaboration with Universidade Federal do Rio de Janeiro. To this submission a new ISTAR collaborator José Pinto Duarte, expert in shape grammars, was added to the team.

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Developing and assessing shape grammar design systems

Sara Eloy (ISTAR-IUL, Digital Living Spaces)

Marina Andrade (ISTAR-IUL, Complexity and Computational Modelling)

Pedro Faria Lopes (ISTAR-IUL, Digital Living Spaces)

Abstract

The ongoing and future research focus on the developing and assessing shape grammars design systems for architecture. The work started by the join paper from Eloy (ISTAR-IUL), Vermaas (TU Delft) and Andrade (ISTAR-IUL) (Eloy, Vermaas, & Andrade, n.d.) where the quality of designs generated by shape grammar systems with designs created by professional architects was compared. In this work authors collaborated in defining and analysing an experiment in which evaluators rank the quality of preliminary designs for refurbishing Lisbon's *Rabo-de-Bacalhau* apartments, and that makes plausible that the design quality of the grammar solutions for this task is similar to that of the designs of the professional architects. It was argued that shape grammars can therefore be used as stand-alone design systems in architecture. The practical value is that shape grammar systems become alternative means to

take up design challenges (such as refurbishing all of Lisbon's Rabo-de-Bacalhau apartments) that currently require too much effort of architects to be economically feasible.

In the scope of the developed work the three authors joined a consortium composed by TU Ghent, ISCTE-IUL, TU Delft, SWAP, MVRDV, ARUP and Caramel for a call proposal to H2020 ICT-20-2017. The proposal project aims at bringing out creative architectural design content as smart digital data, and making this data effectively re-usable across different use-cases, offices and purposes. The project shall create a design engine that can work with given datasets and shape grammar rule sets to generate diverse alternative design solutions. The designs generated by the engine are customized since they responds to specifically selected architectural design language, to building regulations and to a particular architectural design brief.

In this H2020 proposal the team of ISCTE-IUL was composed by Eloy, Andrade and Lopes. Within the project workplan the task and collaboration between the ISTAR group was the following: Sara Eloy tasks were related to architectural design and shape grammar design rules definition, Pedro Faria Lopes collaborated on the interface design and tests, Marina Andrade was part of the team for developing the experimental settings and performing statistical analysis.

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Analysis of the state of the information security conscience in Portugal

Carlos Serrão (ISTAR-IUL, Software Systems Engineering)

Rosário Laureano (ISTAR-IUL, Complexity and Computational Modelling)

Abstract

The growing number of organizations that are dependent of information and communication technologies (ICT) to conduct their business processes is increasingly larger. ICT allows businesses to be more efficient, offer better services to customers, provide better process integration with partners and suppliers and develop new products. However, all of these ICT-powered opportunities are followed by much bigger challenges. One of the most relevant challenges organizations have to face nowadays concerns the growing number of menaces that this digital infrastructure has to endure and the investment necessary to provide the required protection measures that will allow its flawless operation.

The enormous security challenges that organizations face currently raise questions about the extent to which organizations are ready to tackle them. These questions are relevant, not only from a purely technical perspective (that is, to what extent organizations have the technical means to address security challenges) but also from other perspectives such as organizational awareness of these challenges and the knowledge needed to recognize and address them.

Thus, it is important to understand, in particular in the Portuguese context, how cybersecurity is tackled, and what measures Portuguese organizations take (or intend to take) in the near

future to address the possible challenges they face, and how they are aligned with the best practices that are carried out by their European counterparts or globally.

Usually as a result of the difficulties associated with estimating the benefits from cybersecurity investments, there is a widespread belief that private sector firms tend to underinvest in cybersecurity activities. Furthermore, firms tend to defer much of their cybersecurity investments unless reacting to a major cybersecurity breach. That is, firms tend to take a reactive, rather than proactive, approach toward cybersecurity investments related to their organizations.

This work represents one of the first Portuguese organizations extended studies regarding their approach to cybersecurity. It was carried out jointly with the cooperation of the Portuguese Association for the Promotion of Information Security (AP2SI), with the national organizations main stakeholders and decision maker's collaboration.

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Lisbon social housing profiles visualized in augmented cartography

David Leite Viana (ISTAR-IUL, Digital Living Spaces)

call for collaboration

Abstract

The project seeks to deepen levels of social innovation through digital inclusion from technological immersion. Social housing profiles, to be set from urban data analysis regarding

typological, demographic and socio-economic municipal public housing' characterization, will provide relevant information to the correlation between community engagement, e-participation, e-planning and e-governance and social participation. These will be a key aspects within the inclusion of socio-cultural contexts concerning rehabilitation projects in Lisbon municipal neighbourhoods. The goal is to contribute to integrated and comprehensive public housing policies, alongside the collaboration of "excluded" population in innovative solutions to narrow municipal tenants, housing building rehabilitation and administrative modernization.

The research will include the development of: 1) an app (with cartography 2D of municipal districts of public housing) for interface manipulation; 2) a digital platform for interaction between municipal tenants and Lisbon municipality; 3) mapping of spatial dynamics in municipal public housing districts using techniques derived from visual graph analysis and space configuration accessibility and visibility analysis; 4) a collaborative map of Lisbon with socio-spatial data; 5) social housing profiles visualized in "augmented reality" environment. It will be need to assemble a feedback process able to pragmatically assure: (a) innovation and social cohesion; (b) technology imbued within daily life; (c) the reduction of administrative and operational costs in rehabilitation projects; (d) quality (effectiveness and efficiency) of public governance; (e) an advance regarding how Lisbon municipality interacts with its tenants, promoting a responsive way. The project will be structured in the collection, tracking, processing, mapping and visualization of data in real time and in a virtual and augmented environment of Lisbon' cartography.

The outputs can be: *i*) an app of interaction between municipal tenants and Lisbon municipality; *ii*) a responsive digital platform to feedback relationships between municipal tenants and Lisbon municipality with information about the configuration of municipal districts; *iii*) maps of social-spatial dynamics of the municipal districts of public housing; *iv*) augmented cartography of Lisbon; *v*) software for socio-cultural participation processes in municipal neighbourhoods rehabilitation projects.

Using mixed realities to explore consumers behaviors

João Guerreiro (ISTAR-IUL, Information Systems)

Sara Eloy (ISTAR-IUL, Digital Living Spaces)

Miguel Sales Dias (ISTAR-IUL, Digital Living Spaces)

Abstract

The ongoing and future research focus on exploring how mixed realities, especially virtual reality, may be used for changing consumers' behaviours in complement or substituting traditional advertising means. With this main aim the group of researchers submitted a research proposal for FCT (call May 2017), are co-advising a master thesis and have several targets for future research.

The project submission for FCT was done by a collaboration between BRU-IUL, ISTAR-IUL and Dinamia'cet and emerges from massive reality of tourism in Europe and the strategic plan of the Portuguese Government of triplicating the number of cruisers in the country. This new reality creates the urge to pay a deeper attention to the cruisers' tourists and offer them a better and more diversified knowledge of the city they are visiting. The project is structured along two priorities in the domain of Tourism and Hospitality. The first is the definition of new routes to cruise passengers that will broaden the existing offer and the second is the use of

virtual reality as a way to induce in tourists' new opportunities to visit. As a consequence of having a good experience we believe tourists will become more satisfied and the levels of their subjective well-being will rise.

In the scope of the previous proposal a master thesis in Marketing is under development by Inês Amorim and co-supervised by João Guerreiro and Sara Eloy. In a time where major brands are aligned with the latest technology to deliver more impactful experiences, this research aims at studying how a VR experience can be used in moment marketing strategy to influence consumer's perception of a brand. By using VR Inês Amorim aims at being enable to measure engagement, satisfaction, intention and willingness to buy.

Within the FCT project workplan the task and collaboration between the ISTAR group was the following: João Guerreiro tasks were related to the development of the theoretical conceptual model to test under VR environments and to the literature review methodology based on text mining analysis, Sara Eloy collaborated on the definition and development of the architectural scenarios and the design of the virtual reality experiments, Miguel Sales Dias collaborated on the computer sciences issues related to the development of the Virtual Reality experiments,

Applying Deep Neural Networks to Evaluate Image Quality

João Oliveira (ISTAR-IUL, Software System Engineering)

Maurício Breternitz (ISTAR-IUL, Digital Living Spaces)

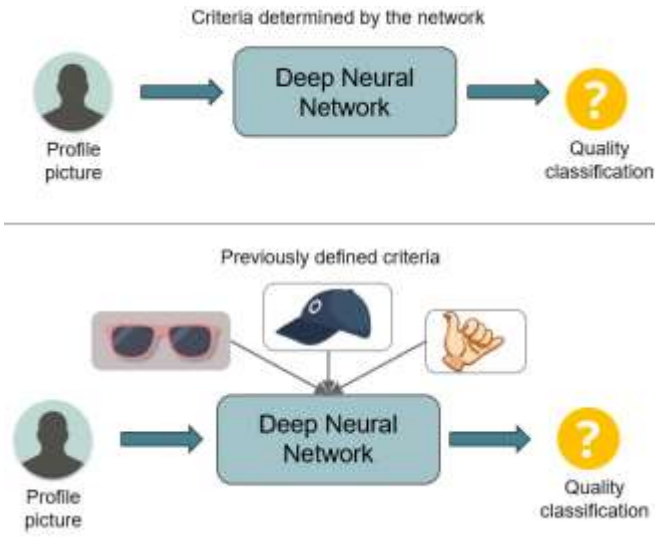
Abstract

Most online platforms (e.g. university platform, LinkedIn, etc) allow the users to upload pictures to their account profile. The fact that a user is free to upload any profile picture of their liking to a university or a job platform, has resulted in some occurrences of profile pictures that aren't very professional or adequate, in any of those contexts (e.g. a picture of an animal, a person wearing sunglasses, a picture taken on a beach). Not only is this circumstance inappropriate, but also, it makes it difficult to identify the person, leading to wasting time and probably making that person lose some credibility.

In this work we will supervise a master's student whose task is to classify the image quality of a profile picture, based on previously chosen criteria (e.g. no presence of sunglasses or hats, etc). To accomplish this, two different approaches based on deep neural networks (DNN) will be used. The first approach uses a DNN trained for image classification where it'll learn which features or criteria defines a profile picture as adequate. The second approach uses a DNN trained for object detection that will evaluate the quality of the picture, based on previously defined criteria.

One goal of this work is to find which of the two deep neural network approaches offers the best performance on this problem. The second goal is to verify that at least one of the two approaches can perform a correct image quality evaluation. Finally, the last goal is to identify and analyse features learned by the first DNN approach to evaluate the quality of the profile pictures.

This work will use and adapt deep learning frameworks such as Tensorflow [3].



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[2] Matthew D Zeiler and Rob Fergus. Visualizing and Understanding Convolutional Networks. Nov 2013.

[3] http://www.tensorflow.org

Monetization models for personal private health data

Daniel Neves (ISCTE-IUL, Master student Engenharia Informática)

Carlos Serrão (ISTAR-IUL, Software Systems Engineering)

Sérgio Moro (ISTAR-IUL, Information Systems)

Currently most of the behaviours that humans adopt have a direct or indirect impact on their health. It is scientifically accepted that a proper alimentation, absence of some risk behaviours (such as alcohol, tobacco or drugs consumption), and frequent moderated exercise can contribute directly to a better health.

Users, in particular those aware of these facts, tend to adopt more and more good health behaviours and technology can play an important role on this. Technology can enable them to have a better control of their physical activities and rest (for instance, sleep time), mostly using smartphones or smartwatches, as well as their calories intake.

Insurance companies often charge a rate for health insurance protection plans that are charged to customers or companies regardless of their users' healthy behaviours. Healthy behaviours from the users will have a direct impact on the insurance companies spending - in theory, better health is equivalent to less medical spending from insurance companies to their customers – and therefore create cost saving opportunities for them.

Having this context into consideration, the major objective of this work is to research, develop and test some mechanisms and software that will enable some kind of user monetization and user reward of their health-related data, as a way to establish a relation between the user behaviour and the value the users (or companies) have to pay for health insurance.

It is also an objective of this work to design the appropriated business intelligence solution that will enable the different stakeholders of the system – mainly users and health insurance companies – to have access to anonymised health performance data from groups of users that will allow the proper adjustments of the prizes the health insurance companies will have to charge.

Daniel will lead this research project undertaken within the scope of his Master of Science in Computer Engineering, supervised by Carlos and Sérgio. Daniel will benefit from this multidisciplinary team of supervisors where Carlos will guide him through all subjects regarding privacy and security, while Sérgio will help in exploring the data gathered using Business Intelligence.

The experimental approach benefits from a partnership with the Innit start-up, co-founded by Carlos. Thus, it should be noted the applied focus of this research.

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Automated CV Screening

Mário Rivoti Hauptfleisch (ISCTE-IUL, Master Student Engenharia de Telecomunicações e Informática)

Luís Nunes (ISTAR-IUL, Complexity and Computational Modelling)

Sérgio Moro (ISTAR-IUL, Information Systems)

Abstract

Companies are increasingly aware that human capital is their major asset and that a good hiring process is a key to success. Big companies receive huge amounts of job applications, for a wide range of positions, and have to analyse them efficiently. In some cases it is difficult to manually screen all candidates and an automated solution would be valuable. Automatic screening candidates would reduce the work load of Human Resources and consequently, reduce costs. The objective of an automated screening procedure would be to mimic the procedure of humans. The main questions are:

- Can we build a model of the screening procedure of a given company based on examples of screening decisions?

- What stage of screening can we more precisely model?
- Is that model dependant on the judge?
- Do we need different models per area?
- If the screening proves not to be possible with the currently available information, can we determine which information could be relevant based on other cases?
- What are the actual decision rules learned from examples of screening decisions?

Previous studies show that an automated system was able to perform the initial phase of screening and "showed conservative savings due to reduced employee turnover, reduced staffing costs, and increased hiring process efficiencies" (Buckley et al. 2004), and more recently a text-mining approach was able to reduce manual screening workload by 88% and 90% in two different cases (Shemilt 2014). The previous studies, however, focus on measuring savings and not on the validation of the screening results.

This study will use real data to answer the above mentioned questions. Data was graciously provided by the HR of one of the largest engineering corporations worldwide, which has the information systems centre located in Portugal. The job applications were submitted on a HR online tool and are organized in two groups. The first has structured data and it corresponds to an online form with several fields that applicants must fill when applying for a job. The form consists in simple text inputs and combo-boxes. The data of the second group is free text. This work will mainly focus on the first part of the data-set.

The study will attempt to learn models by generating them from examples using Data Mining tools. The tools used will be from any software publicly available or one supplied by the company.

This work will be supported by the above-mentioned corporation, that also actively participates in this research project, as it intends to better understand CV screening to benefit from the knowledge extracted.

The student (Mário Rivotti) will lead the research project within the scope of his MSc in Telecommunications Engineering and Informatics, supervised by Prof. Luís Nunes and Prof. Sérgio Moro. The multidisciplinary team will be useful to provide a closer supervision on two different parts of the project, the first in matters related to Machine Learning and the construction of models of the decision making process (Prof. Luís Nunes), and another where the connection with the business model and the exploration of the data will benefit from the use of Business Intelligence concepts and techniques (Prof. Sérgio Moro).

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Sensor and Building Information model supported indoor location

Localização indoor suportada por sensores e modelos BIM

Stuart Martinho (ISTAR-IUL, Master Student)

Joao C Ferreira (ISTAR-IUL, Software Systems Engineering)

Ricardo Resende (ISTAR-IUL, Digital Living Spaces)

Abstract

A diversity of application based on locations and advertising are being created on mobile devices using low cost beacons based on BLE (Bluetooth Low Energy) technology. These devices can be used to track the indoor and outdoor location of consumers via their mobile devices. BIM (Building Information Models) have become the *de facto* way to model buildings in all stages of their life-cycle. BIM models contain the three-dimensional description of buildings, including materials, construction materials, spatial description, systems and equipment, and any spatial information needed.

In this research work we create an indoor tracking system based on *iBeacon*, which is able to store user's movements and provide guidance based on the building BIM model, using both geometric and non-geometric information about the building (e.g. wheelchair accessible areas, location of offices and services, etc.).

We explore this approach in a university campus, where new students can receive notification about available services and guidance towards desirable places. This tracking data is stored for data analysis regarding user movements in the campus, identify congestion paths and users movements' pattern variation based on external events such as weather conditions or campus indoor.

In this work Stuart Martinho and João Carlos Ferreira oversee the sensor network and mobile application development and Ricardo Resende develops the BIM model.

On the prediction of reservation cancelation: modelling and acting

Nuno António (PhD Student)

Ana de Almeida (ISTAR-IUL, Software Systems Engineering)

Luís Nunes (ISTAR-IUL, Complexity and Computational Modelling)

Abstract

Data science tools and skills as data visualization, data mining, data analytics, and machine learning are being applied in uncensored data gathered from 8 hotels Property Management Systems (PMS), and combined with additional data from external sources which we believe that hold potential to identify the reasons why guests cancel their bookings, namely: world holiday dates, local weather conditions, currency exchange rates, stock exchange indexes, local events, hotels competitor's prices and hotels competitor's social reputation.

The current main research questions to be answered are:

1. Can a booking cancellation prediction model that uses Property Management System (PMS) data obtain better results compared to a model that uses Passenger Name Record (PNR) data?

2. Can this model's performance improve with the inclusion of data from additional sources?

3. Can such a model be integrated into at the hotel's Revenue Management System (RMS)?

It is expected that this research should make three valuable contributions in the field of hospitality revenue management:

1. The identification of which PMS feature have effective predictive value for predicting the probability of a booking being canceled and show that PMS data allows better model results than the use of "standard" PNR data.

2. The demonstration of the expressive power that the use of combined data sources for better (more precise) prediction models' results.

3. A procedural definition of how such predictive models should be implemented in a RMS for management decision support.

Ana de Almeida and Luis Nunes act as PhD supervisors, holding periodic discussions over the development of the research and collaborating in the dissemination of results. As a possible side-by effect, Nuno António was invited for presentation talks for Machine Learning Master's classes, and students have shown interest for future work in the project.

A Conceptual Model for Building Design Coordination using open source tools

Bruno Freitas (Master Student)

Carlos J. Costa (ISTAR-IUL, Information Systems)

Manuela Aparício (ISTAR-IUL, Information Systems)

Soraya Genin (ISTAR-IUL, Digital Living Spaces)

Abstract

Building Design Coordination is the process of communicating and integrating multi-disciplinary designs into a single, coherent set of information that can be used for construction, to anticipate problems that would otherwise only be raised on the construction site. As projects grow in complexity and size, digital communication tools and other technological improvements have made it possible for physically distant design teams to collaborate in novel ways. More recently, BIM (Building Information Modelling), has opened even greater possibilities, although the design process nevertheless is often one of trial and error, demanding on each small change multiple possibilities to be considered, with decisions requiring to be validated among designers and other project stakeholders. Regardless of all the advantages that BIM has brought to the industry, testing for design changes in BIM models often requires a big effort and is a time-consuming activity that should be avoided whenever simpler processes can be used.

Further developments on this study will propose a framework for building design coordination, using a non-relational graph database. The system can track design issues between unlimited

users, organized into teams, handling formal project documents and keeping an historical record of the design development timeline. Since all the information regarding the design development process is stored in the form of Nodes and Relationships these can be intuitively be manipulated making it easier for teams to provide input on design decisions in real time with least cost impact to the project, providing at the same time access to pertinent information on the status of design issues and how the various stakeholders are contributing to the project. Through the use of reliable open source tools, a prototype can be implemented and made available to the industry professionals for testing, providing guidelines for modelling a Building Design Coordination system.

IGNITE TALKS

The ISTAR Winter School Ignite Talks Sessions are addressed to all ISTAR-IUL PhD students. Each student does a presentation of no more than 5 minutes and then discussion follows. A highly recommended format for this type of presentation is the presenter to get 20 slides, which automatically advance every 15 seconds. The result is a fast and fun presentation which last just 5 minutes.

The goal is to create an environment conducive to the interaction between the participants, making each one take notice of the projects of others, hoping that this results in new ideas leading either to new projects or to the enrichment of the current ones. In the case of ISTAR-IUL, it is also expected, with these sessions, to attend to one of the repairs of the audit committee that recently visited us, noting the lack of interaction between ISTAR-IUL PhD students.

Chair: Manuel Alberto M. Ferreira

Cork ReWall: Computational Methods of Automatic Generation and Digital Fabrication of Partition Walls for Building Renovation

Filipe Brandão (ISTAR-IUL, Digital Living Spaces)

Abstract

Developments in computational design methods in architecture and their integration with digital fabrication processes enable us to envisage a mass customized construction paradigm. Such is particularly suited to building renovation, a diversified corpus in which interventions are surgical and unique, and where partition walls, which are frequently built with construction systems that are not disassemble-able or recyclable, are the most frequently replaced components in the building life cycle. While it is recognized that there is a need to reduce the waste in the life cycle of buildings, most research has focused on construction and demolition phases. Consequently, it is necessary to develop an efficient construction system that reinstates traditional materials and updates traditional techniques to contemporary needs. The main objective of this research is to develop a disassemble-able and customizable solution of partition walls, with natural and renewable materials, insulation cork board and wood, for the context of building renovation. To meet this end is necessary to develop the construction system, the generative process for digital design and fabrication and a graphical user interface for building owners to interact. This design-to-production system will generate drawings for fabrication, instructions for assembly, and cost estimation. We foresee that the adoption of a file-to-factory process will present several advantages in this context: maximizing efficiency and speed of the construction process without reducing scope or increasing cost, contributing to a more sustainable construction process, furthering the adoption of mass customization in construction and providing building users or owners with more control over the design of their buildings.

Software Development Process Mining

João Caldeira (ISTAR-IUL, Software Engineering Group)

Abstract

Software development has become a fundamental process on any business or organization. As a consequence, together with other emergent technologies, in addition to traditional development environments, new development platforms are being created, mainly in the cloud requiring different approaches on the way software development can be studied. Traditionally, software evolution studies use data insights from software configuration management repositories (SCM), source code systems (SC) and bug tracking (BT) tools. Many times those works focus on SCM, SC and BT synergies but they do not include metadata collected from the development environments (IDEs) about user activities. Information about developer behaviour and IDE usage can be identified as a missing perspective and a fundamental dimension to be part in the area of software development. The discovery of patterns when coding, the search for programmer behaviours and deviations from expected processes to follow, sustain this work.

We expect to produce contributions across three areas of software process mining: model discovery, conformance checking and process enhancement. Model discovery aims at discovering a software process model or at least some software process patterns by mining event logs taken from real software development activities. Conformance checking stands for diagnosing if actual software development activities (again captured as event logs) are following a pre-specified model. Finally, process enhancement aims at improving an existing software process model with information extracted from actual software process instances, captured from event logs during the various activities of the software development process.

Based on the mentioned mining techniques, we expect to analyse the order of activities in development, highlight resources, such as people, projects, roles, and how they are related and potentially predict process time, discover bottlenecks, track resource utilization and measure service levels. In addition, from a Socio-Technical perspective, we expect to identify bad and good practices amongst the developers and profile them using clustering analysis or other classification techniques. As an overall result we expect to contribute to make IDEs more adaptable to the user by identifying different developer profiles, detecting the most used features and actions done in IDEs and potentially by suggesting advices to the developers.

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Transdisciplinary vision of digital architecture through computational methods of mapping, analysis and visualization

Ricardo Mendes Correia (ISTAR-IUL, Digital Living Spaces)

Abstract

Architectural practice is changing not only with computers but also with the use of other disciplines. It is important to establish how architecture started to change. This research aims to draw a historic perspective of transdisciplinary digital architecture through the work of key personalities by establishing links between them and their relevance to nowadays architecture.

It is possible that the change of mind in architecture goes beyond the digital revolution and that architectural practice is becoming fully transdisciplinary besides digital. At the second decade of the 21st century, an architect may have the requirement to use any digital architecture and to deal with algorithms, parametrics and topology and likewise concepts from science and technology (Kolarevic, 2004; Doucet and Janssens, 2011).

Architecture in the last hundred years has undergone a big change but this transformation maybe has not started with early digital computers from early sixties. Nowadays digital architecture can be tracked back to the groundbreaking work of Ivan Sutherland and his 1963 PhD thesis Sketchpad at MIT. This was the first CAD system to be known and even contemplating other pioneer work, this can be considered an inception point for digital architecture (Sutherland, 1963).

But before the digital change of architecture, the transdisciplinary change came first. The transdisciplinary change in architectural has started 40 years early with new teaching methods at Bauhaus with teachers like Gropius and Moholy-Nagy who teach architecture with a new machine-based method. Bauhaus can be considered an important starting point to transdisciplinary architecture like Sketchpad can be to digital architecture. And If nowadays architecture is both digital and transdisciplinary, it is important to trace the relevance of transdisciplinary change as well as the digital change (Moholy-Nagy, 1947; Sutherland, 1963; Gropius, 1965).

Transdisciplinary Digital Architecture has an essential background needed to be known. Bauhaus faculty and other architectural teachers emigrated first to the UK and after to the United States. This made possible that transdisciplinary ideas could flourish on both sides of the Atlantic (Rocha, 2004; Picon, 2010). This research main contribution is to extend the literature, seeking to establish the connection between the use of the machine in architectural teaching and the evolution to computer use in architecture, tracing links between the key figures and between the early computer graphics research and nowadays transdisciplinary digital architecture.

The research methodology aims to trace the evolution of architecture from Bauhaus to Sketchpad and from there to nowadays transdisciplinary digital architecture. It will be focused on relationships and interactions between people, places, and institutions, using computational methods of mapping, analysis and visualization. The study will be grounded not only on archival and oral historical research but also on alphanumerical and spatial databases. We expect to find many connections and influences between a group of architectural teachers which will allow us to establish a path, along almost a century, towards the 21st century architecture.

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Sustainable Materials for Space Architecture

Leonor Domingos (ISTAR-IUL, Digital Living Spaces)

Abstract

When it comes to Space Architecture, it is easy to understand that the study of new structural responses, new mechanisms and components will naturally lead to the need for new, and more advanced materials. These new materials must meet various criteria, such as: Dimensional Stability, Weight, Durability and Environmental Stability, Strenght/Stiffness, Manufacturability and Costs. All this is required because the new material needs to be able to keep its size and shape, despite changes in temperature, it needs to be strong enough to hold itself but also to be flexible enough to bend, it also needs to be durable to resist radiation, atomic oxygen and vacuum, while also being light, to be easily carried in and out of earth. These materials also need to be easy to assemble or manufacture in a space environment, where gravity works differently. At the moment, most architecture and engineering companies such as Foster + Partners consider 3D printing in site to be the most effective option to manufacture in space. It is also needed to be taken into consideration how much the process to produce, test and manufacture in a larger scale will cost, because that will be a determining factor to whether this material will be used or not.

Foster + Partners 3D printed moon base is well known for its innovative buildings, it is constructed from 3D printed parts that would protect its inhabitants from external threats, and the company suggested that lunar soil is used to create the structures, that way it wouldn't be necessary for earth to supply so much material, and we wouldn't be inserting foreign materials in the region. SEArch studios and Clouds AO have won the NASA 3D-Printed Habitat Challenge for Mars contest with their project, ICE HOUSE. They use a series of nested ice domes that create a transparent shell around the habitat that gives access to natural light and uses the waters absorption spectrum to protect people from harmful radiation, while also allowing the existence of green-houses within. Much like Foster + Partners moon base, Fabulous Studio has projected the Sphero House, a 3D printed half-buried habitat, that uses both martian soil and permafrost, for sustainability and protection. If our purpose is not to build however, there are other options. Research teams at MIT have come up with a mobile shelter, an inflatable pod supported by silicone-coated fabric tubes and surrounded by a reflective shield that protects the people within.

More than just orbital stations, human space colonies are increasingly becoming a reality and all around the world architects and engineers are trying to understand how we will be able to live in those places. Without a doubt this will require a new approach to structures and materials, new ways of thinking how we can ensure that these colonies will be as sustainable as possible, and maybe even ensure that, in the process, we can make our own planet and our cities more sustainable.

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BIP / ZIP Observatory: Digital media for local development in Lisbon

Ana Carolina Carvalho Farias (ISTAR-IUL, Digital Living Spaces)

Abstract

The present research focuses on the Priority Intervention Neighborhoods and Zones (BIP / ZIP) Program, developed by the Housing and Local Development Council of the Lisbon City Council (CML), to rehabilitate and revitalize areas of Lisbon through grassroots actions promoting the best quality of life and territorial cohesion. The program aims, therefore, to be a device for co-creation and co-governance in the city. After six years of implementation, the technical staff and politicians who manage the BIP / ZIP recognize an urgent need to map, evaluate and monitor how connections between citizens and municipal administration in order to guarantee greater sustainability to actions at both territorial and administrative level. In this context, it is questioned whether the instruments available today by the BIP / ZIP are enough to articulate a collaboration between bottom-up (local-based initiatives) and top-down (CML) visions towards medium and long-term planning in local development processes. The answer is to adopt a methodology that combines qualitative and quantitative approaches, based on advanced digital techniques of analysis, visualization, simulation and prediction, which are basic to contemporary research. As advice for this problem, it is proposed the design of a "BIP / ZIP Observatory" (O-BIP / ZIP), a platform to follow the development of interaction and collaboration between two visions, which expanded citizen participation mechanisms, and strengthen the capacity for co-creation and co-governance. It is believed that the performance of the observatories, together with the application of new digital technologies in planning processes, offers great potential for the expansion of participatory processes in contemporary cities.

Keywords

Local development, priority territory, participation, digital technologies.

The physical and the virtual space in the architecture of commerce: digital technologies as means of interaction and experimentation

Carla Lopes (ISTAR-IUL, Digital Living Spaces)

Abstract

From the open-air markets to shopping centers, commercial spaces have been for long part of cities, contributing to shape them and stating their identity as points of interest and meeting points. These spaces are a constant presence in our lives and their power of attraction makes consumers spend more time inside them. Motivated by the need to acquire products or by the sheer search of entertainment through being there and moving along the space, society is increasingly present in commercial spaces. Such a reality makes the architectural quality of commercial spaces very relevant. Thus, commercial spaces enable more types of experiences beyond mere shopping. Creating commercial spaces more attractive, useful and meaningful within communities will improve the users' experience and the quality of life of the ones who constantly use these spaces.

The emergence of digital technologies that allow us to study human behavior in public spaces has enabled a new way to simulate the social effects of commerce design and with that knowledge, better plan the commercial space. Before using simulation and analysis tools design relied always on an intuitive process. Today we can base design on objective data and foresee more accurately an array of habits, flows and trends, many of them counter intuitive.

Digital technologies open up new possibilities on two levels that are both intended to be studied in this PhD research.

On one level digital technologies, through simulation and analysis tools, enabled a more objective analysis of the users patterns. Analysis tools as data mining are of key importance since they give the researcher the means for arguing based on facts. Information obtained from video surveillance, financial transactions, sensors and cellphones may be continuously recorded, independently of the user's knowledge or awareness, and used to obtain patterns of behavior and users' preferences. If on the one hand questions of privacy may arise, on the other, data mining can also open way to civic participation, for example in projects in which people voluntarily help to build data bases. In this behavior observation, simulation software and software like Space Syntax are key tools.

On a second level digital technologies used in commercial spaces (both physical and virtual /online) can enhance the users' experience in the commercial space. These latter technologies may have the form of interactive platforms such as tablets, tactile tables or apps – multiplying the possibilities of spatial exploration and orientation – or augmented reality – offering new ways of visualizing a product.

These two levels of influence of the digital technologies in commercial spaces constitute the guidelines of my investigation. The first one is fundamental for case-study analysis, whereas the second will open up way for an experimental approach on an architectonical level, which will try to establish connections between physical and virtual space through various interfaces, exploring new ways of embedding both to create new ways of experimenting commercial spaces.

Perception of Digital Citizenship - The importance of digital inclusion programs for disadvantaged social classes in Belo Horizonte, Brazil

Samir Rodrigues Haddad (ISTAR-IUL, Information Systems)

Abstract

Citizenship is much more than a social issue. In fact, the way each person feels and acts in society is increasingly dependent on participation in the digital worlds and in the realm of new technologies. Digital inequality is particularly significant in a highly technological network society (*e.g.* Grossi, Costa & Santos, 2013). People in disadvantaged conditions have great difficulty to access technological means. Therefore, there is a clear imbalance not only social, but also digital, between the various strata of the population. In order to combat social inequalities, particularly those related to ICTs, governments created digital inclusion programs, having the main purpose of promoting citizenship. To achieve this goal, governments facilitate the access to information and knowledge among poor populations, promoting training actions, and enabling them to use digital tools and applications, to make them feel better integrated and able to intervene more directly in society at the individual, community, social, political and economic levels (Jambeiro & Silva, 2004). This is why digital inclusion actions are so important. In this sense, since 2005, Brazil has been consolidating its digital inclusion policy with the creation and implementation of various programs, projects and social actions. It should be noted that Telecentres are spaces supported and managed by digital inclusion programs, that offer, free of charge, access to computers, Internet and ICT courses. In this context, the present research aims to investigate how less favored people in Brazilian society (classes C, D and E)[1], particularly in Belo Horizonte, who participate in social digital inclusion programs, perceive the exercise of digital citizenship. To what extent does the use of information and communication technologies (ICTs) help them to feel active participants in a networked society? It is also intended to contribute to the development of a conceptual model, based on the concept of digital citizenship and its explanatory components, for future evaluation of Brazilian public policies of digital inclusion, and possible suggestions for improving its functionality. For this purpose, several studies, namely exploratory (a documental study and several focus groups), inferential (that include the development of new scales and questionnaires) and correlational (in order to compare the previously determined dimensions according to the participants' perceptions), were planned. With the results of this research project, we hope to contribute not only to a better understanding of the perceptions of citizenship between this population in Belo Horizonte, but also to promote their exercise of citizenship, wishing to progressively expand our project to other places in Brazil, and later, to countries with similar socio-economic realities.

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[1] The criterion of economic classification in Brazil is used to differentiate the population and classify it in classes from "A" to "E". Being: "A" the highest class, and "E" the lowest class. In fact, the classification is made by minimum wages (MW): A (+10 MW), B (10 to 20 MW), C (4 to 10 MW), D (2 to 4 MW) and E (up to 2 MW) (http://www.ibge.gov.br/home/estatistica/populacao/censo2010/default.shtm, accessed on 05/17/2016 at 9:18 p.m.).

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Research in Island tourism: a literature analysis

Cristina Oliveira (ISTAR-IUL, Information Systems research group)

Abstract

This presentation aims to analyse what insights are offered by current scientific literature regarding tourism in islands. Increasing numbers of articles on island tourism have appeared in top-ranked journals, an enlarged body of literature that needs to be reviewed in a format that compares scope, methods and themes. This study applies a hybrid review method to present the status of research on island tourism and to identify areas where there is a research gap. Scope, methods and themes were evaluated from 377 articles published in 20 top tourism and hospitality journals between 2000 and 2017.

This study adopted a hybrid design, both narrative and systematic quantitative review methods, complemented by semantic network analysis. The systematic method allowed to identify the geographical spread of the papers by author, year, and destination of interest and the research methods, data analysis techniques, and primary topical areas. The narrative discussion within each of the topical areas indicates research production in that area, explores emerging themes and methods, and identifies knowledge gaps for future research directions. Finally, the semantic network analysis further explores connections among key topical areas. Themes and keywords were also analysed using Leximancer, a software program that automatically extracts semantic networks from qualitative data, identifying: (1) the connections among topics; (2) shifts in research interest over time and (3) differences in research focus between tourism and hospitality literature.

Preliminary results show that around 62 of the 377 papers were published in Tourism Management, 39 in Journal of Sustainable Tourism, 32 in Asia Pacific Journal of Tourism Research, 30 in Current Issues in Tourism, and 29 in Tourism Geographies as well as in Tourism Economics. The Researchers with the highest number of publications are Konstantinos Andriotos from Middlesex University, UK (9 papers) and Robertico Croes, University of Central Florida, USA (9), followed by Richard Sharpley, from the University of Centrak Lacashire, UK (6), Chris Ryan, University of Waikato, New Zealand (5), Haywatee Rankissoon, Curtin University, Australia (5) an Jorge Riderstaat, University of Central Florida, USA (5). Latin America & Caribbean received the highest number of studies (146), followed by Asia (108) and Oceania (99). The top researched Islands were Cyprus (25), Mauritus (18) and Barbados (16). The Leximancer analysis revealed that the main studied themes are: hotels, image, tourist behavior destination, sustainable tourism, policy, heritage and economic growth. The review outlines current achievements and future directions for Island tourism research, and is pertinent to both theory building and professional practice.

Bioclimatic Comfort and Life in Public Space. New techniques for space analysis considering environmental factors

Lázaro Ourique (ISTAR-IUL, Digital Living Spaces)

Abstract

How people use the built environment has long been a subject of research and debate. Various authors have characterized what constitutes a successful public space (Carr et al. 1995; Hillier & Hanson 1984; Whyte 1980; Worpole 1992) and proposed design guidelines to enable the design of such spaces (Carmona et al. 2003; Gehl 1987; Marcus & Francis 1997).

Design of urban space for long was considered to depend on empirical knowledge but in 1976 Bill Hillier and his colleagues at University College of London presented Space Syntax which by applying a set of analytical and quantitative methodologies and techniques describes complex patterns of spatial organization and thus brought forth a novel way of interpreting built and proposed environments.

This PhD project intends to research how microclimates affect peoples' comfort, use and movement in the built environment, with the goal of developing a novel analysis' methodology and technic that combines Environmental Analysis, in particular Biometeorological Comfort Indices, and Space Syntax.

This new analysis' methodology and tool will allow the prediction of use and movement patterns, thus allowing designers and local authorities to predict how various design decisions influence and affect peoples' perception and movement in architectural and urban spaces, contributing to the advancement of analytical and quantitative space analysis methodologies and ultimately urban design and planning legislation.

The main goals of this thesis are: i) to research how variations in the microclimates of the built environment, and thus the changes in the users' comfort, influences how they use and move in space; ii) the development of a new analysis' methodology and technic which by combining Environmental Analysis, more precisely Biometeorological Comfort Index, and Space Syntax will allow to predict human behaviour while using public space. The combination of these techniques will allow designers to understand how people perceive and move in architectural spaces, to predict new uses and to analyse existing ones.

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Kinetic Origami Surface

Filipa Crespo Osório (ISTAR-IUL, Digital Living Spaces)

Abstract

Since the 1960's that Architecture is progressively getting more merged with several other fields. Fields like biology, robotics, mechanics, electronics, parametric design, digital fabrication and so many others get to be together through Architecture. It is getting easier and more feasible for the designer to create buildings that are kinetic, interactive and/or responsive in order to communicate with users, enhance the building's performance in response to changing atmospheric conditions and even transform its own geometry to reconfigure spaces as a functional answer to changing demands.

The use of kinetic buildings, or kinetic elements in a building is becoming a natural response to concrete architecture solutions in order to make buildings "intelligent" and "alive" so they can meet the effective demands of users and use the technological means that are currently available.

The present research is placed on this line of thought and focuses on the architectural kinetic systems particularly on the ones relevant to operable/retractable roofs. As a materialization of these roofs we propose the use of foldable surfaces based on Rigid Origami rules due to their properties of elasticity, self-support and, most importantly, their geometric versatility that makes them able to assume planar, single curvature and double curvature configurations.

In this context the present research intends to develop a real scale prototype of a kinetic operable roof through the use of Rigid Origami Surfaces.

In order to achieve the main goal the adopted workflow starts with the choice of a Rigid Origami crease pattern, then its folding is digitally simulated through Rhinoceros and Grasshopper which gives the guidelines for the applicable kinetic system behind the movement, and finally the workflow ends with the digital fabrication and assembly of the architectural kinetic object.

Learning Computer Programming: The adoption of online gamified courses

Martinha Piteira (ISTAR-IUL, Information Systems)

Abstract

Over the past few years, several research studies have addressed the issue of problems in programming learning. As a way to mitigate these difficulties, several solutions were proposed. However, research associated with problems and solutions continues to be necessary as programming learning continues to experience high retention rates in the first year and is evidence of the persistence of learning problems.

In the various proposed solutions, it's verified that all are intended to motivate and to create rich and engaging learning experiences and to focus the student on learning, thus helping the student not give up on the first encountered difficulty. Gamification is the use of game features in a non-gaming context, and its use can provide student's involvement with learning. However, it is important to identify to what extent the adoption of gamification in online

learning systems is accepted and which variables can positively or negatively influence this adoption.

In this sense, the issue of problems and solutions has led us to a central question of research: "What are the difficulties of students in learning to programme and what solutions may contribute to reducing these difficulties?" and "What is the impact of gamification in the online courses? ".

To answer the research questions, an investigation was carried out, composed of four scientific studies: 1) The difficulties in programming learning related to programming concepts and learning situations as well the perception of the usefulness of learning contexts and materials/ resources, were all identified. The teachers' perceptions regarding students were also identified; 2) The perceptions obtained in Study 1 between students and teachers, were compared. Difficulties per each programming concept were identified through the results of the evaluation tests (tests and exams), and the comparison was made with the perceived difficulties; 3) A theoretical, conceptual solution was proposed for gamified online courses of programming learning, and the conceptual solution was implemented through an online course of programming fundamentals. The students' attitudes towards the present gamification elements in the online course were identified; 4) The adoption of gamification in the gamified online course through a theoretical model of technology adoption, was investigated.

We hope to contribute to a better understanding of the problems in programming learning as well as to a greater understanding and use in the educational context of gamification, encouraging its use in the online programming learning by the educators."

Keywords

Gamification, Programming Learning, eLearning, Technology Adoption, Flow, Theoretical Framework, CANOE.

Internet user behavior change - an evaluation under three dimensions: scholars, professionals, and users

Ricardo F. Ramos (ISTAR-IUL, Information Systems)

Abstract

Little is known regarding the change of users' behavior towards Websites, influenced by the increasing use of Social Media (SM) and Mobile Applications (MA).

Gradually, SM is taking over the Internet experience and the way people decide to navigate on the Internet. More than 3 Billion active users have a profile at a SM platform and the number is growing by 1 Million per day (Mashable, 2017). In the 12 top online destinations, five are SM platforms (Alexa, 2017). 90% of time spent on smartphones is spent on a MA (Alliance, 2017). There are more than 5 million MA available at the major app stores (Statista, 2017b), and by June of 2017, 180 Billion MA were downloaded just from the apple app store (Statista, 2017a). There are more than one MA available for every moment of our life (Xu, Manuel, Fleisch, & Ilic, 2016).

The increasing use of SM platforms (Hodis, Sriramachandramurthy, & Hemant, 2015) and the MA usage preference instead of mobile web browsing (Clicklabs, 2014) suggest that websites are no longer the center of the Internet experience.

This project of investigation aims to examine the shift in users' behavior when it turns to Internet access, by understanding the academia, professionals', and users' viewpoint. So far, academia has not provided any research to understand this phenomenon occurring in the Internet.

To achieve this goal, data will be collected through a literature analysis to understand academia perspective, and unstructured interviews to explain professionals and user's point of view. For the academia perspective, Scopus database will be the source to find the most relevant articles to support the literature review, while to understand professionals' perspective, unstructured questionnaires will be conducted through LinkedIn professionals' SM platform. Users will be contacted straightforwardly via email and Facebook SM platform to comprehend their point of view. Collected data will be analyzed through a Text Mining approach for a comprehensive analysis and search for hidden information or patterns (Moro et al., 2015).

Through the momentum associated with such recent and ever evolving technologies, we expect to contribute with recommendations on how to align researchers and professionals toward meeting user experience, and a description, summary, critical evaluation and current state of knowledge regarding the actual changes in the web.

In addition, we intent to create value to SM, MA and Website professionals and scholars to achieve specific goals and objectives in these particular areas, providing with research trends and identifying literature gaps. The outcome of this project can be used as an immediate reference for researchers. Overall, the contribution is expected to be significant.

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Streamlining Code Smells: Using Collective Intelligence and Visualization

José Vicente Pereira Dos Reis (ISTAR-IUL, Software Systems Engineering)

Abstract

Background: Code smells have long been catalogued with corresponding mitigating solutions called refactoring operations. However, while the latter are supported in several IDEs, code smells detection scaffolding still has many limitations. Another aspect deserving attention is code smells visualization, to increase software quality awareness, namely in large projects, where maintainability is often the dominating issue.

Research problems: Researchers have pointed out that code smells detection is inherently a subjective process and that is probably the main hindrance on providing automatic support. Regarding visualization, customized views are required, because each code smell type may have a different scope. Choosing the right visualization for each code smell type is an open research topic.

Expected contributions: This research work focuses on the code smells detection and awareness process, by proposing two symbiotic contributions: crowdsmelling and smelly maps. We envisage that such features will be available in a future generation of interactive development environments (aka IDE 2.0). Crowdsmelling uses the concept of collective intelligence through which programmers around the world will collaboratively contribute to the calibration of code smells detection algorithms (one per each code smell), hopefully improving the detection accuracy and mitigating the subjectivity problem. Smelly maps build upon the aforementioned code smells detection capability and on the previous experience at UNIFACS of setting up a software visualization infrastructure. We expect to represent detected code smells at different abstraction levels with the goal of increasing software quality awareness and facilitating refactoring decisions upon large software systems.

Keywords

Code Smell; Crowdsourcing; Software Quality; Software Maintenance; Code Smells Detection; Refactoring; IDE 2.0.

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Web Applications Quality Evolution

Américo Rio (ISTAR-IUL, Software Systems Engineering)

Abstract

Software evolution is a well-established research topic, but not in the web applications area. Web projects are normally more complex than other software development projects because they have both server and client code, encompass a variety of programming languages simultaneously, and are multidisciplinary.

We will address the quality of web systems in a longitudinal perspective, as an evolution study. This requires choosing metrics that can serve as adequate surrogates for software quality. That choice is not consensual for various reasons. For instance, in a previous study of ours, we found that some web systems quality characteristics may depend on the application domain. To mitigate this problem, several authors have chosen to study the evolution of code smells. We plan to do that, but in the scope of web systems. In concrete, our prospects are to perform various longitudinal studies on open-source web systems to find evidence on the relation between the existence of the web smells – the explanatory variables – and maintainability and reliability problems, such as release delays, failures occurrence and faults (aka defects or bugs) density, which will be the outcome variables. Because of the languages simultaneity, we have to produce a catalogue of web smells to help to perform these kinds of analysis. The code smells in existence, for just one language, are no enough for our purposes.

The expected outcome of these quasi-experimental studies will hopefully help increasing the awareness on the importance of detecting web systems smells as early as possible. Removing them is expected to reduce the failure potential, as well as the time spent developing new features, in other words, improving web systems reliability and maintainability.

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Reconciling Software Projects to Software Processes

Renata Santos (ISTAR-IUL, Software Systems Engineering)

Abstract

Software development processes reify Software Engineering concepts and best-practices and are used to organize how software systems are developed and maintained. The software process lifecycle can be illustrated using two levels: process and project levels. The former is related to the definition of the software process and is generally represented in the form of a process model or in textual descriptions. The latter describes a project plan and it is related to process instantiation and execution, where the activities defined in the software process are usually enacted and recorded in the form of tasks in project management tools. Process instantiation is the procedure in which Software Process elements become part of a Software Project. During process instantiation, the defined process is used as a reference to the creation of the project plan, where tasks are created, people are assigned to tasks, resources are allocated, and deadlines are defined. Transitioning from the Process level to the Project level is needed because processes are typically oblivious to the project context and as result the Software Process is materialized in a Software Project.

Checking the conformance between Software Process and Software Projects is essential for assuring projects are performed according to the prescribed process. In order to identify nonconformity it is necessary to assess to the process that is actually being performed. Given that Software Project tasks are typically stored in project management tools such as RedMine and Jira, conformance analysis must occur between the Software Process Model and the event logs found in such tools. However, extracting process knowledge from the events log generated during software projects is not a trivial activity. Our analysis of several industry related software development projects and the literature review has showed: i) software process are not explicitly found in software project plans; ii) software processes are poorly documented and rarely perceived by the development team; and iii) project management tools are process agnostic, sometimes the activities recorded (event logs) do not correspond to any of the activities allowed by the process. These factors decouple the process and project levels and hamper the identification of the software process that is being followed during software development projects. To make matters worse, despite the efforts dedicated to the creation of guidelines and best practices for software process definition, changes and deviations can occur during the process instantiation and execution.

To foster a smooth transition between process and project and integrate process concepts to project management tools, the main objective of this research is to define a structure for the representation of instantiation traces. This work introduces a set of instantiation operations such as link, split, and merge, to explicitly connect these two levels, thus allowing process and project reconciliation. In this sense, reconciling Software Projects to Software Processes allows the identification of skipped activities, wrong activities sequencing and added activities that may be considered non conformity after a thorough analysis. We have applied the instantiation operations on a real software development project and our approach has managed to reduce the gap between the process and project levels. This reduction improves the identification of non-conformities, since the process activity is explicitly referenced in the project plan. The event logs generated were clearer and more structured, therefore improving the extraction of the executed software process, thus it supported the conformance analysis.

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Detecting Agenda-Setting effects on Twitter conversations about the 2016 UK's EU Referendum

Tiago Santos (ISTAR-IUL, Complexity and Computational Modelling)

Abstract

Agenda-setting theory hypothesizes that the mass media sets the agenda of political campaigns and influences the public opinion. But recent changes in the media environment, with the emergence of alternative news sources, questions the agenda-setting influence of traditional media. The unexpected outcome of the EU Referendum, held in June 2016 in the UK, seems to confirm this lack of consensus between the public opinion and the mainstream media. Therefore, the proposed work intends to shed light upon the EU Referendum by examining the agenda-setting effects in articles in Twitter conversations about the referendum, Twitter feeds of the traditional and alternative media, and articles published on the internet by both media during the campaign. The results have the potential to help us better understand (1) if traditional news media still set the public agenda, (2) the role of the alternative media in the new fragmented media environments, (3) the information flow within the message networks and (4) the dynamics of consensus building processes in order to measure the overall balance of the political system.

The impact of digital fabrication on design methods and architectural practice

Daniela Silva (ISTAR-IUL, Digital Living Spaces)

Abstract

"(…) What can this medium do? (…) What do I wish to do with this medium? It matters that one works in a medium whose properties suit one's purposes: sometimes a more forgiving medium; sometimes a more rewarding medium; occasionally rigor for rigor's sake (…) Psychologists (and software experts) often employ the term "affordances" to describe the workable capacities of a medium. This reflects the truism that opportunities shape outlook: "how we see the world depends on what we can do whit it". (McCullough, 1996:198)

The evolution of the computer has made the design studio a very different place than it was in the 90's. Since then, a new generation of practitioners has emerged due to the creative use of advanced technologies (Burry & Burry, 2016). Digital tools are being used in the field of architecture during different stages of the project, accompanied by various software options (Steinberg, 2000). The landscape of digital technologies in architectural practice since the beginning of the 21th century has deeply transformed protocols, design methodologies, and the conceptualization of the discipline. To understand those transformations, this study is focused in understanding the implications of digital fabrication on architectural practice in the future, by positioning the use of digital fabrication not as a tool, but as design thinking.

Design thinking methods in architecture have always changed, considering that it's bound to the representational medium. Thus, its scope can be expanded by the enlarged possibilities offered by digital media and workflows (Marbel, 2012, Garber, 2017).

Today, the computational methods are a crucial medium for architectural design. On the one hand, digital media in design is becoming truly generative and intelligent, augmenting our design capacity in profound ways (Gu & Wang, 2012). On the other hand, digital fabrication, robotic fabrication or swarm fabrication is establishing itself as a core discipline for architecture. It has the power to link digital design information with physical production processes, thus opening the opportunity to materialize ideas, experiments and investigate physical or digital artifacts during the design process (Gramazio & Kohler, 2014, Tibbits, 2017).

The use of digital design and manufacturing processes and their synthesis through the use of advanced technologies is significantly changing the future of architecture design thinking (Gerber& Ibanez, 2014).

In this context, the present research focuses on the effects of the methodology change caused by digital means, specifically the digital fabrication (robotic and swarm) in contemporary architectural praxis, emphasizing it as a new way of the design process thinking.

The study is centered on the evolving nature and concepts of digital fabrication and attempts to understand the impact that is having on the methodologies in the context of the design studio.

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Architecture robotic construction in the XXI century: the role of drones and robotic arms in the future of construction

Nuno Pereira da Silva (ISTAR-IUL, Digital Living Spaces)

Abstract

Robotic technology has changed the method of production and the final products in several industries as naval, car, shoes and informatics components industries. The use of such production systems allowed cheaper products to be produced in a reduced time frame. Also more complex geometries were possible to use when the construction mechanisms are computerized and not human dependent. Simultaneously to his emergent field a movement of hand-made products also emerges as luxury products aiming at a specific market.

Taking into account the use of robotic elements in other industries such as naval, automotive and computer components, it is questioned here how these technologies could be used for the construction industry and what would change in this industry by such a use.

This PhD proposal follows the Master Thesis developed by Nuno Pereira da Silva with the title "A construção robotizada em arquitetura" (Silva 2017) which was done in collaboration with IT-IUL. During the master thesis direct testimonies from some of the most relevant protagonists worldwide in this area, the architects Fabio Gramazio and Tobias Bonwetsch (ETH Zurich) and José Pedro Sousa (FAUP) where obtained to help the discussion of the future of assembly by robotic means.

The main goal of this PhD research is to analyse and assess the possibilities that robotic technology considering the assembly part of construction, both with robotic arms and drones, bring to the architecture field and to the construction industry.

Robot arms in architecture industry are used mainly to digitally fabricate by subtracting but there are some experiences worldwide using them for the assembly of construction elements. This use for assembling construction elements is rare and is limited to experiments carried out at university level, which have been applied on few occasions in practice. The use of drones in the construction sector has increased considerably in recent years, mainly due to its use for 3D scanning and photogrammetry. The use of drones to assist the assembly of components of the construction has a much smaller advance than the similar one with robotic arms, and is also limited to a few experiments carried out by universities, which seek to explore how this technology can be used to build buildings. Some examples are *The Project Flight Assembled Architecture* from Gramazio Koehler Architects and robot engineering Raffaello D'Andrea from ETH Zurich (ETHZ, 2017) and the project The Aerial Construction also developed at ETH Zurich (Mirjan et al, 2016).

The first steps of this research will be based on a more extensive literature review on the topic of analysis and a mission to ETH Zurich to participate in the RobArch 2018: Radical Cross-disciplinarily conference and workshop.

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IMSGI – an Interface Model for Shape Grammar Implementations

Joana Tching (ISTAR-IUL, Complexity and Computational Modelling)

Abstract

Information technologies are a driving force for progress in the design field, allowing new modes of creativity. However, most of the existing computational design tools are focused on the latest stages of the design process and especially directed to drafting operations. Conceptual design tools that support the designer in the creative and inventive early stages of the design project are still in their early development (Tching, Reis, & Paio, 2013). Shape Grammars (SG) were introduced by George Stiny in the 70s (Stiny & Gips, 1975). Since then there are a considerable number of computational implementations, but few actually assist in the use of SG in the design field (Yue & Krishnamurti, 2014). SG is defined by a vocabulary of shapes and a set of rules that specify how to combine such shapes by recreating spatial relations defined between them (Stiny, 1977). These are similar to phrase structure grammars, with an alphabet of shapes that generate one to n-dimensional shapes. SG use algorithmic processes for the representation and computation of shapes that organize specific knowledge for the exploration of designs (Krishnamurti, 1980). SG computational implementations have the potential to answer the need for tools that can assist designers, architects and artists in the creative process, offering design alternatives, stimulating new ideas and encouraging the search for new design generation processes. The use of SG with computer applications enables the designer to take the full advantage of 1) synthesis and analysis of styles in design/architecture/art and 2) the creation of new forms. Several models of interaction with the user have been developed, as the ones developed by Scott Chase (Chase, 2002) and Haldane Liew (Liew, 2002) [See analysis in (Tching, Reis, & Paio, 2016)]. These models seem to lack guidelines for a clear and efficient interface for SG implementations that translate the objectives of the existing models of interaction. The interface of SG implementation should take into account architects/designers who are trained and comfortable using CAD software systems − an interface well adopted and stabilized. Acknowledging this, a user-friendly interface seems essential for the adoption of these tools. Taking Scott Chase's interaction model as background, the aim of the present investigation is to define guidelines and begin to design a graphical-user interface for SG implementations. Inspection methods of Human-Computer Interaction (HCI) were used to analyze existing SG implementations and understand usability issues. Subsequently, HCI ergonomic criteria for interface evaluation (Bastien &

Scapin, 1993) were adapted to establish guidelines for the design of a SG implementation interface, called IM-sqi. These guidelines take into account different user groups, adjustable interaction modes for each user group, and the nature of each task performed by the user.

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Augmented Reality in Outdoor Environments: efficiency, effectiveness and adequacy

Rui Miguel Simão Pascoal (ISTAR-IUL, Software Systems Engineering)

Abstract

This work explores current methods and technologies that can assist Augmented Reality (AR) technology in outdoor environments. However, the question of how to provide adequate information in real time to end-users in uncontrolled environments and in an efficient and effective way is still an issue. Data flows must be collected, sorted, processed and distributed in real-time, the information must be useful for the end-user and visual and communication overload must be avoided. This technology presents an added-value when providing real benefits and agility with the interactions (be it sportive, touristic, leisure, gaming or social context). The use of AR often generates too much data, which must be processed before being presented to the outdoor end-user. If decontextualized information is provided or the end-user is flooded with information, then AR applications for outdoor lose its purpose. The aim of this work is two-fold: First, to reinforce the need for appropriate use of methods and technologies (such as data science, statistical learning, natural language processing, and geo-referencing) to produce real-value applications for guided and aided outdoor environments, surveying existent technologies and applications and access their feasibility for AR applications

in outdoor human usage through both quantitative and qualitative approaches; Second, feeding from the former requirements, design an AR prototype to deliver appropriate and adequate information to end-users in outdoor environments, tested and evaluated.

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