They’ll know the secrets of your heart...

Electrical activity in the heart can be detected by a regular electrocardiogram, as you know. If more information is needed, like a finer spatial resolution and a better source localization, there is no way you can get it without some form of invasive intervention. Good news is that a project is underway to get the same—and even more accurate—information, without physical invasion, with great success so far! A team of two cardiologists, two electrophysiologists and two electrical engineers, led by Raúl Martins from Instituto de Telecomunicações, the institution where a large part of the work was developed, is giving shape to the equipment that is making this project come true. Arrhythmia situations, such as atrial fibrillation, were the main focus of this project. The requirement was to be able to locate accurately the boundaries of the problematic areas, allowing surgeons to circumscribe the intervention.

Here’s how it is being handled: a vest takes the place of the invasive catheters used up to now, and is applied around the patient’s chest. It contains an array of 256 sensors which measured both the electric and magnetic fields, providing a 4D electrocardiogram, i.e. Inside-the-heart information with spatial and temporal information for a more accurate interpretation of the clinical data. At the moment, the signal acquisition is taking two hours while the image post-processing is taking two days. However, a much faster process might be possible; it has not been tried yet so far, but Raúl Martins is positive that, by massive parallelization using GPUs (Graphical Processing Units), the same process can be carried in less than one minute! In a near future, it is expected that a therapeutic component is included in this equipment to help surgeons identifying the exact location of the electrical phenomena and allowing to circumscribe the ablation of the ill tissues. It is presumed that the developed equipment may become adaptable to other parts of the human body, reaching other areas of medicine, when commercialized.

The investigation has already been awarded: National Prize of the Altran Foundation for Research 2014 and, the most recent one, the Best Basic Research in Cardiology Award, by the Portuguese Society of Cardiology.
PROJECT SNAPSHOT

LITES - Led-based intelligent street lighting for energy saving

Project LITES achieved successfully its conclusion last November, 2014. This CIP project (Competitiveness and Innovation Program, a branch of FP7 dedicated to technology validation) aimed at live demonstration and validation of LED technology as future support for lighting of public spaces. LEDs have numerous advantages over conventional lighting devices, such as: higher efficiency, enhanced lifetime, and enhanced control (due to their fast switching characteristics). These advantages and the availability of high power LEDs with luminous efficiency reaching the state-of-the-art of compact fluorescent devices (CFL), were behind the motivation to bring LITES forward. The aim was to achieve more than 70% energy reduction. This was achieved by an adequate combination of LED lighting with sensing mechanisms. With this reasoning, each luminaire has an associated set of sensors able to monitor power consumption, device temperature and presence/motion detection (here motion concerns the passage of pedestrians nearby the lighting posts). Power consumption and device temperature were required measures to demonstrate the validity of the approach (it suffices to say, that current installations have reduced monitoring capabilities, a trend that will change in the near future). Presence/motion detection on the other hand were introduced with the sole purpose of controlling the luminous output in function of environment needs, that is, under no motion the light is reduced to a safe level (in accordance with the street class regulation). When motion is detected, due to the passage of pedestrians or cars in the vicinity of the lighting post, the light intensity is raised to the maximum level, thus promoting comfort, good visibility and security. This approach enables to reduce power consumption for periods with lower number of pedestrians. Project LITES joined together several partners from academia (University of Aveiro, Technical University of Riga, University of Toulouse, and Politecnico di Torino) an industrial partner (Thornlighting, belonging to Zumtobel group) and a municipality.”
Making IT web system easier for users!

IT website, with its 13 years of age, has been a resilient platform to back the dissemination of IT scientific achievements (publications, patents, projects, events) and also to provide the means for continuous internal monitoring of the R&D output quality and its evolution.

Over the years, IT web system has grown in terms of features and size, and now ranks (in terms of size) in the 144th position among 534 Western European research institutions listed in SCIMAGO institution ranking.

But the old age of the web system brought also some problems, so a completely renewed website had to be developed from scratch. While retaining the key concepts from the old one, some changes were introduced to fulfill long waited desires of IT researchers. Here follow just a few examples: when entering publications, the system will now be able to search external databases and fill in most of the fields automatically, only by specifying its Digital Object Identifier (DOI). The same can be done with a standard BibTex file, both to import and export data from or to other bibliographic databases, such as the University’s.

There are also news on the Productivity Index: IT web system will now calculate it automatically for all researchers holding a PhD, using the information contained in the IT database. Furthermore, the new web system is prepared to track ISI citations of individual publications, number of paper downloads, etc.

There is a lot more to explore. The new IT web system will be open for trials soon, during May!

Best PhD Thesis Award in Information Systems and Technologies 2014 from AISTI

To Gabriel Martín Hernández for the work "Design and implementation of new methods for spatial preprocessing prior to spectral unmixing of remotely sensed hyperspectral data", co-supervised by Antonio Plaza from the University of Extremadura (UEX) and José Manuel Bioucas Dias from Instituto de Telecomunicações /IST, and developed as part of a collaboration between UEX and IT.

This award is granted yearly by AISTI (Associação Ibérica de Sistemas e Tecnologias de Informação) to the best PhD theses in the areas of Information Systems and Technologies, aiming to stimulate scientific innovation and rigorous research work, as well as to disseminate high quality scientific work.

URL: http://www.aisti.eu

EMEA Regional Awards - “Outstanding Young Researcher of 2014”

Daniel Corujo, from the Telecommunications and Networking Group at IT in Aveiro, has received one of the “Outstanding Young Researcher” awards for 2014 from the IEEE ComSoc EMEA Region Committee, for his research activities in the fields of interest of ComSoc. This prestigious yearly award honors researchers who have been very active in the IEEE through ComSoc publication and conference activities over the last three years.

URL: http://www.comsoc.org/about/chapters/emea/regional-awards/winners

PROJECT SNAPSHOT — LITES (continued from p. 2)

(Bordeaux). Three pilots were implemented in live scenarios, and were constantly monitored during one year. The achieved results reveal an average of 70% power reduction when compared to the original installation (prior to LITES). The achieved results revealed other important conclusions, namely: i) more than 70% power reduction is within reach, following an optimized design of the sensors and LED drivers; ii) street activity and weather conditions have a direct implication on the dynamic behaviour of power consumption, which triggers novel strategies, aiming at street profiling and enhanced lighting conditions.

Rui Luis Andrade Aguiar, Luis Nero Alves and João Paulo Barraca
URL: http://www.lites-lights.eu/
Latest concluded PhDs hosted by IT

Filipe Ferreira
High Capacity Optical Transmission Systems Based on Mode Division Multiplexing
PhD degree in Electrical and Computer Engineering by the University of Coimbra, September 2014, supervised by Henrique Silva and Daniel Fonseca.
The thesis proposes advanced optical fiber transmission systems to unlock the capacity of future information systems by enabling the transmission of spatial super-channels over a single fibre.
Filipe is currently a Research Fellow at the Aston University, in Birmingham, United Kingdom. Recently, he has received a Marie Skłodowska-Curie individual fellowship.

João Paulo N. Torres
Semiconductor Ring Lasers
PhD in Electrical and Computer Engineering by Instituto Superior Técnico, University of Lisbon, June 2014, supervised by António Carlos de Campos Simões Baptista and Vítor Manuel de Oliveira Maló Machado.
In the present thesis two methods, one semi-analytic and the other purely numeric, were developed in order to simulate a ring semiconductor laser in the optical domain.
João is currently an Invited Assistant Professor in DECC, IST, University of Lisbon.

Helena Aidos
Dissimilarity-based measures and high-order dissimilarities: application to unsupervised and supervised learning
PhD in Electrical and Computer Engineering by IST, University of Lisbon, November 2014, supervised by Ana Fred.
The thesis focuses on the characterization of a high-order dissimilarity measure in terms of its properties and distribution, and its exploitation for improving well-known clustering and classification algorithms.
Helena is currently working as a post-doc researcher at IT in Lisbon.

Luís Filipe G. Rosado
PhD degree in Electrical and Computer Engineering by IST, University of Lisbon, December 2014, supervised by Professor Moisés Piedade and Professor Pedro Ramos.
The thesis proposed different electromagnetic probes employing both inductive and magneto-resistive sensor technology and dedicated instrumentation for the inspection of Friction Stir Welding.
Luís is currently working as a R&D Engineer for the company Sensima Inspection.

Where are you now?

Ruben Soares Luis
I joined IT in 2001 for my M.Sc. studies on optical fiber communications under the supervision of Professor Adolfo Cartaxo. During that period, he had the patience to transform this cocky graduate student into a proper researcher, achieving publications in highly regarded journals of the field. From 2003 until 2007, I worked towards a Ph.D. at University of Aveiro, with professors António Teixeira and Paulo Monteiro. There I was amazed by their stamina towards the engagement in collaboration projects and was first introduced to the international scene of the field. We had a strong collaboration with the Coriant optical research group, led at the time by professor Paulo Monteiro. Hence, more than a dozen researchers from IT Lisbon, Aveiro, Coimbra, and others, were all working together as a team in Amadora.

Over the course of those years, we managed to produce remarkable outcomes in the field, which resulted from the dedication of the researchers as well as the support of our supervisors, but also from the strong collaboration within the team. I am fortunate to call upon those researchers today as friends and try to continue collaborating with them.

Since then, I have worked as a Photonics Expert for Coriant and afterwards with the University of Azores. I am still an IT external researcher but since 2012, I have been with the National Institute of Information and Communications Technology (NICT) – Japan, where I continue to actively research optical communications systems. We have had several collaboration and internship projects with IT over the last few years (the photo shows me and Ali Shaphari from IT Aveiro after a long night of experimenting over the setup behind us in 2013) and I look forward to more in the future.