ABSTRACTS

Manipulation of Tactile Perception of Objects in MR

Nuno Gouveia

Virtual and Augmented Reality is not a new topic of research, but with the introduction of low-cost head mounted displays (HMD) on the market, the interest of consumers, researchers and companies has resurfaced, who are seeing opportunities for various applications. Besides content creation, there are other interesting areas of research like displays, rendering engines, motion tracking, etc. As the improvements of rendering engines and displays are enabling us to visualise more and more complex and realistic scenes, the stimuli of other senses has been lacking, restraining the user from experiencing full immersion.
This M.Sc. dissertation, intends to develop an instrumented object, with pose tracking capabilities and passive haptics, to further enhance user immersion while handling objects on Virtual and Augmented Reality Applications. The instrumented cube tracking is done by fusing data from a camera, that identifies visual markers printed on the object, and an inertial sensor inside the object.

Interactive Avatars for Triggering Emotional Response

Fernando Pais

The objective of this thesis is to imbue avatars with emotional responses to user and avatar interactions. Doing so allows us to create emotion elicitation scenarios using emotive avatars as the main tool.
The influence of emotions in human behaviour is an undisputed fact. How we feel affects not only how we act but also how we think. Emotion recognition and emulation is one of the most important steps in the creation of intelligent machines. Not all machines will need it, but it's a necessary skill for those whose purpose is interacting with humans. With that premise in mind, a system was designed that varies its behaviour either according to human control, or in response to stimulus appraisal. Using several emotion eliciting situations and exploring concepts such as personal space and primitive emotion contagion we intend to collect data on the ideal behaviour for the scenarios. After the data collection several personality profiles will be created and implemented in the avatars that try to mimic those responses, automatizing the scenarios.

Stochastic Bayesian Machines for HMM Gesture Recognition on a SoC FPGA Board

Bruno Silva

Bayesian inference allows us to deal with uncertainty and also put our prior knowledge into the model.Within the European BAMBI FET project novel solutions for implementing machines performing Bayesian inference have been developed.In this work, we will use an implementation of a stochastic HMM processor on a SoC FPGA board, a hybrid system, using the hard ARM core as well as the FPGA for gesture recognition.

Using an FPGA Mini-Cluster to Implement Bayesian Application-Specific Integrated Circuits for Robotic Applications

Miguel Gomes

Bayesian inference in general involves heavy computations, which are incompatible with the real-time requirements of perceptual and cognitive systems for robotic applications. In this work, we propose to use a mini-cluster of FPGAs for reconfigurable computing to develop dedicated Bayesian Machines (BMs) implemented on hardware - Bayesian Application-Specific Integrated Circuits ((B)ASICs) - that would enable the computation of inference for specific problems and allows to implement probabilistic models and respective I/O interfaces and resources for use on robotics applications.

RobotShepherding - Teleoperation of a Fleet of Robots through a Smartphone

João Pedro Paulo

In tasks performed by mobile cooperative robots it is convenient to ensure that their movement follows a certain geometric pattern, for example, in situations in which a user wishes to command a group of robots in order to transport them from a location to another. To do so, a user commands the group as a whole focusing his/her attention on a single robot that is seen as the leader of the formation, following what is called formation control.
The results of a work developed last year, regarding this particular area, are the starting point of this thesis.
However, it is now intended to explore the usefulness and benefits of using an Android-based smartphone to interact with the leader and consequently, the other robots of the group. The development of new interfaces that improve substantially the interaction is now the prime focus. It is expected that the user is able to control not only the movement but also the geometric pattern of the formation without having to stop the navigation process.
The interfaces aim at exploring different points of interaction between the user and the smartphone, allowing the creation of a mobile application that can be adjusted to each user's preferences.

SmartLocator - Indoor Human Localization using a Smartphone

Francisco Couceiro

Context awareness is very important for services provided by digital platforms of ubiquitous computing, being localization one of the fundamental dimensions in defining the context. There are currently more than 2.3 billion smartphone users. Across the globe, there is already a vast infrastructure of Wi-Fi network points available which, coupled with recent developments in the quality of embedded sensors on mobile devices (smartphones and tablets), makes these platforms a focus of ubiquitous computing. The main localization method in outdoor environments is GPS - Global Positioning System. However, the lack of accuracy or even unfeasibility of this method in indoor environments has led to the development of alternative localization solutions.
In this M.Sc. dissertation, it is intended to develop an Android mobile application -- the SmartLocator -- capable of locating the user in environments where a Wi-Fi infrastructure exists. The application performs indoor localization of the user through an algorithm based on the fusion of data provided by the Wi-Fi network (fingerprinting technique) and the inertial sensors (dead reckoning technique) available on the mobile device. Therefore, the application provides the localization of the smartphone's user in an area of interest (e.g. residence, company, museum, monument, exhibition park, shopping center, etc.).

Human-Inspired Object Discrimination by Color for Artificial Attention

Jorge Monteiro

Human beings are very efficient in detecting target objects among distractors using color as a search feature. In fact, different aspects on a scene drive the attention of the observer, which does not equally process all this information - color is one of the basic features that drive attentional capture, being the most salient dimension. Humans are particularly impressive at appropriately discriminating colors,

helping the visual response to distinct objects within a scene to be different, and at successfully identifying similar colors under varying illumination conditions (color constancy), which ensures that the visual response to any object be the same across scenes. We are also very successful in abstractly classifying colors congruently. This has a high impact in human performance in object search by color when comparing with computer vision algorithms. The goal of the presented work is to create a system that is able to regulate attentional capture according to an objective that depends on a color that can be abstractly defined. Its specific objectives are as follows: (1) to study on how abstract classification influences the ability of humans to discriminate between colors; (2) to compare chromatic (dis)similarity measures using different color spaces and different color constancy algorithms between each other and with human performance; and (3) to develop, implement and include in the CASIR-IMPEP attentional middleware a method to measure chromatic similarity per proto-object to perform human-like color discrimination in order to drive attentional capture. Three different experiments were designed and have already been conducted in order to help attain specific objectives (1) and (2). Results show that an Euclidean difference using the RGB color model generally seems to exhibit the smallest average error when comparing with human performance, with the HSV color model coming in a close second place. However, the difference in performance of the RGB-based solution in an abstract setting compared to the other color models decreases substantially when the experiment is changed so as to consider perception “in context”, i.e. using images taken from real-world scenes. We will present our preliminary conclusions based on these findings, which will help lay down the roadmap for further studies.

Gesture-based interaction for a billboard
Yoann Fleytoux

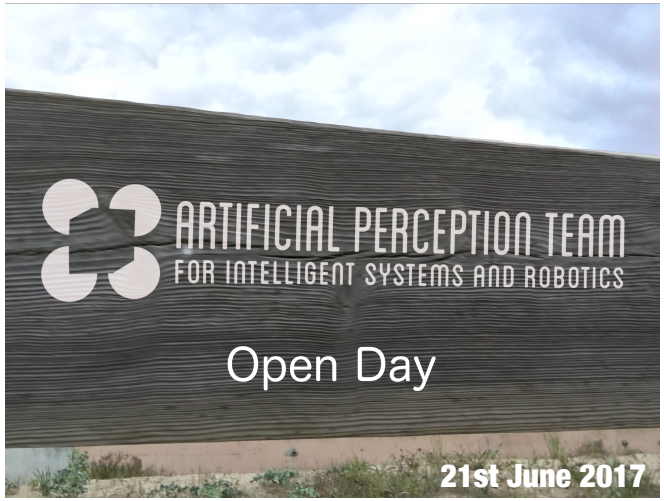
This project aims to adjust the experience offered by a gesture-based billboard, based on what it can perceive from the user. The challenge of using motion as a mean of interacting with a system, is to achieve a more intuitive and efficient user experience than more classical text or graphical interface. Though offering great design possibilities, these control schemes can still provoke a certain uneasiness. By using a mix of computer vision and machine learning techniques, this system will try to draw a profile of the user (based on based on criteria such as age, sex, disabilities, mood, past use of the billboard, etc...) , and adapt it's content and control schemes accordingly: hoping of achieving a more immersive and pleasurable user experience.

Emotion-driven content visualisation for an interactive billboard
Aurélien Bernier-Levalois

The advances in computer vision and artificial intelligence of the last few decades have allowed for lots of interesting new applications. Between CCTV, smartphones and laptops, the ubiquity of cameras have created a huge market for smart applications of computer vision.
The technology developed surrounding computer vision and most importantly face classification being solid enough, the next step was emotion classification. While face recognition allows to prepare personal scenarios depending on the person, emotion detection could help to make more realistic interactions with the user, fitting their mood at the time. The recognition of face then emotion could for example allow a personal robot to recognize each member of the house, then proposing them their favorite activities for sadness/anger, etc…
The goal of this implementation will be to display content on a billboard according to the person and his mood. For example, an ad won't play twice for the same person, and hearing aids ads would only play for the elderly. This billboard could be used for advertising in malls, but also for showcasing the research of a laboratory for example.

User-Adaptive Behaviour and User Modelling
Gonçalo Martins

As robots transition from research laboratories to social environments, their ability to provide appropriate interactions becomes a crucial step in attaining user acceptance, with studies showing that user-adaptive robots, i.e. robots able to adapt their actions to their users’ needs and skills, are better accepted by end-users.
This talk will present an overview of the author’s PhD work, which aims at developing a novel user-adaptive interaction regulation system able to adapt a robot’s actions to a dynamic model of its user, which can be efficiently learnt.
The talk is split into three main parts, wherein the individual components of the work will be discussed: user-adaptive behaviour generation, including previous works; distributed user modelling from heterogeneous data sources; surprisal-driven filtering of training datasets for efficient learning. Previous works and results on each of the topics will be presented, providing insight into the current status of the work, and providing insight into the remaining lines of future research to be pursued.



Programme

9:20	Opening
9:30	Nuno Gouveia
9:42	Fernando Pais
9:54	Bruno Silva
10:06	Miguel Gomes
10:18	João Pedro Paulo
10:30	Coffee Break
10:50	Francisco Couceiro
11:02	Jorge Monteiro
11:14	Yoann Fleytoux
11:26	Aurélien Bernier-Levalois
11:40	Gonçalo Martins
12:30	Lunch
14:00	Preparation of the demonstrators
14:30	Open Laboratory - Visitors are Welcome!
15:40	Announcement of Evaluation Results & Comments
16:00	Portugal - Russia (more demonstrators)

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