DIGITAL MEDIA DOCTORAL SYMPOSIUM

futureplaces

Porto, 21st October 2011
As citizens doing research and art practices, we can also play a role for effective change in people’s behavior regarding forests protection:

What are the possibilities of proposing constructive approaches to the destructive dynamics of fire that aggravate climate change?

Can digital art foster awareness and respect for nature?

This research proposes to investigate innovative concepts and design methods using real-time video as raw material for artistic exploration on environmental causes. RTiVISS [Real-Time Video Interactive Systems for Sustainability] is the acronym for this exploratory project and research agenda.

OBJECTIVES
» Create digital contexts of aesthetic contemplation of nature by exploring the beauty and danger of trees and forest fires
» Raise awareness on the natural environment by establishing a bond between people and forests, using technology in artistic contexts
» Help prevent forest fires by extending surveillance systems to online communities through “the emotion of real-time”.

Combining physical and digital worlds, this practice based research lives at the intersection of Art, Science and Technology. The outcomes include an online platform, interactive installations and the design of a surveillance kit prototype. Treeelucitations, B-wind!, Hug@ree, Play with Fire, Enchanted Forest and Malcro are the first series of installations to develop within the scope of RTiVISS. With this combination of artistic explorations and functional purposes, can we conceive a project that is both artistic and functional?

All together, we foresee that these interactions provide the experiences of contact with nature contributing to a feeling of belonging, strengthening the relationship with the forest, and also leading to local communities growth and empowerment.

+ info » monicamendes.info/rtiviss | www.rtiviss.com

ACKNOWLEDGEMENTS FBAUL and CIEBA for the support regarding participation in conferences and exhibitions; to Victoria Vesna, for the research term at UCLA Art\Sci center\lab. We also thank Valentina Nisi for the collaboration in Play with Fire and AZ Labs and its members for the development support, especially to Pedro Ângelo, who has been programming the interactive installations implemented | This research is done in the framework of the PhD in Digital Media of the UT Austin-Portugal Program funded by FCT - Foundation for Science and Technology (ref. SFRH/BDE/42555/2007).
This research is focused on the artistic digital work of activists that are not considered in the art system. These artists/activists use the web to develop and publish their work as well as to reach the publics, using personal websites, blogs and online art platforms like deviantArt.com. Denouncing current situations involving injustice, war, prejudice, their work intends to raise people’s consciousness towards those worldwide issues, many times distorted and neglected by the media and the governmental power. Therefore, this project intends to reflect on the relevance of those marginal artistic practices considering their themes and morphology, on their critical aspects and alternatives they present. We also intend to discuss their intervening character, and pertinence (or not) of integrating this kind of work in the contemporary art field.

In this interconnected world we live in, where the media are increasingly global, social, and ubiquitous, where each individual no longer depends on the organizations in order to structure their participation or to communicate with others, where consumers become producers, where the amateur's recognition is increasingly intersecting the professional's reputation, what is the role of institutions? How can traditional organizations take advantage of the communication flow that occurs directly between the network members? How can participatory audiovisual tools contribute to culturally revitalize the Historical Center of Porto?

The cultural program of collective boosting of the Historical Center of the City of Porto called “Manobras no Porto”, will serve as a case study for the implementation of the first exercises of participatory nature. With the help of participatory observation techniques and exploratory interviews, in this first phase, the aim is to map the position of the partners of the project in study and identify their cultural boosting actions, to collect information about social, economic and cultural problems of the project intervention zone and to listen to the participating people on the priorities they have in their daily life and experiences. After that, we will begin a proposition process, with the aim of analyzing the context of community cooperation, participation and involvement in the collective creation of new messages and narratives, by implementing a set of audiovisual participatory exercises. The aim is to search the parameters that can characterize the participation of citizens in creative processes.

Finally, we will present preliminary conclusions regarding the results that taken from this first work phase and expectations for the remaining research phases, whose final product can probably include a set of recommendations that may be presented to Portuguese and international institutions in order to call the attention of those responsible for the communication and social media evolution and for the participatory media and contemporary trend issues, which are dominated mainly by the interactive factor.
MUSICAL MORPHOLOGIES: A FRAMEWORK FOR CREATIVE EXPLORATION OF CONCATENATIVE SOUND SYNTHESIS

Gilberto Bernardes  
FEUP  
pdd09008@fe.up.pt

Carlos Guedes  
FEUP  
cguedes@fe.up.pt

Bruce Pennycook  
UT Austin  
bpenncycook@mail.utexas.edu

Concatenative sound synthesis (CSS) is a novel and promising method for sound synthesis with a solid body of work and publications. It uses a large database (corpus) of sound snippets (units) to assemble a given target phrase. earGram is a software prototype developed in Pure Data that implements a framework for creative exploration of CSS, with a special focus on its principle and components and its main applications in interactive music contexts.

earGram selects initially the best segmentation strategy to slice either a collection of audio files or a live signal input. Subsequently, all the segments are reduced to their most relevant characteristics and stored into a database (corpus). The corpus is then clustered according to a weighted similarity function.

Playing modes:
- Timbre-based granular synthesis;
- Composition by navigation;
- Re-arranging the unit's temporal organization by either assembling a given target or extending the sound source according to its own morphology;
- Corpus-based orchestration.

Future Work:
- Incorporate both live audio and audio files in a single corpus;
- Interaction with a live sound source;
- Improve search speed by mining the database;
- Design interactive models between different corpuses.
A Facial Rigging Standard
Pedro Bastos  Xeno Alvarez  Veronica Orvalho

Problem
Animating the face of a 3D character for films and videogames is hard because a complex facial control structure [1] has to be built to support its behaviors. This process, called facial rigging, is laborious and time-consuming for the digital artist and slow and expensive for the entertainment industry. Our overall goal is to study, analyze and deploy a standard for rigging a character’s face and bridge the gap between facial modeling and animation.

Contribution
The contribution is scientific due to the rigging standard being based in the research of artistic pre-requisites. It is professional due to providing a facial rigging framework for artists to use in the entertainment industry. It is technological due to deploying prototypes for facial rigging.

Method
To define the facial rigging standard a collection of requirements and specifications is used. The variations of morphologies and behaviors of the face are the requirements. The resulting facial rig designs for the different facial regions are the specifications.

The Anthropomorphic Face
The starting point is the anthropomorphic face. To get to the rigging variations in the other facial styles a 3-stage process is used: (a) realize morphology variations [2] for each facial region (b) know the behaviors [3] for each of the morphology variations (c) identify the facial rig design for each possible morphology and behavior variation. The resulting data encloses the combinations to support the characteristics of both the highly stylized and hyper-realistic character styles (also known as cartoons and creatures).

Creatures and Cartoons
Characters with highly stylized or hyper-realistic characteristics show a complex variation of the basic human face proportions and behaviors, thus requiring different rig design approaches.

State of the Art
Studying the evolution of the process of rigging a character’s face in the entertainment industry is the goal of the State of the Art. The specification of the facial rigging process is obtained by studying scientific and artistic references. This involves collecting and analyzing literature from the most renowned researchers and artists to realize existing tools, be aware of techniques and realize the interaction paradigms in facial rigging. This allows providing a detailed insight on how the science and art of rigging a character’s face has evolved.

Acknowledgments
This research is funded by FCT – Fundação para a Ciência e a Tecnologia and IT – Instituto de Telecomunicações. The images are copyright of FaceInMotion. We published in BlenderArt [4], ComputerArts [5], and Interact2011 [6].

References
Generation and control of automatic rhythmic performances in Max/MSP

We developed two algorithms and the corresponding software applications for automatically generate music rhythms and rhythmic variation. They can be used to substitute static loops with constantly varying rhythms which are intuitively managed and controlled in real time. The first, the kin.rhythmicator, generates rhythms characteristic of a certain rhythm and that do not belong to a specific musical style. The second, the kin.recombinator, recombines in real time a batch of MIDI drum loops in order to get non-excessively repetitive combinations of loops during a performance. The algorithm’s power lies in a novel analysis of the drum loops which sorts them in increasing order of complexity prior to utilizing them in the recombination algorithm.

**kin.rhythmicator**

1. Chose a Time Signature
   A metrical template is constructed, characteristic of the meter specified by the user. The template consists of weights that represent the importance of each pulse in the meter.

2. Generate a Rhythmic Performance based on a Metrical Template
   A stochastic performance is generated by cycling through the pulses in the meter and stochastically triggering events according to the weights in the template.

3. Effectively Control the Performance through Descriptive and Intuitive Parameters
   The generative algorithm has been parametrized in such a way that the user can control all aspects of the performance—density of generated events, amount of variation, amount of syncopation, and the meter itself—in real time through a musically meaningful interface.

**kin.recombinator**

1. Chose a Bunch of MIDI Files
   Metrical templates are constructed according to the time signatures found in the MIDI files.

2. Sort the MIDI Files from Simple to Complex by Comparing them to the corresponding Metrical Template
   Each rhythmic pattern found in the MIDI files is compared to a Metrical Template characteristic of its Time Signature. The files are assigned a complexity score according to the amount of syncopation and density of events.

3. Generate a performance by recombining the MIDI files
   The complexity of the generated rhythms is controlled in real time by restricting the range of files (from the simplest to the most complex) that take part in the recombination process.
VIRTUAL MARIONETTE
DIGITAL PUPPETRY

Luís Leite
FEUP Faculty of Engineering of the University of Porto | PIC Porto Interactive Center

Introduction

Virtual Marionette is a research on digital puppetry, an inter-disciplinary approach that brings the art of puppetry into the digital world of animation. Inspired by the vivid animation of marionettes in movies and TV commercials, the main objective is to study novel interfaces as an interaction platform for crafting creative contents based on computer-animated puppets.

Aim

The overall goal of this thesis is to research and deploy techniques and methods for the manipulation of articulated puppets in real-time with low-cost and practical interfaces to establish an abstract interaction model for digital puppetry.

Findings

Study on marionettes, animation, interaction design, interfaces to find out differences between:
- Key-frame animation vs real-time animation;
- Analog controls vs digital interfaces;
- Animation vs Digital Puppetry;
- Animator vs puppeteer.

Methods

Several experiments will be made for comparison purposes using several interfaces as puppet controllers, like:
- Willmotte; PlayStation Move; Microsoft Kinect; Joysticks; Sensors;
- Adapting different types of marionettes with different interfaces;
- Glove puppets;
- Rod puppets;
- String puppets.

Background

The most common approaches to create animations using digital puppetry include: strings to control the puppet with a digital glove [1]; computer vision for tracking color markers in a object that controls the marionette movements [2]; using a multi-touch surface for direct manipulation of bi-dimensional shape puppets [3]; hand gesture recognition to use fingers to control the marionette simulating a string controller [4]; a multi-modal interface to simulate different manipulation techniques [5]; a motion capture system for performance-driven with gesture recognition to trigger behavior animation for virtual theater, using an extra joystick for expanding the movement area [6].

Low-Cost Interfaces

Overview

Several proofs of concept experiments were developed during the research to study manipulation techniques and interfaces.

CBS – Cartoon Broadcast System

A simple proof of concept of live cartoon animation system for televisions:
- Features: lip-sync; Triggered animations; Triggered cameras.

Animatic

Virtual puppet show for real-time animation

Multi-modal 3D system simulating different marionette manipulation problems with different interfaces:
- Features: collision detection; animated lights and cameras; lip-sync;
- Interfaces: Willmotte, microphone, gomepad, mouse, keyboard.

Virtual Silhouette

Low-cost marker-less motion capture solution for 2D puppets. Real-time 2D puppet animation using the Microsoft Kinect.
- Easy to use interface, captures the motion of the body to assign to a silhouette.
- Software workflow: OpenNI + OSC + ANIMAT.

chAr:tor

Low-cost marker-less motion capture solution for 3D puppets. Real-time 3D puppet animation using depth camera. Capture the motion of the body to assign to a 3D Puppet.
- Software workflow: OpenNI + OSC + UNITY.

Act or Interact

An experiment with 18 participants to evaluate low-cost motion capture system in real-time animation comparing Virtual Silhouette (2D) with chAr:tor (3D).
- The participants were invited to guess what sports other participants were doing just by observing the animations.

Kine-Puppitt Show

3D Puppet Show demonstration using body motion as a controller for the puppet animation. Performance animation with digital puppetry technique using the Microsoft Kinect device with OpenNI Framework and Unity Game Engine with Wrapper for OpenNI.
- Software workflow: OpenNI + Wrapper + Unity

Acknowledgments

Luís Silva silhouette figure: Verónica Orvalho Supervisor

Further information

luis.grife@gmail.com

www.grifu.com/vm

Literature cited

Gimme ‘da Blues
A Jazz / Blues Player and Automatic Comping Generator for iOS devices

The user can play a solo instrument and/or a keyboard, while the Bass and Drums are generated automatically.

The bass and drums generation algorithms follow the user activity, continuously adapting it’s density.

The drums are generated by probabilistically recombining small phrase segments.

Carlos Guedes, Rui Dias, George Sioros, Telmo Marques
Facial Skin Shading Parameterization
Methodology for Rendering Emotions

Instituto de Telecomunicações | Faculdade de Engenharia da Universidade do Porto

PhD Student: Teresa de Jesus Baptista Vieira - viteresa@gmail.com | Supervisor: Verónica Costa Orvalho - veronica.orvalho@gmail.com

October, 2011

Introduction
What if we would like to portray the skin color of a 2D or 3D character according to his emotions? We would have to hand paint empirically, without guidelines, each skin texture and then animate them frame by frame. Resulting expressions look more artificial since they do not follow the dynamic changes of blood under the skin, which makes us blush or turn pale, like anger or fear. Accurate lifelike texture portrayal is:

1) time consuming (“it can take an estimated time of 30 hours to create texture maps for 3D animation of each one of the six basic facial expressions, as defined by Ekman”[1]);
2) computationally expensive (high definition textures slow down real time rendering), thus being avoided.

Goal
We propose to study and define skin color variation of facial emotions for accurate animation of expressions. Our methodology is supported by scientific and artistic data, such as hemoglobin and melanin maps empirical analysis and comparison with photos and painted portraits, which reflect gaze’s perception. Accurate and standard guidelines will help digital artists to animate increased lifelike emotions.

Methods
Our study will empirically analyze and compare several data, in four different phases, namely: 1) hemoglobin SIAscope maps for definition of areas and intensity of major blood perfusion (Fig. 1b); 2) melanin SIAscope maps for definition of skin basic color (Fig. 1c); 3) photos of actors depicting the six basic emotions (as defined by Ekman[2]) for color and expression comparison (Fig. 2); and 4) artists painted portraits for color comparison (Fig. 3).

A comparative table of expressions and its skin color change was proposed by Jung and Wagner[3], which also helped us define facial skin color variation for the preliminary results (Fig. 4).

Results
A 3D model was textured with our study and a preliminary facial animation was done, for the six basic expressions defined by Ekman, whose results can be seen in (Fig. 4). For instance, we can see that the anger expression is the most blushed. These preliminary results (Fig. 4) will be compared with photos of actors deploying the same emotions and with facial expressions portraits, painted by recognized artists, because they represent the gaze’s perception.

Conclusions
Defining the skin color variation of facial expressions comparing physical and artistic data provides accurate guidelines for standard portrait of emotions. Our methodology guidelines can also open new implementation opportunities, such as helping programmers to build applications for rendering skin shading expressions. As a result, the film and videogame industries will gain more expressive and lifelike characters, because their skin is represented as a live organ, reflecting blood perfusion patterns.

Acknowledgements
This research is partially supported by the European Union FP7 Integrated Project VERE (No. 257695) and FCT - Fundação para a Ciência e Tecnologia.

References

[1] Jimenez, J; Scully, T; Barbosa, N; Donner, C; Alvarez, X; Vieira, T; Matts, P; Orvalho, C; Gutierrez, D; and Weyrich., 2010. A practical appearance model for dynamic facial color. ACM Transactions on Graphics, 29, 2010.


Figure 1: SIAscope chromophore maps (female, 35 years) in Matts, P.J. New Insights into Skin Appearance and Measurement. Journal of Investigative Dermatology Symposium Proceedings, 2008, 13, 6-9.


Figure 3: a) Christopher Z. Y. Zhang, Man with Smile Norman Rockwell, No swimming, 1921 John Michael Taylor: Halfs

Figure 4: a) Heat map of facial skin color variation; b) Hemoglobin maps; c) Melanin maps; d) Preliminary results of a 3D model textured with the six basic emotions (joy, surprise, rage, disgust, fear and sadness)
how to create a virtual avatar in 30 minutes

Virtual environments, offer the opportunity to immerse one or more individuals in a completely different virtual world with which they can interact, and an all-new of experience is open to participants today, when compared to the inception of virtual reality.

Nonetheless, one of the main drawbacks of a full immersion sensation is visual likeness. Although possible to achieve with today’s technology, the process to produce a look-a-like character is tedious, laborious, requires an expert in the field of virtual characters creation and it takes, approximately, 4 weeks of work.

To be able to provide to any participant an enriching experience in a virtual environment, there is the need to develop tools that can create in a short period of time a look-a-like character of a particular human, which can be used by anyone, not necessarily an expert in the field.

With this in mind, we developed a proof-of-concept that can produce a completely animatable character, which looks like a given human, in less than 30 minutes. Taking advantages of well-known software and facial and body meshes rigged by default, we devised a pipeline that takes as input a couple of photos, and produces an animatable avatar that can be used in a virtual environment and mimics the likeness of the participant. We also developed a set of tools that allows any user to create the avatar without the need of understanding the details of the avatar’s creation process.

The complete pipeline

Bruno Oliveira  
bruno.oliveira@dei.fc.up.pt  
PIC, IT, FCUP

Verónica Orvalho  
veronica.orvalho@gmail.com  
PIC, IT, FCUP

Xenxo Alvarez  
xenxogdl@gmail.com  
PIC, IT, FCUP

Nuno Barbosa  
nuno.barbosa@fc.up.pt  
PIC, IT, FCUP

Nuno Barbosa  
nuno.barbosa@fc.up.pt  
PIC, IT, FCUP
LearnIng Facial Expressions usIng Serious GAMEs

http://www.portointeractivecenter.org/lifeisgame
Project Principal Investigator: Verónica Orvalho
Email: veronica.orvalho@gmail.com
Project Leader: Tiago Fernandes

Introduction:
The ability of socially and emotionally impaired individuals to recognize and respond to emotions conveyed by the face is critical to improve their communication skills. The LIFEisGAME project attempts to show how it is possible to apply a pioneer serious game approach to teach people with Autism Spectrum Disorder (ASD) to recognize facial emotions, using real time synthesis and automatic facial expression analysis. This is a joint project between Portugal and UT Austin.

The LIFEisGAME project is part of a broader research effort, focusing on an open question of scientific and clinical importance, of whether the use of virtual characters in interactive training programs can provide a basis for ASD rehabilitation. But first, we need to develop the technology. LIFEisGAME overall objective is to deploy a low cost real time facial animation system embedded in an experimental game, which will allow to further study the symptomatic problems of facial emotion recognition.

LIFEisGAME advances the synthesis of realistic virtual characters and markerless motion capture technology, and creates a non-stressful game to help individuals recognize facial emotions in an interactive way.

Partners: Instituto de Telecomunicações, Universidade do Porto, University Texas Austin, Microsoft Portugal, Instituto Politécnico do Porto.

Team:
Verónica Orvalho (PI FCUP/IT): Computer Graphics, HCI, Character Animation
Cristina Queirós (Co-PI FPCEUP): Psychology, Emotion Recognition
António Marques (Co-PI IPP): Psychology, Emotion Recognition
Miguel Sales Dias (Co-PI M): MLDC Director
Jake Aggarwal (Co-PI UTA): Computer Vision, Signal Processing
Yan Zhang (Co-PI UTA): User Needs Assessment
Tiago Fernandes: Project Leader
Xenxo Alvarez Blanco: Technical Director
Researchers: José Miranda, Samanta Alves, Pedro Rodrigues, José Serra, Gustavo Augusto, Birgi Tammersoy, Changbo Hu, Bretagne Abirached, Stacy Crain, Pedro Bastos, Bruno Oliveira.
Immersive Resonances, Rhythm and Room Feedback

This work continues to promote a dedicated research on sound and space, based on artistic work and scientific research, supporting new trends in this investigation area. The last few years, the domain of architecture and the solid and quick development of acoustics, has been more and more prominent in the research conferences on computer music, highlighting a growing interest within researchers and artists.

Music is an art linked with time. This makes rhythm one of the most important aspects when dealing with development, structure and musical experiences. Rhythm creates formal relationships between past, present and future. This project will focus on creating ways in which physical properties of sound/music and spaces can be bounded into one while having rhythm mediating this symbiosis.

“The acoustics of a grand cathedral can create an exalted mood; those of a chapel can enhance the privacy of quiet contemplation; those of an elevator can produce the feeling of encapsulation and, in the extreme, claustrophobia.”
(Blesser&Salter, 2007)

“The perceptible and unmistakable sensation of nearby walls is created by elevated low-frequency sounds, and by the presence of strong resonances.”
(Blesser&Salter, 2007)

My first question was how to musically approach space beyond reverb…? What is there besides reverb in music performance? What is the rhythm of a space? These basic questions seeded my investigation and quickly diverge in other questions such as: Is music and space able to immerse audiences in a symbiotic relationship? What are the elements for that fusion? How to blend sound and space and what’s the role of sound on that relationship? In the search for a more profound physical relationship for audiences to experience music and space, the idea of resonances appear has a possible path to explore. Vibrations and resonances are the natural response of rooms to sounds, which in turn gives it his sonic fingerprint. The use of established techniques such as impulse-response measurements will be used, extended and rethought to be used as compositional and immersive tools.

“The perceptible and unmistakable sensation of nearby walls is created by elevated low-frequency sounds, and by the presence of strong resonances.”
(Blesser&Salter, 2007)
On-Demand Immersive-TV for Communities of Media Producers and Consumers

Today’s TV role in social interaction cannot be diminished. Users are more receptive to new types of interaction (e.g. Wii, Kinetic, iPhone, iPad), probably through a gaming experience undertaken in this medium, breaking mental models and habits in how home entertainment is processed. Further, the living room is now the stage for playing golf, sing karaoke, follow a personal trainer demands, or other group activities, where the family or a group of users is called to interact.

Users are more active. The interactional TV paradigm is no longer just the leanback “couch potato” interactional paradigm (although sometimes still is, and a lazy interaction thus requires a simpler interface, involving minimal consumer effort. Some users simply just want to watch a movie on TV).

New on-line social activities are also emerging from the web, such as the growing on-line social communities, and they are enabling the burst of new communicational paradigms on our society. These new communicational paradigms are pushing more and more the user needs in a way that traditional television could not keep up. Hence user needs are also pushing the interactional paradigms more and more to a new and challenging level of user experience – booth aesthetical, functional and social. These communities are creating, in fact, new viewing habits. Not just for entertainment purposes but also becoming gradually part of a new collective everyday experience.

In that order, interfaces should consistently adapt as the interactional paradigm changes. Interfaces must change along, adapting and evolving, becoming more and more aware of the user - or users - expectations for a particular interactional occurrence. The system should be predictive and attend to a specific situation and also attend to a specific user.

It’s recognized that there is a lack of comprehensive studies in how the user feels an iTV interface, particulary with all these new and recent capabilities. How the interface facilitates the interaction and how it should adapt to a specific scenario. Defining and explore these new interactional mental models and evaluating the user experience under those is urgent in order to establish design guidelines for future sustained research that aim to provide a effective immersiveness state in iTV users.

This research aims to develop and apply new work methodologies in the creation and development of multimedia products with this specific characteristics, achieving a more participative, motivating and satisfying interactive experience in new types of interactive and immersive digital television. It will also focus on a User Experience Design (UxD) approach with the purpose of develop and approve design guidelines that can be translated not only in greater effectivness and efficiency of use, but also in increased user satisfaction in an immersive interactive television environment.

Achievements:
> Design an effective immersive user interface for a personalized combination of Mainstream TV and On-line User-Generated Content.
> Develop specific methodologies in the creation and development of a digital media product with this characteristics.

Further research:
> Enhanced Remote Controls
> Gesture Interface
> Facial Recognition and User Awareness
> Voice to Command
> Interaction over Content
> Virtual Channel Metaphor

This study is being pursued in the context of the ImTV research project coordinated by the Research Center for Informatics and Information Technologies (Centro de Investigação em Informática e Tecnologias da Informação - CITI) of the New University of Lisbon Science and Technology Faculty.
Haptic Art: The Exaltation of a Sense

Doctoral Program in Digital Media
Faculdade de Engenharia da Universidade do Porto (FEUP)

Researcher: Sandra Coelho
Supervisor: Miguel Velhote Correia

The ‘future is haptic’ is what we have been heard from technologists and visionary theorists. Yet, haptic is not a technological feature, but a biological function. Haptic is almost an unknown term outside the research discourses and engineering labs. When asked, the majority of people ignore the relation between haptic and touch. What is generally unknown is that haptic is part of our multifunctional sense of touch. Proposing to rediscover the haptic through crossroads of art and design, this research aims to introduce a concept of a biomimetic dynamic surface as an awareness project inspired by the sensorial behavior of living beings. Intended to construct the knowledge of the self through the sense of touch.

Through a design creation and engaging the inherent inquisitive characteristic of art, this research aims to develop considerations based on crossing scientific findings related to the sense of touch, intervening and raising awareness for this sense that we so often neglect. Usually people know very little about touch, often restricts it to the sensations felt on the skin. They only know the surface of this sense. The sense of touch is critically vital, from controlling the body to perceiving, learning from, and interacting with others and the environment. The biomimetic dynamic surface is a visual and tactile metaphor created to show how our actions influence the behaviors of others. How our immediate reactive instinct predicts our consequent behaviors. Concerning the instinctive action to an unexpected touch, or the first reaction to the embodied experience of feeling something in our skin. The first moment we experience something new is the alluring of an instant that will determine our future behaviors to similar experiences.

A lasting involvement depends on the quality of the first impression. We are moved by sensations, constantly looking for unforgettable ones. Commonly, beyond our survival instincts, it is our desire to enhance our experiences when dealing with the most disparate things, from the everyday simplest actions to interactions that challenge our knowledge. Those improvements are related to how we use our senses when experiencing those things. When forming first impressions, it is what we see, hear, smell, taste, and touch that influence our assessments and future behaviors. The Reactant is a design surface concept that goes through a physical change during a reaction. This sensitive surface changes its physical nature, as it may grow or shrink when we press a finger on it.

The Fundação para a Ciência e a Tecnologia (FCT) funds this research (SFRH/BD/33952/2009) through the UT Austin | Portugal program for the joint Doctoral Program in Digital Media by UP and UNL.
Understanding and exploring through BCI (Brain Computer Interface) the duality/unity of determinant constituents of human behavior and condition—or the brain potentials generated by the dynamics between aware cognitive commands and unaware emotional reactions.

Abstract

The practice of music is based on an orchestrated dynamic rational, motor, visual and emotional behavior where various mechanisms interact in multiple and complex decision-making in real-time, to adequately control the muscular, auditory, visual systems. It also triggers emotional signals—generated simultaneously in the deepest interior of the brain—that often function as spontaneous feedback energy, complementary to the aware cognitive system. A factor that may influence our own rational decisions and affect the practice of music itself—seen, as an example, in the modulation of interpretation.

Background and state of the art (short summary)

The practice of music is a human activity that can activate nearly every known areas of the brain, whether at the cognitive or the emotional level. But we also activate the systems of generators and the deepest emotions in the primitive reptilian areas (amygdala and vermis), the core of emotional processing that is part of a network that deals with pleasure, arousal, opioids transmission and production of dopamine, a neurotransmitter associated with emotions.

A musician is thus a psycho-dynamic engine, a generator of electromagnetic brain signals at various levels.

Investigation throughout the last century led to the creation of a system known as encephalograph, which reads and records the oscillations of the electric potential of the brain. Based on these systems brain-to-computer interfaces (BCI) have been created—BCIs can establish links between humans and computers. The majority of the practice based research on BCI and its potential uses has been oriented by the dynamics between aware cognitive command and condition—or the brain potentials generated of known potentials—the cognitive conscious, aware, thoughts and the emotional spontaneous unconscious, unaware, responses—but exploring an unknown terrain which resides inbetween reason and emotion, in contexts of contemporary performative arts practice [music, dance, audiovisual interactive installations, generative visuals] that is, based and focused on a digital experimental arts conceptualization field.

Objectives

a) better understand the characteristics of the potentials and signals generated by conscious cognitive aware brain commands and emotional spontaneous inner brain generation in context of instrumental music practice;

b) use of rational and emotional brain potentials, simultaneously, in real-time, with proper differentiation, through low cost BCI, to control and control and modulate or recharacterize [certain aspects of] digital narratives and entities;

c) use the system to interactively alter content and form, leading as such to the modification of the conceptual and aesthetic meaning of the performance constituents;

d) Understanding and exploring through BCI (Brain Computer Interface) the duality/unity of determinant constituents of human behavior and condition—or the brain potentials generated by the dynamics between aware cognitive commands and unaware emotional reactions.

e) to pursue a framing of the usefulness of the research to consequently apply it as a possible therapeutic tool to people with physical and/or neurological disabilities—at least in context of clinical art therapy.

References

Dynamic Animation of Surfaces using Chemical Approaches

Objectives:
The aim of my research work is to explore and develop innovative low cost dynamic display surfaces through the use of the concepts behind printable electronics and electrochromism.

It will focus on how these displays can be implemented in products and used to exhibit dynamic programmed animations, while employing minimal hardware resources and computational power (e.g. by implementing Cellular Automata).

Supervisor:
Prof. António Câmara (FCT/UNL)

Keywords:
Ubiquitous Computing, Printable Electronics, Invisible Displays, Cellular Automata.

Design Principles:
• Simplicity: The complexity of the device is that of the task, not the tool. The technology is invisible.

• Versatility: Devices are designed to allow and encourage novel, creative interaction.

• Pleasurability: Devices should be pleasurable, fun and enjoyable.


Device Scheme:

Applications:

Consumer Electronics
- Integration in simple computational devices such as music players, digital watches, and calculators.

Advertising
- Magazines, newspapers, signage, billboards, posters, or any other paper surface featuring animations or user-activated content.

Smart Cards
- Simple displays to access information on payphone cards, frequent flyer cards, public transportation cards, or any other type of smart card.

Smart Packaging
- Improved information on packages / packages that react to the environment;
- Electronic shelf labels and pricing tags for dynamic information signs.

Other
- Intelligent furniture and walls;
- Interactive clothing.
Learning is an extremely complex process. It depends on the individual characteristics of the learner, on the learning context, on the proposed activities, on the tutor, etc. It also depends upon actions such as experimenting, interpreting, visualizing, abstracting and summarizing, by means of which the learner succeeds in constructing his own knowledge. The educational environment has been undergoing considerable changes due to the use of the Information and Communication technology tools. However, there are social and individual skills (like being autonomous, responsible or dealing with teamwork) that learners acquire by the social relation with their peers, teachers and other individuals. We live in a society that is constantly demanding creativity, globalization, recordance and the ability to deal with virtuality and the new technologies (Baptista, 2008, p. vi), and the use of technology has a strong influence on human cognitive functions (Tobaldini & Brancher, 2006).

The definition of computer game combines the concept of "game" with the use of computers. The "game" concept represents a structured or semi-structured activity with goals that players try to achieve by following a set of rules. The associated concept of 'play' relates to the interaction with the game itself. A game can be characterized as entertainment or recreation as it involves mental stimulation and development of practical skills - games forces - to decide, to choose and to define priorities.

Games are now part of modern culture (Olbinguer, 2006). Rewards are a major part of their universe, whether they are translated in game entities (get more life power, access to new levels, acquire new capacities or equipment, etc.) or even as a neurological impulses for satisfaction or happiness. Comparatively, in real life, humans do not achieve so easily the rewards obtained in the complex world of games. Games assume different forms and as in real life, “games present problems that must be solved and overcome by taking action. However, games depart from reality in the consequences of success or failure and in the clarity of outcomes.” (Bergeron, 2006, p. xvi)

Serious games "are games insofar as they have rules, simulate behaviours, accept input from the player, and provide feedback within the context of the rules and behaviours." (Michael & Chen, 2006, p. 43) This type of games is defined as "an interactive computer application, with or without a significant hardware component, that: has a challenging goal; is fun to play and/or engaging; is important to some context of learning; imparts to the user skill, knowledge or attitude that can be applied in the real world." (Bergeron, 2006, p. xvii)

Mike Zyda describes Serious Games as "a mental context, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives" (Zyda, 2005, pp. 22-35).

A premise of this type of games is "if the player learns to beat the game but can’t usually apply what he has learned in the real world, then the serious game has failed in its mission" (Michael & Chen, 2006, p. 42). The player becomes motivated to learn on their own when they can relate to what’s being taught. So many areas can be explored with virtual success because few may be the most effective means of learning skills and attitudes and that serious game play may support longer-lasting learning than traditional methods.

These games aren’t only entertaining, but intentionally deliver an underlying message. Their value results on change of emotional state of player, and understanding the user experience is central to quantifying the effectiveness of serious videos games as educational tools. The goal for the design of Serious Games is the successful integration of learning objectives with the elements of entertainment, play and fun, (Rankin, McNeal, Shute, & Gooch, 2008, pp. 43-49). Other important aspect of design is involved pedagogical concepts to become a successful mediator of knowledge, as like Zyda called as "cognitive linearizing" - the learning that happens by mechanisms other than formal teaching (Zyda, 2005). But designers, developers and teachers need to make sure their serious games are adaptable to a variety of classroom and training situations as well as being easy to use.

Fortunately, game design and development can now be made in a much more economic way because there are already game engines that allow for rapid prototyping and production. These engines can result in highly competitive and engaging environments, not at the top commercial level, of course, but to the extent required for this research.

The serious games have implied the acquisition of knowledge / skills after completion. One of the issues relevant to research in the serious games is the assessment of learning that has to be certified.

In order to help clarify this issue, I propose the construction of a methodology for evaluating the serious games in education, whose learning objectives are listed at the beginning of the game design and validated at the end of the game.
Introduction

Being the dominant mean of human communication, facial expressions and motion are regarded as one of the fundamental topics in computer animation. Applications are among interactive games, using live real motion to control a character's face; virtual reality and animation. In a performance-driven animation system, usually the workflow is separated in three main components: Motion data acquisition with Motion Capture (MoCap), design of a Facial Rig to control the animation, and Mapping/Retargeting to the defined rig.

Towards the goal of finding a standard method to relate facial motion data to rig parameters, in order to be able to perform retargeting to different kinds of faces' topologies, we have currently implemented a marker-based first approach to synthesize facial expressions in real time. By using the Optitrack ARENA software [2], the animation library HALCA [3], and the XVR development framework [4], we are able to synthesize in real time local facial deformations on an a priori modeled and rigged 3D face model.

Methods

Our system is composed of 3 different components: The ARENA expression, a Client Application and an XVR Project. The ARENA software allowed us to administrate facial motion capture using facial markers. We used a previously fully calibrated standard set of six Optitrack cameras to define our volume of capture; and 24 facial markers (including head tracking) to define a facial template to track, which depended upon the definition of the facial rig for the 3D model to animate.

Figure 1. Markers distribution example and its corresponding rig based on hierarchical joints

For performance-driven animation in real-time, we used the streaming capabilities of ARENA in conjunction with its C++ NatNet SDK by implementing a compatible client application. This last was developed to retrieve in real time the facial template information created previously in ARENA, along with 3D markers positions for each of the frames, scaling of the data, correct orientation and head tracking. This data is finally sent via UDP to an XVR application, which in turn implemented the HALCA library to load all animations functions and controls over the avatar mesh and rig.

In our procedures we used a joint based facial rig and a direct mapping between joints and facial markers (Figure 1).

Mapping Process

Let \( R = \{ f_j \} \) be the facial rig of our model, defined as a set of \( n \) facial joint positions at time \( t \). Let \( M = \{ M_i \} \) be the set of corresponding \( n \) markers positions also at time \( t \), without counting the four head tracking markers. Suppose that at \( t=0 \), \( J_0 \) stores the neutral expression joint positions, and similarly \( M_0 \) stores the neutral user expression markers positions. In a direct mapping procedure, it is natural to relate displacements of the joints to displacement of the markers. Therefore a linear model can be constructed by the equation

\[ f_j = J_i + K_i (M_i - M_j), \quad i=1,...,n; \text{ for all } t \]

Which allow us to get joints positions for all time (frames) \( t \). The constant factors \( K_i \) could be modeled to influence more certain parts of the face than others that we know are more stable along time. The range of motion calibration can be attached to the 3D model rig definition procedure, simulated with predefined values for these factors by regions. This mapping method however could not be applied to joints whose motion is due to rotation rather than translation, e.g., the Jaw joint. For this, we used a cosine law to solve for rotation angles in joints from displacements in markers, in a very similar fashion to the aforementioned linear method. The head rigid motion is extracted from four headband markers from Optitrack.

Results - Work in Progress

We performed two MoCap sessions to test our mapping and animations in real-time. In general the range of motion factors \( K_i \) needed to be adapted for each of the participants, in a range value from 0.25 to 1. The assumption of linearly between joints and markers displacements synthesized facial expressions in real time accordingly to live performance but losing subtleness of a particular actor. Artifacts however were caused mainly by markers tracking instability, and bad weighting of the joints.

In order to get the subtleness within the expressions of each user, a different mapping needs to be developed, including the design of another rig. Current development points to address: Optimal number of markers that are needed to capture subtleness of facial expressions. Optimal facial rig and skinning accordingly to the number of markers: Shape-Aware joint weighting as an alternative to the traditional manual painting; and finally to replace reflective markers for feature tracking in a vision based method such as Active Appearance Models (AAM).

Acknowledgements

This research is supported by the European Union FP7 Integrated Project VERE (No. 257695) Instituto de Telecomunicações - IT and Fundação para a Ciência e a Tecnologia - FCT, Portugal.

References


http://www.naturalpoint.com/optitrack

tion/avatarslib/doc/


Figure 2. Performance-driven Animation: Facial Template(Left), marker based mocap (Middle), and animation (Right)
Introduction

Collaborative Virtual Environments provide a way for people to develop team work from any part of the world. Besides from a common virtual ground, a CVE provides tools to improve collaboration. The use of a virtual world that replicates the real world, combined with augmented reality, allows for the interaction of desktop based users with team members on the field.

Objectives

The exploration of the virtuality continuum metaphor intends to provide group awareness to spatially distributed teams in the execution of a common activity. Team members that are far away can interact on a virtual world that replicates familiar buildings, roads and landmarks. Since this virtual world is a reproduction of reality, avatars can interact with each other but also with the embodiments of real people whose location, direction and speed is known from location and direction sensors in their mobile devices. These devices gather and exchange information and also act as an interface to the virtual world making use of augmented reality. This approach allows all users to visualize other participants – whether on a computer or on the field – and share relevant information. The main objective of this dissertation is to study forms of interaction that may bring together the before mentioned users, whether they are “real” or “virtual” and permit information sharing on a CVE that brings people together, on the field, at home or in an office. Since a mobile device will be used as a “window” through which information can be visualized, an alternative data entry system shall be studied in order to replace or complement menus and buttons, providing a more natural interface.

Research Questions

The main research questions are focused on communication, interaction and visualization for optimizing collaborative work. The benefits of AR will be lost if the user has to use menus or read small text. Both AR and VR users must be aware of other users and the environment.

Four mains questions should be answered with the present study:

- In what ways can collaborative work benefit from a combined VR /AR approach?
- How to achieve optimal group awareness for both “real” and “virtual” users?
- What forms of communication can be used to improve group dynamics and collaboration?
- How should users, objectives, objects or other relevant information be visualized, explored and handled for better collaboration in performing group activities?

Methodology

- Analysis of real life requirements – Interviews with fire department and the army should provide real time scenarios, allowing research questions to be tested for situations based on real life.
- Development of an AR / VR solution for collaborative work – Specifications for an AR / VR solution for collaboration based on parameters defined from the analysis of requirements.
- Working prototype – Development of an AR / VR prototype for collaborative work that implements established considerations.
- Mixed reality interaction – Hypothesis testing with the use of proposed mixed reality solution.
Instrumental Fado: A Generative Interactive System

Tiago Videira
Digital Media PhD Student – FCSH/UNL – UT Austin Portugal

Fado in Literature

The history of Fado as seen through literature. How the practice evolved in society, analysis of definitions, schemes, histories, and musical transcriptions.

“A section of eight 2/4 measures, divided in two equal and symmetric parts, with two melodic contours each; preferably in the minor mode, although many times it goes into the major with the same melody or another; harmony built on an arpeggio in sixteenth-notes using only tonic and dominant chords, alternating within two measures.”

(Ernesto Vieira, 1904)

Systematization

A database is being built using the occurrences of musical transcriptions classified as Fado in literature.

Abstract

Fado is commonly thought as being a traditional Portuguese musical genre that evolved and became the most important style of music in Portugal, regularly identified with the people and culture of the nation itself. Its study, performance and preservation is of great relevance in the present time. Currently, Fado is claiming its place in the world applying for the classification of immaterial humanity patrimony by UNESCO.

Interactive Music and Digital controllers

Sonata for unprepared player

Our goal is to understand what Fado is and to create an automatic system that successfully generates new instrumental music based on it. The generative process also aims to be interactive, i.e. responsive to user constraints, considering musical and aesthetic parameters, such as tempo, rhythm, or general mood of the Fado.

David Cope’s successful Experiments in Musical Intelligence and Emily Howell programs as a source of reference and inspiration.

General reference:


Alberto Cosmic Fingers

A digital instrument based on a glove with sensors.
http://alotmoredesigns.yolasite.com/experiments.php