numediart

Research Program in Digital Art Technologies - Newsletter 6 Mar09

Call for Participation

Period 6 - Apr-Jun'09

numediart is a long-term research programme centered on Digital Media Arts, funded by Région Wallonne, Belgium (grant N°716631). Its main goal is to foster the development of new media technologies through digital performances and installations, in connection with local companies and artists.

It is organized around three major R&D themes (HyFORGE - hypermedia navigation, COMEDIA - body and media, COPI - digital luthery) and is performed as a series of short (3-months) projects, typically 3 or 4 of them in parallel, during which a 1-week "hands on" workshop is held.

numediart is the result of collaboration between Polytech.Mons (Information Technology R&D Pole) and UCL (TELE Lab), with a center of gravity in Mons, the cultural capital of Wallonia. It also benefits from the expertise of the Multitel research center on multimedia and telecommunications. As such, it is the R&D component of Mons 2015, a broader effort towards making Mons the cultural capital of Europe in 2015.

The numediart board now calls for participation to three short projects defined in the following pages, to be held (remotely) from April, 6th to June, 30th 2009. The project will involve a one-week workshop in May 25-29 in the Royal Theater of Mons, Redoutes room. Results will be publicly presented at the end of the project. If you want to contribute, please send an email to contact@numediart.org mentioning which project you want to join, and what kind of expertise you could bring, before March, 20th. The number of participants is limited to 8 people per project. Participation to the workshop is mandatory. No funding is provided, but no fee is asked for either.

POLYTECH MONS

UCL Université catholique de Louvain

RÉGION WALLONNE

Laughter Cycle: Query-by-Example and Navigation Approaches for Audio Content

Idea

This project aims at developing a web-based service for efficiently navigating inside a laughter database. It will enable users to quickly and easily find laughter utterances corresponding to their wishes. Two main approaches to explore the database will be provided:

1. query-by-example (the user gives a laughter utterance to the system, which finds similar samples in the database);
2. query-by-keyword (using tags stored as meta-data and characterizing the utterances).

Query-by-example approach

The query-by-example approach requires an evaluation of similarities between laughter occurrences. Several acoustic properties will be investigated to assess to what extent they model human perceptions of similarities between laughters. Characteristics usually computed in speech and music analysis (e.g. descriptors of pitch, timbre, harmony, melody or rhythm) will be adapted to laughter. Features specific to laughter will also be considered, for example the ratio of voiced versus unvoiced segments or descriptors characterizing the periodicity and durations of such segments. The laughter utterances from the database will be visually organized according to their similarity with the example along one dimension and the similarities between them along another space dimension, in order to ease the localization of the region of interest. The user will be able to listen to any displayed sample, define it as the new example towards which similarities must be estimated and reorganize the database visualization by, for example, weighting the acoustic properties involved in the similarity evaluation.

Query-by-keyword approach

The query-by-keyword approach will only differ in the way data is accessed. According to the requested keyword(s) and the database tags (possibly automatically extracted through characteristic features aforementioned), the software will propose the most relevant samples and place all the objects around them. The user will then be able to navigate inside the organized database, using either keywords or acoustic similarities to refine his search.

Web-based implementation

The software will be embedded in a web-based service. This implies providing a quick access to the laughter database remotely stored and managed on one hand and, on the other hand, developing a web application to run the audiovisual rendering on the client computer.

In addition, this application must enable the user to record its own laughter and send it to the server for starting a query-by-example search. In consequence, worldwide users will be able to enrich the database with new laughter utterances and find similarities with other laughers. The website will support a laughing community. Designing this website, starting by establishing its specifications and studying solutions to develop it (Rich Internet Applications [3] being good candidates), will be an important part of the project. It can be split into 3 aspects corresponding to 3 developers profiles:

- server side application, managing the database of laughters and community members, likely based on PHP/MySQL or some equivalent technologies;
- client side GUI and interaction, probably using Flash or AJAX;
- client side graphics design.

Motivations

Laughter is an essential signal in human communications. It conveys information about our feelings and helps to cheer up our mood. Moreover, it is communicative and has the potential to elicit emotions to its listeners. Laughter is also known to have healthy effects, and especially to be one of the best medicines against stress. Laughter therapies, "yoga" sessions or groups are emerging everywhere, amplified by these crisis times where people need to relax and forget about the negative things. We can cite the laughter chain launched on Skype [4], laughters clubs [1] or the World Laughter Day. The first objective of Laughter Cycle is concerned by this strong social impact. Inspired by singing communities like Midomi [2] and the miscellaneous social networks emerging over the internet, we would like to create a laughing community, where users could enjoy all the benefits of laughter.

In addition, due to the growing interest for virtual agents modeling human behaviors, there is a need to enable these agents to perceive and express emotions. Laughter is clearly an important cue for understanding emotions and discourse events on one hand, and, on the other, to manifest certain emotions. However, from an engineering point of view, laughter is an understudied signal. The second goal of this project will be to extend the state-of-the art in laughter production. Pure laughter synthesis is very difficult and, to date, unefficient. We would like to help people finding easily a desired laughter sound. We have acquired 2 databases containing several thousands of laughters, covering the largest possible range of laughter kinds, that will be primarily used to this end. Organizing the database according to similarities will facilitate and accelerate the search.

This project lies in the continuity of the work done within a previous numediart project, Audio Cycle (#04.1), where a graphical interface to browse a large music library and help creating new performances has been designed. Similarities between music loops have been used to spatially organize the corpus and synchronized 3D Audio rendering of the activated loops has been implemented.

Agenda

- 06/04/2009: Project start.
- Week 1: Kick-off, coordination, first specifications for the website.
- Week 2: State-of-the-art in:
  - laughter properties and features to investigate.
  - website design and available solutions to fulfill our needs (database storage and access, audiovisual rendering, etc.).
- Week 3-9: Development of the components of the system architecture:
  - Feature extraction: implementation of features particular to the laughter topic, adaptation of the Audio Cycle (#04.1) music features (timbre, harmony, rhythm), automatic keyword tagging.
  - Visualization, Audio Rendering and Interaction: modifications of the Audio Cycle (#04.1) interface towards a laughter database browsing, introduction of the query-by-example and query-by-keyword modules.
  - Website design and database management.
- Week 8: Workshop week (May 25-29)
- Week 9-10: Overall improvements and optimizations, and final integration of the music/images browser prototype.
- Week 11-12: Reporting and packaging deliverables, including launching the website.
- 30/06/2009: Project end and public presentation.

Team

This project will be coordinated by Jérôme Urbain (FPMs/TCTS) and Stéphane Dupont (FPMs/TCTS). Xavier Siebert (FPMs/MathRO) will also be collaborating. Experts in audio analysis, information retrieval, web design, database management are welcome.

Deliverables

1. Report on state-of-the-art and website design solutions.
2. Software to browse a large laughter corpus, supporting searches via examples or keywords.
3. Website upholding a laughter community and managing the database.

References

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MorFace: Face Morphing

Idea

The idea of this project is to interact between human and intelligent agents through face morphing.

Artistic collaboration

This project has been initiated by discussions with Collectif METAmorphoZ (Natalia de Mello, Valérie Cordy, Franck Halatre), and will benefit from their collaboration, in the framework of the "Gioconda Painting Show" installation project, in which participants will passively interact with various representations of the Mona Lisa.

Figure 1: *Wired Dreams* from Collectif METAmorphoZ.

Motivations

Face detection was already achieved in a previous project. This bloc will be used to segment faces and to extract important points around locally contrasted areas. Those points will be used for real time face morphing. Morphing with sad or happy faces will be done depending on user's behavior.

Morphing and face mimics

This first part of the project consists in detecting and segmenting users' faces. The segmentation will be used to achieve morphing of a given face on the user's one. This face could even produce exaggerated expressions if the key points coordinates from the user's face are multiplied with some coefficients.

Morphing and face expressiveness

This part of the project is a continuation of the previous project on natural interaction between natural and virtual worlds. The face could be morphed to smile or laugh if the behavior of the user in front of the camera is strange and novel. If the movement of the user is repetitive, the face should be morphed to sadness.

Figure 2: Morphing software by CreaCeed [2].

References

Faces convey a lot of expressive information. The EyesWeb software [3, 1], through the European IP Mega project, has brought very efficient algorithms for video-based tracking and analysis. The video and faces analysis will be used to achieve real-time face morphing by using CreaCeed society software Morphage [2].

[1] A. Camurri and G. Volpe, eds. *Gesture-based Communication in Human-Computer Interaction*. Vol. 2915. LNAI. Springer Verlag, 2004. P.: 4.

[2] CreaCeed. *Morphage*. URL: http://www.creaceed.com. P.: 4.

[3] *The EyesWeb platform*. URL: http://www.eyesweb.org. P.: 4.

Agenda

- 06/04/2009: Project start.
- Week 1-5: Study of the face segmentation.
- Week 6-9: From face segmentation to key points.
- Week 8: Workshop week (May 25-29)
- Week 10-11: Transmission of key points from the analysis module to the morphing module.
- Week 12: Attention module adaptation for morphing to laughter and sadness.
- 30/06/2009: Project end and public presentation.

Team

This project will be coordinated by Matei Mancas (FPMs/TCTS).

Deliverables

- Report on the three tasks of the project.
- Software tools for building the applications.

Bodily Benchmark: Gestural/Physiological Analysis by Remote/Wearable Sensing

Idea

Within the `CoMedia` research axis (see figure 3), this project aims at analyzing gestural and bodily behaviors so as to augment audiovisual performances [4], by comparing and combining a certain selection of remote and wearable sensing techniques [13]:

- biomechanical sensors, especially accelerometers [7, 11];
- computer vision using cameras [3];
- biosensors, particularly for muscle tension (EMG), respiration and heart beats (ECG/EKG) [8, 2, 1, 10];
- intelligent wearable textiles [12, 9, 5].

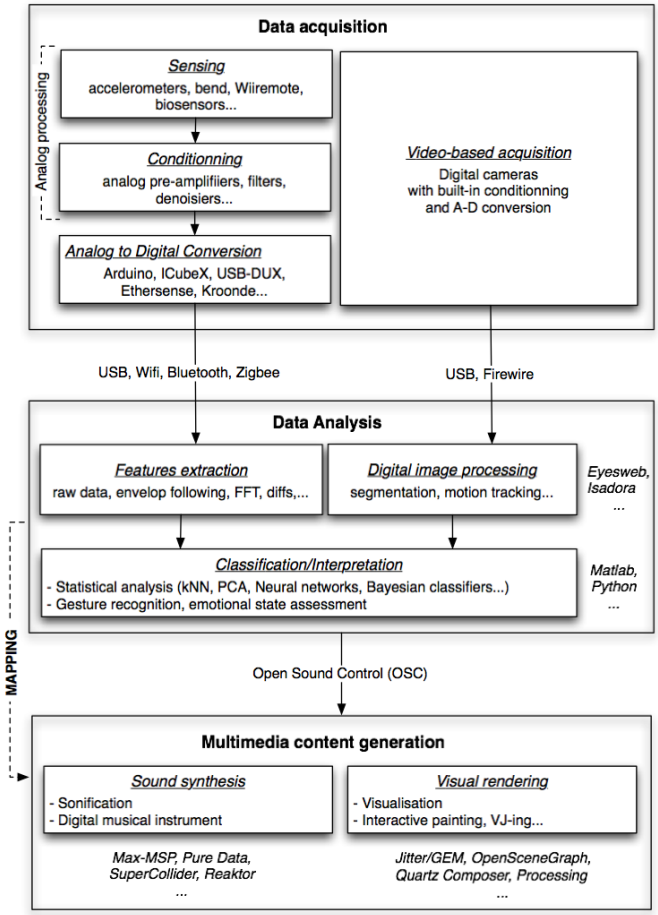

Figure 3: Diagram of the CoMedia generic framework.

By designing and implementing a hardware and software toolbox for sensor acquisition, processing, analysis and mapping, similar to Smart Sensor Integration (SSI), WiiGLE, and [6], we will experiment with the different sensing techniques through hands-on exercises and record multimodal databases (audio, video and sensors) following a repeatable experimentation protocol.

Artistic collaborations

Throughout this project, we will collaborating with three artistic projects described here below, which all feature a single solo performer at a time on stage.

Musichorégraphie d'appartement by André Serre-Milan

In *Musichorégraphie d'appartement*, we are following a woman in her apartment, in her daily life. Here, the body and his "traditional", daily attitudes and gestures, are used like musical and choreographic potentials in order to write a double partition.

To use daily gestures as musical potential, two direction will be followed :

1. an INNER one, with an embedded sensor's system on the interpreter's body: it will essentially be made around accelerometers and inclinometers in order to: on the one hand, recognize gestures and and on the other hand, to extract the maximum features (it is possible from) speed of a gesture, direction of the gesture.
2. an OUTER one, made with two video cameras: one facing the stage from the foreground and an other one, facing the stage from above. This second system is used to have another scale, to use the body as a part of a larger space and to be able to track it in 3D.

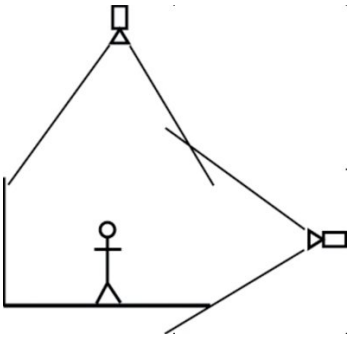

Figure 4: Stage setup of *Musichorégraphie d'appartement*.

BioDiva by Nios Karma

Nios Karma blends improvised borborygmous vocals and electroacoustic soundscapes on stage. As illustrated on Fig 5, her performance setup is heavily constrained by the microphone standing beneath that records her voice, the laptop and soundcard laying below that process and synthesize the sound, and the MIDI fader box that controls the sound. As she naturally surrounds her vocal performance with bodily movements and yearns for moving in larger stage space, her goal from this collaboration is to set her gestures free from these hardware devices by using wireless sensors, the computed gesture analysis augmenting her performance.

Figure 5: Evolution of Nios Karma performance setup constrained by microphone, computer stand, midi fader box, etc...

Bio Diva is in residency from April to June at BRASS, Brussels

***Vent, reviens* by Fanny Derrier**

A performer is facing a tulle placing on the front stage and on which is projected videos of her fantasized double: the traveller, the absent woman and the barking woman. The performer's movements influence the omnipresence of the wind in the videos and in the diffused sound. When touching the screen, the performer disperses the fanciful characters and shut down their voices in a whisper. The performer interacts with her imaginary, in which her own movement become the movement of the wind.

Figure 6: Picture of the fantasized double in *Vent, reviens*.

The research, here, will focused on the way to capture the touches made by the performer on the screen. Which kind of textile? Embedded sensors on the textile or piezo fiber? And in a more general way, how to capture and what to capture with textile?

Motivation

Reusing past projects

In this project will be combined and merged several ongoing efforts undertaken within the CoMedia research axis by reusing results from various projects.

Sensors A first comparison of sensors has been made through Sensor-Based Mini-COMEDIA (#01.2). The idea is to take further the study of sensors (wearable, like flexometer, Wii Remote... or external, like video camera...) in order to have a strong expertise on the different possibilities of the sensors.

Biosignals In Breathing for Opera (#02.2), we took further the early research done on project #01.2 to add specific study of breathing sensors. This project aimed at testing several breathing sensors and extract characteristics from the received signals. Another part that could be reused is the recording / playing patch made to analyse signals. In this patch we recorded sensors data, video and sound separately and then could access to every part of the recorded file in order to focus on one moment in particular.

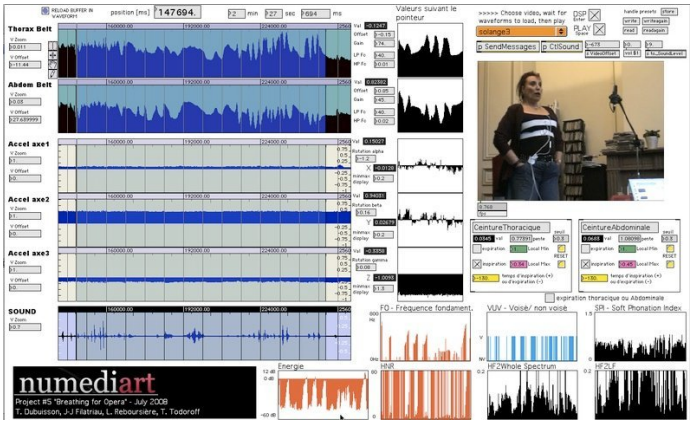

Figure 7: Respiration Max/MSP patch in Breathing for Opera (#02.2).

Computer Vision In Tracking-Dependent and Interactive Video Projection (#03.1) and Behavioral Installations (#05.2), things has already been done concerning the video image analysis in real-time so that we can extract features from a video stream in order to characterise the scene or to follow different elements on it.

Biomechanical One of the goal of Dancing Viola (#04.2) was to recognize gesture of a dancing viola player. Three elements of this project can be reused and taken further: firstly, module of gesture recognition based on the Dynamic Time Warping (DTW) was made to work in real-time, secondly, a module was made to extract features directly from the preprocessing of the sensors using a wavelet analysis. Thirdly, a tool of mapping using a solar system metaphor-based interpolation has been developed for the Max/MSP/Jitter software. All of these three elements are very good basis to start our research on this present project with.

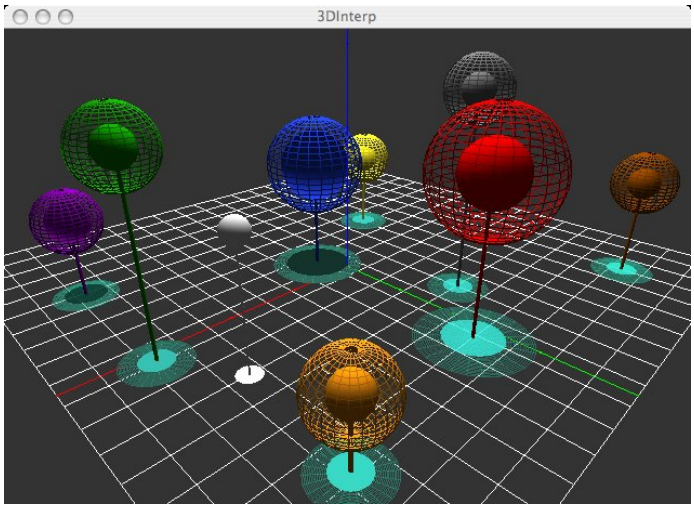

Figure 8: Max/MSP/Jitter mapping interpolation view in Dancing Viola (#04.2).

Technological challenges

We plan to solve the following issues:

- Test new sensing methods (intelligent textiles), continue our efforts from past projects to master the others;
- Design a synchronized audio/video/sensors recording tool using OpenCorn, implemented in two visual programming modular environments: Max/MSP/Jitter and PureData/GEM;
- Build rapidly reusable sensor analysis algorithms in the same modular environments, using opensource libraries (such as: PhysioToolkit, BioSig, AuBT (Augsburg Biosignal Toolbox) for biosignals);
- Improve the mapping interpolation tool started in Dancing Viola (#04.2);
- Conclude on the different experiments by defining a taxonomy of remote/wearable sensing methods so as to assess their advantages/drawbacks in several use cases.

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Deliverables

- State of the art and taxonomy of:
  - new for textile/wearable sensing,
  - revisiting Sensor-Based Mini-COMEDIA (#01.2), Breathing for Opera (#02.2), Dancing Viola (#04.2) for other sensing methods;
- Synchronized sensor recording tool made with OpenCorn in Max/MSP and Pd and definition of the associated experimental protocol;
- Rapidly reusable packages of sensor analysis algorithms (Computer Vision with OpenCV, enhanced TT_DTW from Dancing Viola (#04.2) for accelerometers...) integrated in Max/MSP and Pd;
- Mapping Interpolation Tool (improved version of TT_Interpol from Dancing Viola (#04.2)) in Max/MSP/Jitter and Pd/GEM.

Team

This project will be coordinated by Christian Frisson (UCL-TELE) and Loïc Reboursière (FPMs/TCTS).

Agenda

- 06/04/2009: Project start.
- April-June: Residency of BioDiva at BRASS, Brussels
- April 6-17: School holiday in Walloony
- Weeks 1-4: Preparation of the Recording Studio
  - State-of-the-art on textile/wearable sensing
  - Verify/Buy sensors
  - Choose/Build a Wireless Acquisition interface
  - Development Recording Tool in OpenCorn
- Weeks 1-4: Preparation of the Analysis Algorithms:
  - Enhancement of video and accelerometers extraction features algorithms,
  - Integration in Pd (and Max/MSP) of opensource biosignals processing libraries;
- Week 5: Recording Sessions
- May 5: Possible sensors recording session day for Musichorégraphie at Centre National de la Danse, Paris
- May 4-8: Residency of Musichorégraphie at Royal Theater of Mons, Redoutes room
- June 7: Doudou Day in Mons
- Weeks 5-7:
  - Test and validation of the algorithms on the recorded database:
  - Improvement of the Mapping Interpolation Tool
- Week 8: Testing Sessions during the Workshop Week (May 25-29) at Royal Theater of Mons, Redoutes room
- Week 9-10: Improvements
- Weeks 11-12: Reporting and packaging deliverables.
- 29-30/06/2009: Project end: public presentation and artistic performances, at Royal Theater of Mons, Redoutes room, and BRASS, Brussels.

numediart Research Program

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