Issue 05 Emotional IT Fellows

April 30, 2010 Volume 3, Issue 5

A CALLAS Newsletter

The CALLAS Project:
Conveying
Affectiveness in
Leading-edge **L**iving
Adaptive **S**ystems

In this issue:

Communicate through:
callaseu.ning.com

Visit us at:
www.callas-newmedia.eu

Contact us:
info@callas-newmedia.eu

Main project results and some potential future applications

By Massimo Bertoncini

The CALLAS research project, lasting three and a half years and carried out by a Europe-wide consortium of eighteen companies and research institutions, has been the flagship initiative of the European Commission in Affective Multimodal Interfaces for Digital Media, ranging from Art to Culture to Entertainment.

Human beings communicate naturally in a multimodal way, combining different "senses" like gesture, movements, speech and non-verbal expressions. Emotions and affectiveness play a key role in enriching the naturalness of human-to-human and human-to-machine communication and interaction.

Traditional human-machine interaction is, however, normally based on common simple devices such as the keyboard and the mouse, which are not designed to allow computing systems to understand expressed emotions.

Computers are not in fact able to "naturally" communicate with humans as they do not have the ability for emotion processing and rendering.

Affective Multimodal Interfaces are at the crossroads of Affective Computing and Intelligent Interaction research fields. They are expected to allow computers and artificial systems to handle emotions and affect, and, accordingly, to make available a more natural and user-centric human-computer interaction paradigm.

Unfortunately, despite a lot of significant advancements that have been achieved in the Affective Multimodal Interfaces domain, much work is still needed to be done in order to bridge the gap between computational systems and human emotions.

The CALLAS project has delivered significant outcomes in the Affective Multimodal Interfaces field in the three working areas in which it has been involved, namely the "Shelf", the "Framework" and the "Showcases". Thanks to its scientific advancements and technology outcomes, the CALLAS project has strongly contributed to increase the maturity of Affective Multimedia Interaction technologies especially in the field of Digital Media, which represents a promising application domain for these kind of technologies, since the interaction of the user with the technology is traditionally very rich from the emotional point of view.

(Continued on page 2)

(Continued from page 1)

The originality of the CALLAS approach lies in:

1. bringing the software engineering approach centre stage in the multimodal affective interfaces, allowing developers in this field to reuse and integrate existing components;
2. providing a new real-time semantic approach to affective multimodal fusion;
3. increasing the robustness and further validating a significant set of software components for detecting multimodal input and rendering multimodal output against unimodal and, above all, synchronized multimodal corpora;
4. developing multimodal interactive applications in the Digital Media domain as proof-of-concept of the proposed integrated approach;
5. developing an innovative business ecosystem-based sustainability model aimed at fostering a significant market penetration of Affective Multimodal Interfaces.

The main significant yet original project outcomes are:

- An Open Source plug-and-play environment of reusable software components for the rapid prototyping of multimodal applications, reducing complexity for programmers, artists and practitioners (the CALLAS IDE);
- A library of software components, the CALLAS Shelf, for the emotional processing of single and multimodal inputs (speech, gesture, gaze,…);
- An innovative approach to late (or semantic) affective multimodal fusion, built on the top of the Pleasure-Arousal-Dominance (PAD) model and related mapping from recognised input, which allows input components to be adaptively combined and fused together in order to detect the user's emotional state in real time;
- A broad range of affective multimodal applications, generating an affective output dynamically linked to the detected user state, which have been developed on the top of the CALLAS IDE and Framework, as proof-of-concept of the effectiveness of the CALLAS approach;
- An innovative business ecosystem-based model for technology transferring the research lab prototypes into mature yet sustainable applications in Digital Media, and of the developed innovation towards the market, primarily represented by innovation-led SMEs for laying the foundations for effectively reusing CALLAS technologies in different application fields, ranging from adaptive personalised learning systems, assistive technologies for social inclusion of disadvantaged people (elderly, disabled), to gaming systems and related consoles.

The CALLAS future sustainability is based on the full modularity of its integrated approach and implemented technologies, which open up the possibility for being replicated in other yet partially overlapping application domains, such as:

- Entertainment (Natural control interfaces for gaming and for multimodal search engines, Digital Art based on Brain Computer Interfaces, Adaptive Personalised Museum Visitors' Experience)
- Technology-enhanced Learning
- Supporting Independent Living for Elderly People
- Social Inclusion of Disabled people
- E-health (Virtual rehabilitation for seriously impaired people)
- Experiential Marketing

CALLAS beyond Art and Entertainment

By Andrea Scoglio, Zoran Curto and Giovanni Cappiello

Since the beginning of the project, the CALLAS target fields have been principally focused on the Art and Entertainment domain. Humanware has, however, also been considering the idea to use the results of the experiments and the technology developed in the project in Healthcare Applications. The core business of Humanware is focused on the design, development and marketing of advanced Man-Machine Interfaces (HW and SW), such as datagloves and 3D joysticks. Apart from digital theatre and puppetry, one of the target markets for these devices is Biomedics and Rehabilitation, where these devices can be used as physiological joint angle measurement devices or as trackers for upper limb rehabilitation.

The company aims to improve the usability of its medical devices by extending their functionalities by means of the emotional multimodal interfaces of CALLAS.

The CALLAS project represents the opportunity to approach new groundbreaking technology, but also a good opportunity to improve existing Humanware devices. CALLAS thus represents the key for providing a new perspective on biomedical applications, one of the strategic activities of Humanware.

For instance, the dataglove developed for the CALLAS project, currently being used mainly for digital theatre and cartoon animation applications, could be used to improve interactions between persons with hearing/speech disabilities and persons able to hear/speak, supporting an easier inclusion of hearing/speech-impaired persons into social and occupational activities. In particular, one of the ideas on which Humanware is working is using the dataglove to address issues related to communication problems arising when hearing/speech-impaired persons want to interact with persons using Sign Language (SL). This device could be used to translate sign language, but a Gesture Recognition system could be integrated with an emotional detector module (e.g. gesture affect recognizer) to translate gesture into a text enriched with emotional information to be fed into an emotional voice synthesizer.

Most of the tools needed for the creation of the above described system can be found among the CALLAS components, demonstrating that CALLAS results have great potential to be exploited in other fields.

Moreover, according to Humanware estimates, this scenario could have a good chance of success. Citizens with special needs such as hearing/speech impaired people are roughly estimated to be 0.1 % of the European population and some work on this topic can be found in literature [1].

To give another example, Humanware also supplies a tracker endowed with specific software for upper limb post-stroke rehabilitation.

The ULTRA system is a seven Degrees of Freedom device detecting the real-time position of the user's hand in the working space. The user can interact with a handle in order to move an end-effector in a virtual environment generated by its dedicated software. When exploited in a complete rehabilitation process for post-stroke or neurological diseases, the ULTRA system can train the patient focusing on motion control or cognition. The scenarios can be customized or targeted for the patient and the software automatically adapts the difficulty level to the patient's performances

In such therapy, due to the interactivity of the task, the attention and the motivation of the patient should be monitored and stimulated. To improve the therapy results, the device can be enriched with the emotional detection modules for motivation control and also in order to detect if the results of the physiotherapy task are being affected by some emotional status (fear, stress, etc.). Once again, CALLAS could provide most of the tools necessary to carry out such a task.

These were just two examples which show how CALLAS components could be used even in other markets, when interaction between humans and machines is very

(Continued on page 4)

(Continued from page 3)

important, and enriching this interaction can lead to a much better user experience and to better performance.

[1] *Ong, S.C.W.; Ranganath, S., Automatic sign language analysis: a survey and the future beyond lexical meaning, IEEE Trans Pattern Analysis and Machine Intelligence, Volume 27, Issue 6, Jun 2005 Page(s):873 – 891].*

Museum Innovation: techniques and approaches

By Cristina Vannini

Before academically learning about the works of composers, visual artists, and authors, for most of us, our first contact with a technological, multimedia, and synaesthetic representation of music was Fantasia (by Disney 1940). Multiple senses are engaged simultaneously, each medium united, representing and reinforcing the beat and the message. Later on, studies and professional activities enhanced our knowledge and perspectives, and we learned to rely and interact with technology in a more active form, as in 2001 Space Odyssey. These two examples embody how technology is used presently in museums, especially in museums of musical instruments and museums of music. In facts, we can trace three main reasons about why it is commissioned in permanent exhibitions:

1. To recreate with a hedonistic or aesthetic purpose the ambient in which music was created, played, enjoyed
2. To explain and teach how music was created and played and how it is listened to in a cognitive way
3. To amuse and entertain for a complete emotional approach.

We can ask ourselves, then, if interactivity is pre-eminently a technological prerogative, or if hands-on, "mechanical," and "face-to-face" methods can be equally successful on the cognitive, sensorial, and emotional levels. More and more, museums have started to adopt holograms, "talking heads," sophisticated applications broadcast through high-level screens and touch screens in order to provide the everyday technology to which audiences – the visitors of the museums - are accustomed. The above, though, corresponds firstly to the individual museums' missions and, then, to the public's expectations, whereas technological devices are ever-increasingly entering peoples' lives. So potential visitors and museums-goers have a high level of expectation towards the exhibit displays, transforming a room of a museum into a "domestic space". Of course, it is easier in temporary exhibitions, to have a massive usage of technology, either for being usually high-budgeted, and for their relatively brief duration. In fact, in order to consider the feasibility of technological multimedia applications in museums, space, maintenance, and consumption (either "physical" and of contents) must be taken into account.

SPACE

Most times, space represents one of the two main differences between many European museums and the Italian ones (the other being sponsorship and fund-raising).

Museums need space; objects must be looked at at a considerable distance, or, alternatively, must be observed very closely without hindrances. Explanations must be read and exhibitions enjoyed and in any case people need to be able to move at their ease in a "visitor-friendly" environment, following specific or individual "flows"[1]. For "museums of music" wishing to use technological applications, space also means silence and time. Music has to be listened to, but a museum isn't a music hall or an orchestra-room; therefore objects and music itself have to be explained, narrated in sound or in texts, contextualized within the museum's philosophy. Technology, most of the time requiring a certain level of interaction, asks for larger spaces than usually Italian museums (located in historical buildings) can supply. Attention must be given to space and silence, so that an

overlapping set of stimuli will not jeopardize the experience of visiting the exhibition, providing too many inputs. Museums of music might be considered, from this point of view, multimedia museums themselves , since they combine various ways of communicating their own specific concepts throughout various media, not to forget light and lighting of the museum that can be used to convey musical experience as well. Additionally, music needs specific space to be listened to in a proper way, either in an emotional, educational, or contextualizing approach: projecting a museum in which music has "a role" means to integrate many professionals among which sound engineers and neuroscientists.

MAINTENANCE

While during a temporary exhibition, the technology application supplier is usually available to operate on-site (to correct any malfunctions), for permanent exhibitions, the more a technological application is sophisticated, the more maintenance can be a problem (this also relates to sophisticated architectures such as for the Seattle Library[2]). The origin of malfunctioning resides both in the delicacy of the devices themselves and in "domestication"[3]. Often, talking to some Italian curators and directors, they deplore the superficiality of the public or too much familiarity with technology especially among youngsters, provoking damages.

CONSUMPTION

While technicians can speak about the "physical" decay and consumption of the devices, here we wish to focus on the museological need of providing a broad choice of contents, multi-levelled design, from which any visitor can choose, also from a continually updated website. Museums of music and of musical instruments, as well as all kind of museums inter-related with the fascination of music, on the one hand must make a choice on what they want to be and what they want to offer but, conversely, must concentrate on whom they want to interact with: schools, families, researchers, music professionals, mass tourists… and upon these choices, they can programme the length and the depth of concepts to offer to their public, through the technological devices. In this sense, technological database for the preservation of orality, art, history, craftsmanship — but also for the sound reproduction of the instruments themselves and as repository of different kind and styles of music and of some specific musical texts — are of extreme importance for the creation of contents and for implementation of intangible heritage (shall we call it virtual heritage?). We should not forget studies on the public's reaction and on public in general — which are always too few in this field in order to better understand what is retained from the visit of a museum of musical instruments or of music, considering that most of the public is a so-called "not trained listener"[4]. It can also be discussed and decided, considering all the above, what kind of music has to be listened to in a museum of musical instruments (high – low music?), and with what purpose (to witness the evolution of craftsmanship/technique, of music itself, the history of music, the diffusion of music in society, the comparison with other cultures' music, to pair off the scholastic curricula that is so dismissed in Italy, in this sense).

In order to draw some conclusions, I want to try and sketch a tentative model of integration of multimedia technology in the museums' displays.

As for the examples just reported among European and Italian museums, we can summarise three main themes are the topics of museums of music:

1. Instruments, people who wrote or created music and places in which music was/is played and created.
2. Technology can be integrated in the displays with hedonistic, emotional, or cognitive purposes (or mission; most of the times the three issues mix up together and need to be balanced).
3. Considering the specific missions of the museums, technology should be acquired in order to improve and not to overwhelm the contents.

(Continued on page 6)

(Continued from page 5)

That is why it is important, not to say vital, that before deciding to use multimedia technology, museums must be sure of what they want to be (define their mission) what is their most congenial approach (define their vision), and how and to whom they want to communicate (be aware of their public and architecturally design their contents).

[1] Csikszentmihalyi, Mihaly (1990). Flow: The Psychology of Optimal Experience. New York: Harper and Row; Csikszentmihalyi, Mihaly (1996). Creativity : Flow and the Psychology of Discovery and Invention. New York: Harper Perennial; Csikszentmihalyi, Mihaly (1998). Finding Flow: The Psychology of Engagement With Everyday Life. Basic Books

[2] Antonella Agnoli, "Koolhaas costa, Seattle chiude", Il Sole 24 Ore Domenica, 06/09/'09

[3] In the sense of the everyday habit above allthe youngs have gained about technology

[4] As to freely quote Th. W. Adorno, Philosophie der neuen Musik, 1958

Long Life to the C³!

By Antonina Scuderi

When the CALLAS Consortium set out in 2006 on its mission, the situation was that advances in research were not reflected in the specific Art and Entertainment field, which suffered a lack of understanding between artists and technology developers: on one side artists considered technology as a complication to realize their artistic masterpieces, often disturbing their creativity, while from the other side technology experts did not want to adapt the technology to the specific needs of the artists.

CALLAS results mediate these two diverging approaches: boosting creativity without imposing deep knowledge of research foundations, hiding the complexity of human computer interactions, multimodality, theories: the development of multimodal application are affordable and pre-existing or new multimodal components can be easily embedded to widen affective recognition and rendering of emotions.

By building a team and a Community, CALLAS sponsored the diffusion of knowledge and practices, creating the foundations for a CALLAS culture and preparing its continuity through a combination of efforts from industries, SMEs, researchers, artists, amateurs and service providers.

By participating in a loosely-connected network, these entities can now contribute to common goals while each pursues its own specific activities: multidirectional relationships which will develop a value web instead of a supplier/buyer relationship.

This value spreads to many business fields: from Performing Arts, Interactive Art, Interactive Stages, Motion picture, Intelligent Spaces, Gaming and Edutainment and can be replicated for use cases in other domains. The exploitation of this potential is the aim of the C³ (the CALLAS Community Club), a Community to which we wish long life and fruitful results!

The C³ pages have been opened to public access and even after the project conclusion it will host exchanges, postings, sponsorship and initiatives to support a wealthy business ecosystem to the benefit of all Emotional IT fellows!

The CALLAS Consortium gratefully acknowledges the European Commission co-funding of the CALLAS project N. 34800 under the FP6 Programme, that made this publication possible

The **CALLAS Consortium** is composed by the following members:

- Engineering Ingegneria Informatica S.p.A. - Italy (Co-ordinator)
- VTT Technical Research Centre of Finland
- British Broadcasting Corporation - United Kingdom
- Studio Azzurro Produzioni S.r.l. - Italy
- XIM Ltd. - United Kingdom
- Digital Video S.p.A. - Italy
- Humanware S.r.l. - Italy
- NEXTURE S.r.l. - Italy
- University of Augsburg - Germany
- Institute of Communication and Computer Systems / NTUA - Greece
- Universite' de Mons - Belgium
- Teesside University - United Kingdom
- Aalto University - Finland
- Telecom Paritech - France
- Scuola Normale Superiore di Pisa - Italy
- University of Reading - United Kingdom
- Fondazione Teatro Massimo - Italy
- Human Interface Technology Laboratory - New Zealand

The CALLAS Editorial Team:

MASSIMO BERTONCINI, ANNAMARIA DE SANTIS, DAVID FUSCHI, CATHERINE PELACHAUD and ANTONINA SCUDERI