

# BCI–Based User–Centered Design for Emotionally–Driven User Experience

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## EXECUTIVE SUMMARY

*In order to develop a complex interactive system, user-centered evaluation (UCE) is an essential component. The new interaction paradigms encourage exploring new variables for accounting the users' experience in terms of their needs and preferences. This is especially important for Adaptable Virtual Environments (AVE). In this context, to obtain a more engaging overall user's experience, a good designer should perform proper formative and summative usability tests based on the user's emotional level, which become a UCE activity. Our methodology tries to overcome the weaknesses of traditional methods by employing a Brain Computer Interface (BCI) to collect additional information on user's needs and preferences. A set of preliminary usability experiments has been conducted for (i) determining if the outcome of a BCI is suitable to drive the designer in organizing the user-system dialog within AVE and (ii) evaluating the user-system dialog, in terms of dynamic increase of the emotionally-driven interaction's customization.*

## **ORGANIZATION BACKGROUND**

The University of Bari (<http://www.uniba.it>), created on 1924, is the second largest university of South Italy. The university includes 1058 professors, 1060 non-teaching employees, and 58000 students.

The Dipartimento di Informatica (<http://www.di.uniba.it>) is composed of 10 full professors, 14 associate professors, 20 assistant professors, and 10 postdocs. Currently the department provides three undergraduate courses (500 students per year), a Master science course (150 students per year), and a postgraduate course in computer science (10 PhD students per year). The Dipartimento di Informatica performs research in several fields of Information and Communication Technology, such as intelligent systems, software engineering, human-computer interaction, and others.

Within this department, the Collaborative Development Group (Collab) is a research group which addresses those challenges that must be overcome in collaborative environments to accomplish a common task, even if users are distributed by time or distance.

The general domain of expertise and innovation of Collab is the development of tools for virtual teams with a special focus in the domain of distributed software development. Research at Collab address topics such as collaboration in software development, collaborative knowledge sharing, object-oriented technology, interactive virtual environments and emotion in computer-mediated communication. More detailed information about the research group and current projects, together with publication lists can be found at <http://cdg.di.uniba.it/>.

## **SETTING THE STAGE**

In the global race for more intuitive interfaces that must allow non-expert users to operate increasingly complex technology, we explored Virtual Environments, paying attention to the role of emotions in the design and use of such interfaces. The area to which our past work belonged most directly was Multimodal Interfaces. Our work specifically addressed the objective of this area to develop natural and adaptive multimodal interfaces and its focus on interaction between and among humans and the virtual and physical environment, with particular emphasis on recognizing and responding to emotive user reaction.

The employment of 3D Virtual Environments (VEs) is continuously growing in several different applicative domains. VEs show great potentialities in fields such as Virtual Heritage, Serious Gaming and Visual Analytics. The flexibility of a VE allows domain experts to communicate specific views and interpretations of the reality in a way accessible to final users by a proper choice of contents, representation and

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