You Move You Interact:
a full-body dance in-between reality and virtuality

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ABSTRACT — YMYI (You Move You Interact) is an interactive digital installation designed to encourage a body performing dialogue with an artificial system, uncovering an ongoing interchange between the body kinetic universe and the audivisual imagery embodied in the interface. YMYI sets a stage where body gestures and movements guide a audio visual installation invoking an imaginary of body expressiveness.

INDEX TERMS — *Digital Art; Multimodal Interfaces; Expressive gesture; Performing Art.*

I. INTRODUCTION AND MOTIVATION

In YMYI the viewer is an active player dialoguing with the artefact, possibly changing it. It allows for a process of continuous audiovisual and kinetic flow, sometimes dynamic and volatile, trigering expressive effects on side of the user, as he/she is an active player *interacting* with the artwork itself (Paul, 2005). It represents also a form of *virtual art* though it implements forms of perceptual immersion (visual, auditory) of the viewer in the artefact. The user starts perceiving himself/herself as a part of a dynamic virtual world, where he/she is at same time created object and creating entity (Grau, 2003) (Marcos, 2007).

In this paper we start by presenting the user interaction aspects, then we proceed discussing the YMYI concept, continue with an overview of the technological aspects and finally present some observations and comments of the users experiencing the artefact.

II. YMYI INTERACTION

YMYI interaction is built on the concept of its own name, "You Move You Interact". One of the main YMYI outcomes is allowing the user to be aware of his/her own movements and choreography, even if this last is rather spontaneous. Users watch their virtual personas (here defined as his/her audiovisual projected silhouettes) representing their energy, movements and their expressiveness and are permitted to interact with their virtual partner(s) or personas. The users' empirical gestures are interpreted in real time by the system, which outputs virtual metamorphoses creating a sort of interactive choreography where the users' movements blend themselves in virtual ones and vice-versa.

Dancing is not an art to be property of an ephemeral process, but of a dynamic one (Quintas & Dionísio, 2005), (Gil, 2001).

The interaction in YMYI activates multimodality by aggregating several layers – vision, sound and kinetics (a base for kinaesthetic). The users do not only "see" themselves, but also "hear" and arguably "feel" themselves. All of these layers become highly reactive to the movements of the user allowing the users' to perceive their own body. We must highlight the fact that the new emerging forms are dependent on the movements, acceleration and velocity, in other words the user's energy. For example, the sounds become reactive to the user's displacement velocity in the space - every movement of hands and legs, every jump - and so it develops a set of associated parameters, accordingly. In YMYI, we experiment by synchronising events reactive to the gesture

dynamics of the user and responding in real time to his flowing speed movements.

By making use of theirs senses and by moving, the users are able to create new agencies, not only directed to themselves, to their own body, but also directed to other bodies or elements that appear in the shape of particles travelling throughout the interface and dissolving themselves. When they flow they approach one another as if they were holding magnetic fields of attraction and they succeed in establishing a communicative link with the user, resembling feelings of affection. The user has a tendency to establish a close connection with them by touching, grabbing and moving them upwards or downwards and so controlling their position in the interface. Within this atmosphere, the user's body becomes intertwined with a body of particles creating a sort of playfulness. The user creates it and lives in the created object.

III. EXPRESSIVENESS IN YMYI

Whatever the practitioner does to things is grounded in an attentive, perceptual involvement with them, or in other words, he watches and feels as he works (Ingold, 1997)
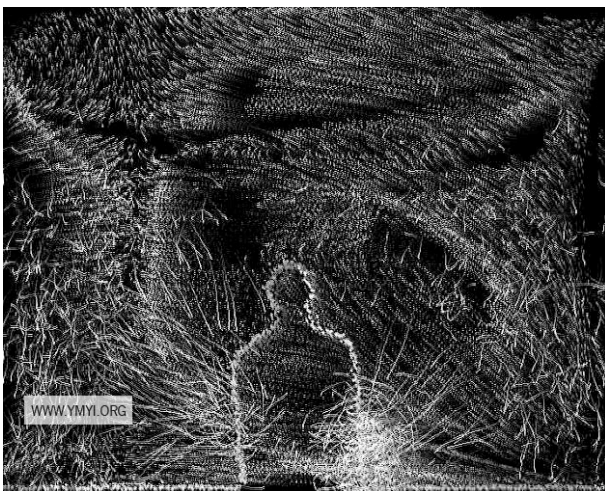

Fig. 1.   View of the YMYI artefact generated projections.

YMYI takes into account a coherent organized dialogue in the shape of gestures and movements felt and thought about by both a body and a mind and conceptualized in art representations. As Valery acknowledges: "in the end of the mind, the body, but in the end of the body, the mind" (Valéry, 1896) and Yvonne Rainer in 1966:"The Mind Is a Muscle". In YMYI, the user shares an intimate discourse with his/her virtual personas by accomplishing an interaction based on the expressiveness resulting from the improvised exploration of his/her body performing input aiming at establishing a bidirectional artistic communication with the system. By featuring malleability, expressiveness and motion, the body turns itself into a "natural" open-ended art, providing affordances consisting of an inherent emotive engagement/communication with the digital system and emphasizing a "doing" energy which emerges from the body immanent self-discovery.

In YMYI, art results from this story of physical liberty experiencing of the body in a creative way and in direct interaction with its other virtual embodiments in the interfacial digital platform.   The YMYI enhances the dancing performer, from the psychological point of view, to become an active actor, who acknowledges a yet to discover universe through his/ her experiencing of a dancing "trance" status consisting of a whole world of natural sensations/emotions inherent to his/her artistic string of sensitive characters.   "The dance becomes the dancer" (Sasportes, 1983). The expressionist dance nourishes itself from the organic energy emerging from the body and supplying with vitality the domains of the physique, mind and emotion and thus making possible the flowering of a new aesthetic order in search of the most "natural and primitive" intimacy of the artist. According to Bausch, "it is precisely the movement and the action in dual interaction that set the foundations for the establishment of a bond between the world of

the physique and the world of the psyche and for the creation of an harmony, conveying a dialectic "*Körperseele*" (body-soul) belonging to the dancing actor" (Bausch, 2005), here understood as a creative active being of an art of his own resorting to new improvisation paradigms.

IV. TECHNOLOGY IN YMYI

A. Image processing system

The sensorium motion tracking atmosphere all-around the YMYI stage is captured by a webcam connected to an USB/Firewire interface exchanging information with the software Processing (Website at: http://processing.org), an object-oriented programming environment based on Java. The user´s body, turning into a data shape, is tracked by a dedicated system capable of translating the original image into a black and white curvy clean uniform silhouette. A brightening apparatus spreads over a background a spatially uniform light. The noise attributable to the original image undergoes a clean-up filtering process applied to each incurring frame. Following the acquisition of a clean black-and-white image signal, the silhouette extremities are to be computed by making logical comparisons to detect three main epicentres: hands, head and mass centre belonging to the user´s body. The system follows each of these gravitational pointing units in its course along a movement track at every instant, measuring both the velocity and acceleration of the user´s kinetic body. Every movement and acceleration in transit diffuse themselves throughout the environment global image, made up of three thousand small widely dispersed particles, holding beams of attraction towards the user´s body proximity. Every particle exhibit a particular movement and acceleration function caused by a unique behaviour belonging to the

Perlin Noise algorithm (Website at: http://mrl.nyu.edu/~perlin/). This algorithm generates a minor predictable reaction compared to the randomised function normally used in computation, which gives rise to a more natural behaviour, more similar to what happens in nature atmosphere. The global amount of particles, all of them so endowed with a natural and unique behaviour movement, fly over an ever-changing density undergoing mutating responses according to the user´s body inner gesticulations.

B. Sound system

In the YMYI artefact, the human performer and the computer system engage in shapping visual graphics and computer music interactively in real time. The sound system of the artefact puts into service the computation capacities of the software *Super Collider* (Website at: http://www.audiosynth.com/), an environment and programming language for real time audio synthesis. The system is proposed for automatic music performance based on artificial neural networks and its model produces a musically expressive variation of the control parameters according to all of the gesture dynamics. The sound exerts a reaction to the user's overall movements in the interactive space and it develops a set of associated parameters in intensity, duration and pitch, accordingly. The agent's continuous improvised flow of movements generates harmonic-related rhythms making possible for YMYI to exhibit a high-level mapping between the music, the graphic output and the agent's performance. Both the musical harmony divided in its discrete contours and the instantiation of the animated graphics in the digital scenery altogether with speed, velocity and trajectory of the user's movements, form a combining compound giving rise to an artistic

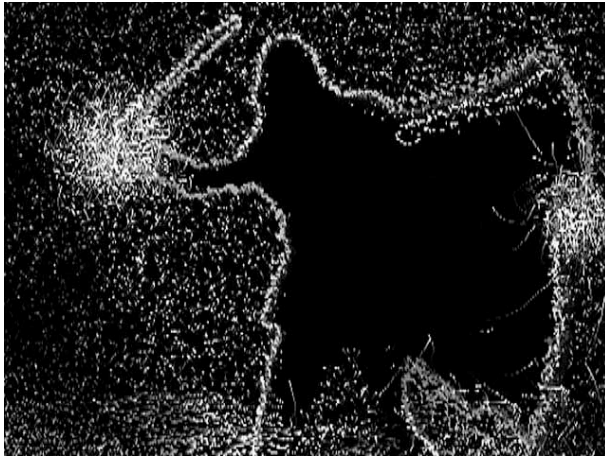involvement touching the YMYI universal expressiveness.

Fig. 2 A warrior-shaped artist interacting with YMYI.

Several performers have had the opportunity to experience YMYI. One performer has given the artefact a warrior-body shape by instantiating the incarnation of a warrior figure fighting vigorously with his sword against his enemies until he actually died – a forward allegory to the conquering of new lands.

A professional dancer reported some aspects following an opportunity he had been given to experience with the artefact during a live performance for about 15 minutes in the event International Symposium on Computational Aesthetics in Graphics, Visualization, and Imaging held in Lisbon between the 18th and the 20th of June of 2008.

The professional dancer did some training with the YMYI artefact the night before the event for about 3 hours. We made some dilligences so that he could feel at ease to explore it alone and so get a better artistic acquaintance with it and learn better as well how the interactive processing flow of information worked between himself and the digital system. In his words: "My interaction with the machine resulted in a growing adjustment of both my sensitiveness and fine motor skills so that my body became more suitable to every movement to be projected onto the screens. The moving field for the image motion capture that I had at my disposal was a truly narrow space, which posed additional difficulties to my improvising dynamics and composition." He also reported that his interaction with the system posed him some challenges: "the standard-slow motion capture of the sensor device compelled me to keep within boundaries a low performance body speed and my public exposition to an audience urged me to bring from latency an imaginative rhythm so as to keep a gazing interest in both my displayed image and my movements and so establish a better and more interesting connection between myself as man and the machine". To accomplish that he reported the following: "I had chosen to play with a spatial deepness interactivity in-between the capture background and the webcam, as well as to opt for different sorts of human metamorphosed embodiments so as to explore a wished dynamic tangible deepness and to mould inner velocities according to the outputted universe". Then, he reported also the following aspect: "my experiencing with the artefact was a worthwhile interesting opportunity for me and also to take advantage of the machine I had to reinvent myself to develop thoroughly my whole composition". Finally, he reported that he was grateful for having been given the possibility to participate in this project/artistic experience. We would like to add some relevant information to the dancer´s testimony as well: the room had been changed to suit a new purpose related to the performance event and also the computer hadn´t been under our supervision during the whole day of the performance and at the given time we had observed that it revealed a considerable latency dynamics gap to read accurately the displacing movement speed of the artist. So, we acknowledge that the motion

capture velocity of the system at that particular time was in fact too slow, for alien reasons.

We also noticed the artefact provided an entertaining space resulting in the exploration of fun and art. Common reactions observed lead us to think on the feeling of pleasure through "fun/playfulness" present on the users' interacting with the system: moving in several directions, seeming to play a sort of an interactive game with their virtual instantiations.

Fig. 3 The dancing actor experiencing with the artefact.

V. CONCLUSION

We have implemented an artefact able of energizing the development of an artistic performing choreography (even if spontaneous) in an interactive physical stage between a user's body and its virtual embodiments displayed in a digital system. In YMYI, reality seen as user body is carried into a virtual course of action and vice-versa. We also approached the concept of agency resulting from the expressive improvisation in real time of gestures and movements supposed to open empty spaces encouraging an implicit and explicit interaction (Dix et al., 2004) generating new metamorphosed shapes and contours in a timeline continuum. In YMYI, we also highlighted the key point in human-interaction design – the multimodal integration of layers, recreating sounds, visualizations and kinetic feelings, allowing the user to acknowledge a growing insight on his flowing self-balance in the interface. We also stood out the importance of gesture as a leitmotiv to induce emotions in the user of the artefact. As for technology, we put a relevant emphasis on both the YMYI image processing system and sound system. Finally, we provided some feedback on the observations of performers and general users experiencing with the artefact.

Videos recording some of these moments can be downloaded from:
http://www.ymyi.org/YMYIpreview.mpg
http://www.ymyi.org/YMYIRTP.mov
or in the official website: http://www.ymyi.org

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