Postprint

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Shadow dance: Installation and discussion on proposed solutions for embodied games through cross-disciplinary workshops within an educational context.

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Keywords:
Embodiment in new technologies, dance technology, physical games, expressive gesture, pedagogical tools, interdisciplinary collaboration.

Abstract

This paper argues the issue of embodiment and gesture in games, the aesthetics of movement from the phenomenological point of view, and suggests a framework proposal for DAMA, a Dance and Media Art Network interdisciplinary network project, which integrates students and teachers from art schools and universities within the European Nordic and Baltic regions. This argument is supported by documentation of Shadow Dance installation that presents an interactive tool for corporal expressions, based on real-time movement capture, an open source and visual programming environment (Pure Data), all integrated within a web environment. The aim of this installation is to propose a different perspective based on corporal movement’s aesthetics via subjective expressions. It is one of the action points for the game development process, during interdisciplinary workshops, proposing content based on traditions in dance and physical theatre and encouraging the notions of presence and creative use of whole body movements across digital space and especially within physical games.

Context

The following work references the aesthetics of the physical body within new technologies, as widely argued by Broadhurst (2007) and to the personal perspective built on long-term experience working with students within the Game Development Department at Gotland University and background in Polish Physical Theatre based on Grotowski’s methods. Shadow Dance is a method borrowed from physical theatre and translated into a digital interactive tool and installation with the same name, which took place in September 2009, at the Visual Research Centre/DCA (Dundee Contemporary Arts). It is an attempt to obtain an active response from the audience/participant for the visual stimulation tasks through the mirrored movement of oneself, such as a visual confrontation that opens neurocognitive channels to self-discovery of bodily-amplified empathy (Freedberg & Gallese, 2007). The installation is based on motion recognition using a web camera as input. The output supports the subjective perspective, by mirroring movement traced in real time, and is assisted by immediate feedback trough visual movement collections, encouraging experimentation and reflection. Emerging development of gesture-based technology is opening doors for a paradigm change in the way we perceive at the human body, the physical aspects of corporal movement and at the expressive gesture. Camuri (2002) situates expressive gesture in the artistic context,
such as performing arts, as a container of information based on emotions. ‘Expressive gesture is the responsible of the communication of information that we call expressive content. Expressive content is different and in most cases independent from, even if often superimposed to, possible denotative meaning. Expressive content concerns aspects related to feelings, moods, affect, intensity of emotional experience.’

This paper refer to the expressive gesture in terms of Natural User Interfaces (NUI) and to expressive content such as user input as well as in terms of the game content, such the expressive gesture of avatars. Shadow Dance is a part of PhD research project; Periodic Table of Movements that is intended to collect and classify human corporal movements according to emotions.

The following refers to two different pools of recent development: Synchronous Objects and Natal, both projects are based on human body movements and illustrate possibilities for new platforms for future developments based on expressive content.

Synchronous Objects explain and explore choreographic structures of William Forsythe through visual communication techniques build on data visualization tools for capturing, analysing, reimagining and presenting movement of dancers in terms of volume and space. (http://synchronousobjects.osu.edu/). This, according to Forsythe (2009) is to make dance and choreography accessible and understandable for the broad public. This project was collaboration with Ohio State University, Advanced Computing Centre for the Arts and Design and The Department of Dance.

The game industry accelerated development of gesture responsive applications built on infrared and optical tracking systems and full-body 3D motion capture. Microsoft's project Natal for Kinect, the Xbox 360 video game platform uses advanced futures, which turns human body in to an interface using full-body gestures, facial expressions and sonic localisation as input. In this case game industry is a driving factor in terms of development of new sensing technologies.

Based on recent technical developments, the following is posed. Could emotions be translated into numbers that were accessible for computational systems without a loss of intuitive presence?

**Intention**

The intention of this project is to change the perspective on the physical body from one of ‘object’ to one of ‘subject’ in terms of bodily experience. During the industrial revolution, the human body was presumed to adapt as a component of the industrial process. This perception continued on into postmodern cultures during the development of digital environments, along with human-computer interaction models, and automatically prepared the foundation for today’s gaming culture. Advances in technical developments, should allow us to take into account a more holistic human approach, and therefore it is important to discuss how to reduce these knowledge gaps.

The background to this discussion is the issue of empathy and kinesthetic empathy in the digital environment, as in games. Empathy could be considered to be an “interface” to ourselves that connects us to the collective consciousness of the human species. Therefore, it is important to ensure that the emotional presence or subtlety of
movement is not lost within the system’s interpretation and translation of that movement. Munster (2006, p.26) debates a corporal virtual experience and uses the term “reconfigured bodily experience” in describing a new level of experience as a “new logic in the non-liner sense.” Further, the ‘digital embodiment’ is a process in which “…individual bodies engage with digital codes to produce new and different sensations and affects” in the process of “reclaiming” the digital space and technology.

However, from a performance art phenomenological perspective, some questions arise concerning how a game’s content could look if games were also tools used to increase human perception based on human corporal movement and expressive content. Could the past century’s knowledge, derived from pioneering performance and theatre work by Stanislavsky (1863 -1938), Gurdjieff (1866-1949), Meyerhold (1874-1940), Schlemmer (1888- 1943), Lecoq (1921 -1999) and Grotowski (1933 -1999) be transferred into two and three-dimensional digital games? Many names could be added here in terms of choreography, dance and body-centred knowledge. However, this question may not be answered through analyses on why the Cartesian view of the human body dominates the gaming world, but rather via knowledge exchange among different art cultures through collaborative interdisciplinary practices beginning at an educational level.

Fig. 1. Shadow Dance installation. Movement mirror on screen (© Hrynczenko, I.)

**Shadow Dance Interactive Installation as a Pedagogical Tool.**

Performance art disciplines have the privilege and experience to use the body as a poetic tool in exploring the boundaries between the body, on the one hand, and time, space and human communication, on the other. This exploration related to phenomenology and the four existentials formulated by Max van Manen (1990), “lived space (spatiality), lived body (corporeality), lived time (temporality), and lived human relation (relationality or communality)” (p. 10).
It is necessary to consider this knowledge when constructing simulations in the virtual world, since the value of subjective physical experience is important when constructing Natural User Interface (NUI) and motion based content. Cooperation between Performance Art, Media Art and Computer Sciences is inevitable and necessary in order to support development of both. How this different knowledge cultures could build a common knowledge base with common semiotics? The first common denominator worth considering is the fact that this knowledge disciplines, unfortunately often positioned as opposites, possess the notion of play. Play, as a conceptual space, according to Huizinga (1938), is a natural element of human culture.

In case of Shadow Dance, as artifact it provides pedagogical tools build on simple game strategy, which could be classified in the area of Serious Games. Serious Games are in the first place, pedagogical or training tools that are not considered entertainment but may entertain to achieve educational goals. In the context of this project, the aim is to extend the notion of body movement and use the provided documentation for further development of ideas. This application was built using Pure Data and is based on webcam input, which produces several layers of captured movements projected on each other, thus making it possible to follow the movement trace spectrum in real time. Participants use their body as the interface to influence the visual information projected on the screen. Graphical representations of these movements, viewed as shadows are collected from the camera and projected onto the screen. However, physical dialogue between participants and the projection is needed to achieve new graphical effects. In this way, movements drawn on the screen build patterns that extend body parts from its joints. (figure 2,3 and 4).

Fig. 2. Shadow Dance installation, movement patterns. Slow movement. (© Hrynczenko, I.)
Fig. 3. Shadow Dance Installation. Movement patterns: fast movement. (© Hrynczenko, I.)

Fig. 4. Shadow Dance installation. Movement patterns: very fast movement. (© Hrynczenko, I.)
Patterns size depends on gestural expression and intensity illustrated here in the schematic action flowchart (figure 5). Possibility to extend the virtual body opens a kinaesthetic consciousness for the participants. Dependent of participants movement intensity, the output is stored on a website as movements key frames using a database built on XML and PHP scripting language (figure 6). Movement representations are replayed for the participants as visual collections inspired by the works of Muybridge (1830-1904) and Marey (1830-1904).

Fig. 5. Shadow Dance. Action Flowchart. (© Hrynczenko, I.)
Conclusion

Shadow Dance invite participants to explore body movement in two different ways. Firstly to explore in playful way their own body in motion as an expressive movement, inviting to experimentations gives an opportunity to connect physical movement with visual experience, and opening the possibility to explore and analyse the visual movement trace via a virtual mirror. These develop deeper understanding of the movement’s physical process, also movement’s relation to anatomy, mechanics of specific joints of human body and personal kinaesthetic perception. Secondly the documented movements stored on the website can be used as mocaps for further movement analyses, also as sketches when corporal movement consciously reflected could be useful in character development in games and possible to reply in mocap capture studio.

In conclusion I propose the use of interactive artifacts, in this case Shadow Dance installation, as tool in education and research. The fact that these artifacts are simple games provokes the next conclusion. The areas of expressive gesture knowledge can be extended using playful methods, thus preserving the authenticity of movement’s intentions. This is reflected as a framework proposal for the 2011 DAMA Network meeting based on experience as a participating teacher during two previous workshops: Rovaniemi, Finland, 2007, and Tallinn, Estonia, 2010.
Framework proposal

The Dance and Media Art Network (DAMA), founded by EU North Plus, is an interdisciplinary network project that integrates students and teachers from art schools and universities within the European Nordic and Baltic regions. Beginning in 2005, the network organised several workshops in Reykjavik Island, Visby, Gotland, Sweden, Rovaniemi and Turku in Finland, and Tallinn, Estonia. All workshops were project based and built on the cooperation between dance and media students. During those workshops several issues were revealed, such as the need for methods for interdisciplinary collaborations and interartistic ways of working as well as better understanding of the possibilities beyond student’s subject-specific knowledge when working across disciplines (Knuutila, 2007).

Based on experience from cross-disciplinary workshops with DAMA, this practical, project-based knowledge exchange between students has given rise to many innovatory solutions, assembling core knowledge of their domain-specific skills (Knuutila, 2007). In conclusion, this paper considers action points for the proposed interdisciplinary workshop DAMA 2011 at Gotland University in Sweden, encompassing areas such as physical gaming, media arts, dance, urban planning, and game design. Based on pedagogical methods, the purpose is to provide students with a common ground in movement based on self-notion and game design. Further, this paper aiming to serve as a starting point for future discussions on the development of new knowledge exchange platforms in terms of cross disciplinary cooperation.

Proposed framework action points:

1) Physical exercises, such as movement sequences: goal-directed functional, expressive-emotional, parallel mirroring, abstract improvisations, rhythmical introvert, rhythmical extrovert, and communicative gestures in pairs.
2) Group trust exercises such as caring and touching, foaling, and catching.
3) Common semiotics for physical movement descriptions verbalized during the performed movement.
4) Analyses of the visual movement trace via a virtual mirror, Shadow dance.
5) Simple character based live games using floor and urban space.
6) Dance with cameras (see body movement trough the camera in real-time).
7) Camera as a first person shooter (see the space through the camera in real-time).
8) Dancing, and running with blindfolded eyes.
9) Mocap studio exercises, crossing 3D space.
10) Laban Movement Analysis (LMA).
11) Game development theory.
12) Movement sensors.
Acknowledgments


References


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REVIEWER #1

Reviewer's Scores

Relevance to conference theme: High
Originality: High
Accessibility: High
Overall rating (<3 = reject): 5
Confidence level: Medium

Comments

This paper/installation engaging with the theme of digital embodiment is highly relevant to the themes of this year’s conference. This is a very engaging paper which is engaging in ongoing debate, grounded in theory and informed by practice. This paper should make a significant contribution to this year's conference.

REVIEWER #2

Reviewer's Scores

Relevance to conference theme: High
Originality: High
Accessibility: Medium
Overall rating (<3 = reject): 4
Confidence level: Low

Comments

Although I'm finding it hard to imagine exactly what this installation involves, the theoretical framework behind it sounds very interesting and relevant to the conference.