Painting with Movement

Interaction design tool to paint, track and analyze the movement

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ABSTRACT

The transdisciplinary experience between art and technology has grown over the last decade. The application of augmented reality and virtual reality on other areas has opened doors for hybrid projects and consequently new experimental ideas. Taking it as motivation, a new application concept is proposed in this work, which will allow to someone to walk through and see his body movement in a three-dimensional space. Currently, a user can choose which visual effect is used to draw the resulting movement (e.g. continuous/dashed line). The model has been extended in a way that the visual effect and shape are automatically generated according to movement type, speed, amplitude and intention. Our technological process includes real-time human body detection, movement visualization in real-time and movement tracking history. This project has a core focus on dance and performance, though we consider that the framework is targeted to anyone interesting in body movement and art work. In this sense, the proposed application tracks body movement inside a three- dimensional physical space, only by using a smartphone camera. Our main objective is to record the sequence of movements of a dance, or of someone moving in space, to further analyze their movements and the way they moved in space. And through this idea, we have created an application that aims to record the movement of a user and represent that record in a visual composition of simple elements. The possibility for the user to see the visual tracking of the choreography or performance, allows a clear observation of the space traveled by the dancer and the range of motion and accuracy of the symmetry that the body should or should not have in each step. Over this article the main concepts of the project are presented as well as the multiple applications to real-life scenarios.

CCS CONCEPTS

• **Human-centered computing** → **Systems and tools for interaction design**; *Interaction design*.

KEYWORDS

Movement Technology, Interaction Design, Augmented Reality, Visualization

1 INTRODUCTION

It is in the virtual space where degrees of freedom and degrees of materiality are played that the dance finds its body-sensation again [Barros 2004]. The possibilities that virtual spaces provide through augmented reality can unlock ideas and encourage the creative process. In these art forms the dynamic power of the creator is enshrined in the form of his work. The body becomes open to the technological, not dependent, but able to experience things that can escape the normal sensory perception [Klich and Scheer 2012]. Just like slow- motion images that reveal aspects of a gesture that would not be visible to the naked eye, the fusion of dancing and new augmented reality applications also opens up different perspectives of movement. Before describing the target audience of this project, we should explain the different ideas that stimulated the concept of this work. On a first phase, we approached the issue of some works that combine dance and technology [Ioannidis. 2019; Jacky Chan. Howard Leung. Kai-Tai Chang. 2007]. The intention of showing a virtual element to the user, often to the dancer, ends up restricting the movement or the creativity itself. So, the intention of creating an application that seeks to feed the process of creativity, and not blocking it, has become one of our goals. Allied to this objective, we approached the case that some people face when they don't know how to (or can't) experiment with artistic activities, such as dancing or painting. Sometimes people have a creative thought, but they can't reproduce it. From then on, we thought about the possibility of this research project to also become a work of inclusion, giving to people the possibility to move as they can and at the same time see their movement. Thus, we tried to stimulate the creativity not only of people in the area, but also of anyone who wants to create something different. This work was always thought of as a virtual tool, so that the act of painting can be an iterative process, meeting what the user wants to see projected.

2 INTERACTION DESIGN

By using a tablet computer and this application the user can check the 3D movement record in real time. At this moment, the application is intended to be used by two persons simultaneously: User a,

the mover, who dances and moves through space; User b, the observer, who sees the other user through the tablet computer screen and also sees the corresponding design of the virtual movement created by user a, as shown in Figure 1.

Figure 1: Application tests: Detecting movement

2.1 Use case example

To start, user a stands in front of user b, user b can see user a on the screen. On a first stage, user a must be still and face user b in order for the application to detect the body extremities, hands and feet, which are the points currently detectable by the system. Each detected point on the user's, feet and hands, has a different color so that the perception is clearer for user b. At the same time, user b is able to visualize on the screen what user a does, as virtual lines appear on the screen, which correspond to each movement that user a creates. The dance and movement that are being performed, is being recorded and presented by the system, under the visual identity of simple elements such as a line, a ball and a stroke. User b can walk through physical space and see (by the tablet computer) the movement that is being made and registered by the user a in three dimensions. As user b watches user a performing, he can also select which visual shape and stroke type he wants to see from the recording of the movement that is made. In other words, when the user activates the touchscreen, the screen changes the shape of the trail that is being saved. After some time of usage user b can delete user a's movements record, through the scroll, so that the screen is not overloaded with images. user b can also save the records done since the beginning of the performance, regardless of whether or not the trace had been altered. After the user a's performance, he can also visualize the visual tracking that was recorded during the time he danced, through the lines of the movements that were saved in the virtual space. While walking around the physical space where user a performed, he can also see all the movements he performed.

2.2 Future Work

The exercise of understanding movement through abstract forms and colors should also be a continuous act of learning [Albers 2013; Franklin 2013]. For this reason, it is not our intention to create a very complex application, in terms of user flow and features, because the focus of this action is the movement in physical and virtual space, and how the visual record is displayed to the user. In a three-dimensions space, the visual record of the movement is similar for different geometrical plans, such has x0z and y0z. Some of them could be represented in a different manner, emerging new information about the movement. In other words, a plan can virtually represent a new feature, which together allows to: Study the temporal record of a movement on a certain space; Overlap geometrical plans on the x0z; Get a visual representation of emotions

expressed while performing movements [May and Barnard 2011]; Visual perception of speed and intensity of a given dance. Our intent is to plot the aforementioned features, providing an easier way to find out interesting patterns. Even more interesting is to analyze it by considering the temporal component. We also aim to provide the user the possibility to choose the final art of composition, such as the painting technique (e.g. gouache, neon, pastel) or even the painting styles (e.g. fauvism, abstractionism, impressionism).

3 CONCLUSION

As aforementioned new design features are being considered in order to improve user interaction, customization and visual appeal. We believe that this project opens several new possibilities in real-world environments: It can, for example, be applied to assist dance companies and academies in developing creative works. This would extend the choreographic work to a next level where the choreographers and dancers would validate movement sequences at time and space perspective. In the choreographer's work, the possibility of having a virtual drawing that shows the visual record of each choreography will facilitate the transmission of the idea of movement of each choreography. Also, the use of this application will help one's work in the compilation of the different choreographic pieces, showing the visual record of each one. In the dancer's work, the possibility for the dancer to see the drawing of his movement in space will facilitate and perfect his body consciousness [Robertson. 2010]. In the long term, the dancer will be able to visualize the sequence of his movements and, through the visual record of that same sequence, will improve his performance. Alternatively, the result from a sequence of movements can be converted to a 2D/3D printing, which in turn allows anyone interested in art works to produce its own and unique piece of art. In a social inclusion context, we consider that this application can be used by people with disabilities, augmented reality systems are being developed in medical therapy for a considerable time [P 2018]. For instance, someone who uses a wheelchair may also use the application, as it can use different points of the body, such as the head, shoulders, or elbows. The whole of possible applications that this work can have, allows us to think of different characteristics that can be given to the different type of end-user. As a final thought, we believe that our work will give the public an interesting tool, suitable and available to anyone who believes or feels that their body can communicate something.

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