Canvas Dance: an interactive dance visualization prototype for nightclubs

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ABSTRACT
Parties, festivals and nightclubs where people gather to dance often provide some entertainment technology that complements music with visual media, however they do not offer any kind of interactivity to the people dancing. We propose a new entertainment technology that complements music with an interactive visualization animated by the dance moves of the audience projected on a big screen. Our research aims to understanding how to make the interactivity of a dance visualization easy to discover and flexible enough to support general casual dancing. For this we have developed a prototype that uses smartphones' sensors to read the dance moves of the users, which are then represented in a projected visualization.

Categories and Subject Descriptors
H.5.1 [**Information Interfaces and Presentation**]: Multimedia Information Systems; H.5.2 [**Information Interfaces and Presentation**]: User Interfaces; J.5 [**Arts and Humanities**]: Performing arts (e.g., dance, music).

General Terms
Design, Human Factors

Keywords
Interactive dance visualization, design for crowds of dancers.

1. INTRODUCTION
Nightclubs, music festivals and events with music usually make use of technologies that complement music with some sort of visual media, for example music videos on big screens, 3D projections inside nightclubs [1] or music visualizations that are automatically animated by mapping features of the music signal (such as its loudness and frequency spectrum) to different graphic representations. These entertainment technologies do not offer any kind of interactivity to the audience (the people dancing) and only depend on the performance of the VJ [1] that is manipulating them or the music itself.

To fill this gap we built a prototype of an interactive dance visualization intended for crowds of dancers in nightclubs called "Canvas Dance". Despite interactive dance has been explored in other works focusing on dance performances [2][3] we believe that designing an interactive dance visualization for crowds has different design needs. On the other hand, the previous work on interactive dance for crowds [4] chose to represent the movement of the dancers through changes in the music instead of visually.

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2. PROTOTYPE DESIGN
This first design of an interactive dance visualization for crowds of dancers has two goals:

- Augment both individual and group coordinated dance moves in a way that allows the users to identify their contributions to the visualization
- Inspire dancers to do coordinated group dance moves.

We chose to have different visual representation mappings of dance moves: those that augment the dance moves of an individual and those that represent coordinated group dance.
The prototype system takes motion input from a mobile application that reads accelerometer and gyroscope data from the dancer's smartphone while he or she dances, and sends it immediately to the visualization application. For this first design the mobile application assumes the user has the smartphone saved in his or her pocket and it's getting motion information about the user's hips.
The visualization application then extracts features of the sensors' data and maps them in real time to a 3D visualization projected on a big screen, where each dancer is represented by a *comet* traveling inside a tunnel as shown in Figure 1.

Individual dance moves such as one person moving the hips to the sides or jumping in the place are mapped to different characteristics of his or her comet. There is an affinity between a person and a comet that is never broken. When the dancer moves the hips to the sides the comet does a *zig zag trail* (Figure 2) and when the dancer marks the beat with up and down movements (such as jumping on the place or bouncing a leg) the comet makes *flashes* (Figure 3).
Coordinated group dance moves i.e. coordinated dance steps or choreographies within the crowd, are mapped to global characteristics and objects of the visualization.
The only mapping of this kind that is implemented in the Canvas Dance visualization is a coordinated jump between at least half of the dancers. When at least half of the dancers jump together there is an *explosion* (Figure 4).

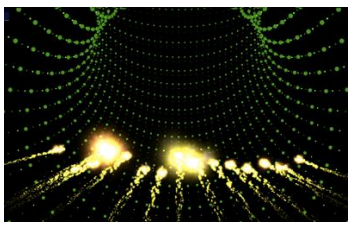

Figure 1. The Canvas Dance visualization: comets traveling in a tunnel. Each comet represents a dancer.

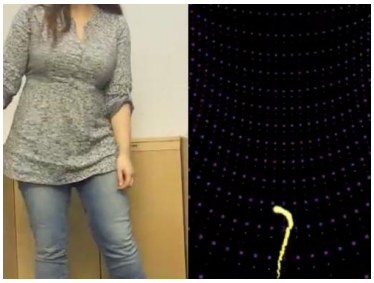

Figure 2. A dancer moving the hips to the side, triggering the zig zag trail mapping of the Canvas Dance visualization

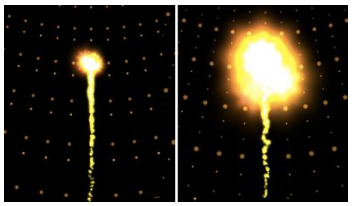

Figure 3. Small and big flash representing soft and strong movements marking the beat respectively.

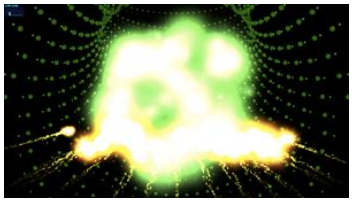

Figure 4. When at least half of the dancers jump together they trigger a big explosion.

In order to use this prototype system (Figure 5) users must have the Canvas Dance mobile application installed in their smartphones (running either the iOS or Android operating systems) and connect to the same WiFi network as the visualization application is connected. A projector is also needed to display the visualization to all dancers.

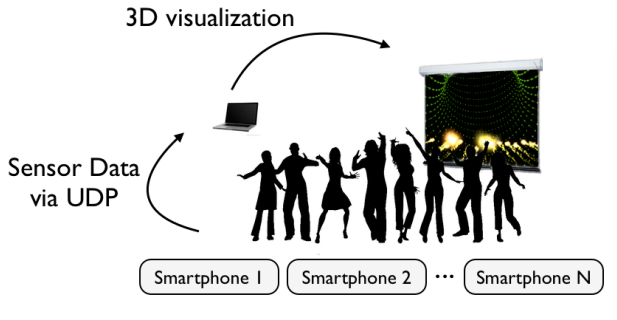

Figure 5. Architecture of the interactive dance visualization system

3. EVALUATION

The prototype was tested in a small party with 9 participants that had the mobile application installed in their phones without previously knowing what was it for. Participants were invited to dance next to the projected dance visualization and after dancing 4 songs they were asked to answer a survey. Only one participant didn't understand that his movements were controlling the visualization. The rest of them discovered most of its interactions, but the coordinated jump explosion was never triggered as participants were more focused on discovering how to interact instead of dancing together.

In general participants said that they enjoyed the experience, but they would have liked to know in advance that coordinating dance moves trigger special effects.

4. FURTHER WORK

The current design of the prototype supports very few mappings between dance movements and visuals, so more and better mappings should be integrated.

On the other hand, the prototype should be tested with a large group of people to understand what is the limit in the amount of individuals represented on the visualization to allow people identify their movements on the screen, as large groups could generate an overcrowded visualization of *comets*.

Through more evaluations we will gain a better understanding on how to design interactive dance visualizations that engage individuals into dancing more and encourage them to participate in coordinated dance moves as part of a crowd.

5. AKNOWLEDGEMENTS

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