PY.VI – Platform for audience-controlled dynamic visualisation

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ABSTACT

In live music stage performances, artists depend on preprogramed visualisations or a third party controlling them live. The goal of this project was to take this responsibility and in a way, outsource it to the audience by taking their behaviour and transforming it to an image enriching the performance.

Based on observation of a couple of live concerts, we designed an audience-controlled dynamic visualisation platform, using an RGB camera, Max/MSP visual programming software, Arduino micro-controller, and a projector. The prototype called PY.VI takes audiences movements and transforms it into a colourful visualisation, and the sound of the performer and audience into lights illuminating the crowd.

At this stage of the project, PY.VI is a platform for further research in how this type of audience participation will influence the relationship between the performer and those they are performing for.

Author Keywords

Audience participation; dynamic visualisation; Max MSP; live music; concert.

ACM Classification Keywords

I.4.8 Scene Analysis: Motion

INTRODUCTION

Stage performers often enhance their shows with use of lights, smoke, visualisations, decorations etc. All these elements must be prepared beforehand or controlled by another person, which can be problematic for smaller bands that lack the means to buy the equipment or hiring a person to do it. Small venues, often have limited equipment not allowing artists the possibility to enrich their performance.

PI.VI started as an idea of how can we make a stand-alone visualisation system for small bands and amateur music artists, that would be rather inexpensive, easy to set up, easily reproducible, and most of all, attractive and beneficial for both artists and audiences attending the shows. Through a three-week project, our team have constructed a prototype of a platform for audience-controlled dynamic visualisation for live music performances.

The contribution of this project is a stand-alone piece of stage production, enhancing a performance by dynamically transforming audience's behaviour into an image, making audience a collaborator in the performance, and adding production value to live music performances.

RELATED WORK

Increasing a level, or changing audience participation by the use of technology in the context of the live musical performance was widely studied in the last couple of years, with projects such as Open Symphony [3] and real-time music notation by Jason Freeman [2]. In these projects, the audience uses an application on their mobile phones or waves a glow stick to influence what the artist is going to play. In the case of Open Symphony, it is just a visual suggestion displayed for the artist to see and interpret. However, in case of the other project, audience members' movements are read by an algorithm and transformed into music notation for the artist to play. Hodel et. al [4], noticed that the use of mobile phones as a way of interaction with the performer, distracted audience from the performance. Furthermore, manipulation of the sound by the audience was met with mixed reception from the musicians, as they felt like they are losing control of their performance.

The most noticeable use of technology-mediated audience participation, in a visual context of the show, done by a mainstream music performer would have to be Xylobands[1] used by British band Coldplay. The LED-bands are worn by each of the audience members, which are radio controlled to sync with the music. As impressive the effect, the audience does not influence the bracelets themselves other than by changing their position by hand movements. Furthermore, this solution ended up being extremely expensive [5].

PROJECT

Building on related work, we decided to create a platform, that will not influence artists' music, but enhance the visual part of the show. We also decided to use touch-free sensors, as they might be a distraction for the concertgoers, as well as they might increase a total cost of the prototype. We wanted to make the prototype inexpensive, self-contained, portable, easy to use and customisable by the artists themselves. The prototype should be place on stage as a part of stage production element.

Understanding the setting

To understand possible users as well as the environment in which the prototype would be used, we filmed audiences during two distinctly different live concerts. First, a set of a Danish rock-folk band Ulvetimen, at Head Quarters in Aarhus, in front of 35-40 people. Followed by, concert of a Danish Rock/Metal band Siamese. The concert with over 200 in audience, which took place at Studenterhus Aarhus. Video analysis of audience behaviour at both shows, heavily informed our design.

Behaviour of the audience during the first concert, can be described as reserved and calm. Most of the audience distances themselves from the stage, by standing a couple of meters away, creating a half circle with the centre in the middle of the stage, where the vocalist and leader of the band stands. The stage is low, what makes audience and the performer be at a similar level. As the music was calm, movements of the audience were limited to nodding head, and gentle full body movements to the rhythm of music, and clapping hands after each song, that created the sound of the audience. Full body movements can be divided into two specific instances. Side to side when the rhythm is slower and songs calmer, and back and forward or up and down, when the tempo is higher and the songs more lively. Furthermore, the lights in the venue are focused on the stage and audience remains in the dark for the entirety of the show. Faces and characteristic features of the audience members are mostly unnoticeable.

Figure 1. Audience during Ulvetimen concert. Mostly standing far away from the stage, almost invisible in the dark.

On the opposite side of the spectrum, we have a concert by Siamese. The music is mostly high tempo and high energy. The audience stands directly in front of the stage, with a few people putting their hands on it. The stage is a bit lower than waist-height for the spectators in the first row. Similarly, to the first example we can see full body back and forward movements when the songs have high tempo and are energetic. In this case the movements are more pronounced and aggressive. Head bobbing is also more distinct and it often changes into moving the entire upper body. Some audience members jump up and down, often in groups of two or more. Hand gestures often accompany the movements. Risen fists, open palms or sign of horns, hand gesture popular within rock and metal music. Applause between songs is accompanied by screams and whistles. Clapping also occurs during the songs where the audience claps over their heads, following the rhythm of the bass drum. There are no designated lights for the audience, but the stage lights illuminate crowds faces up to a couple of meters away from the stage.

Figure 2. Audience during Siamese concert. Clapping rhythmically to the sound of the bass drum, illuminated by the stage lights.

Design considerations

Based on these findings, we wanted to focus on couple of aspects. The audience should be visible by the sensors from any distance. Even small movements should be visible. The audience, like the performer, should be illuminated. The prototype should be adjustable to the setting.

The design process started with the choice of what will allow us to transform audience's behaviour. Despite not knowing how to use the programme, we decided to create the system in Cycling '74 Max [6]. Max was chosen over other software, due to its ease of use. The visual programming aspect of it made the system easier to modify and personalise, also by users who may not be familiar with the program. Max can process both video and audio inputs, which was crucial considering that the audience not only moves but also makes sounds like clapping, cheering, and screaming. The software is available for both Mac and Windows computers, allowing users of both for easy reproduction of our results. Max file is exported as an executive file, and it can run, and be adjusted without the need for purchasing the full software licence.

As a video input, we chose to use an ordinary RGB camera, for our prototype, which is a Logitech C920 HD Pro Webcam. The reason for using an RGB camera instead of a depth sensor like Microsoft Kinect, was because RGB cameras have an unlimited range whereas depth cameras work within a specified range and do not detect objects being too close or too far from the sensor. As our research has shown, concert goers can stand by the stage and also far away from it, and by using an RGB camera we can capture the image of the audience no matter what distance from the camera they are located. The camera is placed on a telescopic camera stand, allowing for adjustment of the height of the camera independently of the height of stage.

The prototype, is set to change between two modes. First, displaying contours of the audience members, coloured red with up movements and blue with movements down. Second, contours leaving bright trail following audience's movement, exposing the actual background from otherwise black screen.

LEDs, placed on the side facing the audience, are set to fade in red to low tones, and fade in blue to higher tones, with a mix of both in mid-range. The brightness of the lights is influenced by the volume. By using a microphone, lights react both to music and the audience.

The prototype is enclosed in a pyramid shaped box, housing all its components. The box is made from a laser-cut 6 mm MDF. The Pyramid is painted black to better fit the other elements usually found on a stage, like amplifiers and stage monitors.

Testing

At the end of the three-week project, we organised a short testing session involving our university colleagues. Ten participants attended the test session, including 9 women and one man, age 24 - 52. Participants describe themselves as concert goers. The test was run to a selection of music of various genres.

Quickly, participants engaged with the prototype. They moved individually, observing their own movements, as well as stepped back, or to the side to observe their colleagues. Some of the participants, attempted to synchronise their movements with each other (see Figure 4). They mostly gathered near the prototype.

Figure 4. Two participants synchronising their up and down movements.

A video recording of the test was show to three recording musicians, and one of the owners of previously mentioned music venue Head Quarters.

Figure 5. Participant illuminated by the sound controlled LEDs.

DISCUSSION

One of the main limitations of this project was that due to scheduling issues and the limited time for completion of the prototype, we were unable to test the prototype in the environment it was intended for.

Participators of our test session, as positive about the overall prototype, voiced their concerns when it comes to the type music the prototype would work best with or be appropriate to. They often could not specify a perfect genre, but they could choose an artist that they believe it could fit with.

Musicians who were shown the videos from the test, called the prototype promising and voiced a will to use it during their shows, but were worried about it being a possible distraction to the audience. The venue owner was interested in the prototype as a way of providing better and more interesting service to the audiences, as well as the musicians they are hosting.

A lot of important issues, are so far unresolved and require tests in a live concert setting. Would the audience focus their attention on the performer or the visualisation? How would this set up change the relationship between audience and the artist? Would it invite or intimidate the audience?

CONCLUSION

Through analysis of previous work within audience participation in live music performances, and video analysis of two concerts, we designed a platform for audience-controlled dynamic visualisation. The setup is constructed to benefit audiences and performers, especially performing in smaller venues. The prototype was designed to avoid distracting the artist and to avoid interfering with the music itself.

Our team used, Cycling ’74 Max software to make the system easy to manipulate, and adjust in future development, as well as for the end users.

Despite positive reception from concert goers, musicians and a venue owner, the project is yet to be tested in the environment it was designed for. We do not know the actual effect this prototype might have on its users.

As we continue working on the project, we hope to answer questions concerning the system’s impact on audiences, performers, and the relationship between them.

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