The Duran Duran Project: The Augmented Reality Toolkit in Live Performance

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Abstract

A variety of real time visual effects were developed for the band Duran Duran's December 2000 "Pop Trash" live concert tour. The AR toolkit [1] was utilized extensively to prototype and demonstrate many of these effect sequences.

***Keywords*:** live performance, visual effects, augmented reality

1. Introduction

A real time 3D visual effects system was assembled consisting of a Windows 2000 based desktop PC, a Winnov Videum capture card, and professional grade video cameras. Using software based on the Microsoft Vision SDK and OpenGL libraries, the system captured live video of the band or the audience and composited it with real time 3D graphic imagery. The results were projected onto a large screen where the audience could view the results. Simple animations were pre-programmed and triggered based on the lead singer's requests during the concert. This process enabled animated characters to appear live with the band on a large projection screen. The system created an augmented reality effect that convincingly mixed 3D graphics with the audience's real world view of the band.

2. Stage Tracking and System Integration

Prior to the tour we intended to utilize AR toolkit based tracking during the live shows. The band members expressed interest in having the ability to appear to pick up animated characters and interact directly with them on stage. In rehearsals, under tightly controlled lighting conditions, this approach worked well. Ultimately, we did not utilize the tracking fiducials during the live shows due to random lighting conditions that made it difficult to achieve consistent results. However, we found that the AR toolkit was extremely useful for pre-programming 3D position locations throughout the stage environment. Before a concert, AR toolkit fiducials were used to set and record 3D coordinates where animated characters and objects would appear in the show. These saved positions were loaded during the live performance. Throughout the actual concert, animations were keyboard triggered to appear at these pre-programmed stage locations.

We found that the AR toolkit integrates easily with professional broadcast video equipment. The AR toolkit functioned seamlessly in a complex system of video switchers, broadcast cameras, recording decks, and large format projectors. Furthermore, we found that chroma and luminance keying techniques can significantly improve the live video quality of AR toolkit applications.

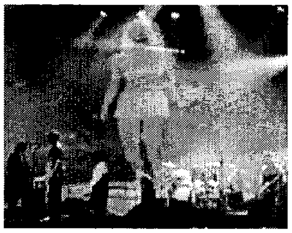

Figure 1. Animated character triggered by a fiducial

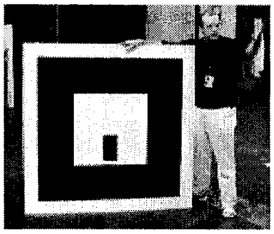

Figure 2. Large fiducial used to pre-program 3D stage coordinates before a live concert performance

3. Areas for Further Work

During the course of the live concert tour, we identified a number of areas where our work could be improved upon.

3.1. Lighting Control

AR toolkit marker tracking during a live stage performance requires close coordination with the show lighting control system. Most lighting systems are controlled by a network communication protocol which could be interfaced with an AR toolkit application. By integrating the application with the control system, stage lighting conditions could be strictly managed, maximizing tracking performance.

3.2. Content Development

Large-scale productions and their audiences demand high quality 3D graphics and animations. AR toolkit applications frequently use the VRML [2] library to import and manipulate 3D models. VRML based 3D content is adequate for research prototypes. However, it is insufficient for delivering professional quality 3D graphics and animation. For example, VRML does not support the advanced character animation, lighting models, and particle systems common in packages such as Alias Wavefront's Maya [3] and Discreet's 3ds max [4]. These features could be added to an AR toolkit application by developing extensions to import 3D content and animation paths directly from Maya or 3ds max scene files.

3.3. Backup Systems

In a live performance, a software crash or hardware failure is unacceptable. Consequently, it is important to have at least two computer systems running identical AR toolkit applications at all times. Both systems should be selectable using a switching device. If one system crashes, the backup system can be immediately activated without the audience noticing the failure.

4. Conclusion

This project illustrates both the versatility and the practical limitations of using the AR toolkit in a live performance. We hope that our experience will encourage other developers to explore using the AR toolkit in live performance scenarios.

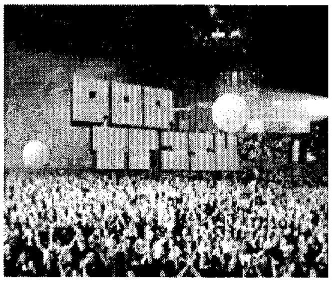

Figure 3. Screen capture of a rotating 3D logo floating over the audience

Figure 4. Screen capture of a virtual animated character dancing with the lead singer

5. Acknowledgements

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6. References

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