AR Baseball Presentation System Based on Registration with Multiple Markers

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ABSTRACT

The *AR Baseball Presentation System* is an entertainment tool allowing users to watch "virtual baseball game" on the real tabletop field model through a web-camera attached to a LCD monitor. Our system uses multiple planar markers for geometrical registration of virtual catoons onto the tabletop field model. In contrast with most AR applications using multiple planar markers, we can place the markers at arbitrary positions and poses without measuring those arrangements manually. Since the markers can be placed at various positions and poses, the registration of the virtual objects becomes more stable than placing all the markers on the same directions. The baseball game scene is generated from the log history data of the baseball game.

1. INTRODUCTION

AR/MR has recently been applied to many kinds of applications including entertainment. Especially, many AR applications use a planar marker like AR-Toolkit. The *AR Baseball Presentation System* is also a marker-based AR system. The advantage of our system over other marker-based approaches is that we can use multiple markers placed at arbitrary positions and poses without measuring them. The arrangement of the multiple markers can be automatically estimated by using a projective 3D space defined by two reference images [1]. Therefore the markers can freely be placed in the real world. The baseball game scene is reproduced by virtual players according to baseball game sequence data, in which the sequence of the event of the game are described play-by-play. Users can watch the baseball game on the real tabletop field model through a hand-held LCD monitor with a web-camera.

2. DEMONSTRATIONS

Fig. 1 shows example snapshots of the game played on the tabletop. Multiple markers are arbitrarily distributed inside and outside the field model without measuring the positions and poses of them. Even though particular markers are not continuously captured over the frames, the virtual players and the ball can correctly registered onto the real tabletop field with the same world coordinate.

In fig. 2, one marker is placed at different pose from the ground plane and the other markers are placed on the ground plane. In this case, the angle of the camera relative to the tabletop is too small to detect the markers lying on the tabletop plane. Therefore, the markers which face the same directions as the tabletop plane cannot be detected because of the angle of the camera. If all the markers have to be on the same plane, no marker is detected so the registration is not possible. In our registration method, however, the markers can face various directions like fig. 2 because the arrangement of the markers can be automatically estimated. In the example in fig. 2, the marker with the red cube is placed at different pose from the ground plane, so that this marker can be detected even in the case that the markers on the tabletop plane are not detected. Therefore, the registration can stably be continued even if the user moves the camera to any view point. This is a big advantage of the proposed system for applying to entertainment AR applications.

| frame 0 | frame 29 | frame 89 |

Figure 1: Virtual players are playing on the real tabletop field model.
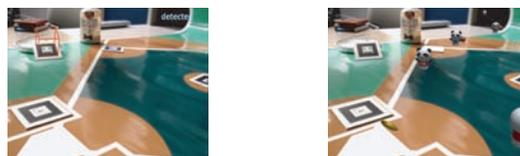
(a) Detection of markers.   (b) Augmented View

Figure 2: Only one marker facing different direction from the tabletop can be detected.

3. ACKNOWLEDGMENTS

4. REFERENCES

[1] Y. Uematsu and H. Saito. AR registration by merging multiple planar markers at arbitrary positions and poses via projective space. In *Proc. of ICAT2005*, pages 48–55, December 2005.