AR Baseball Presentation System Based on Registration with Multiple Markers

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Abstract

This AR system allows a user to watch "virtual baseball game" on a real tabletop baseball field model through a web-camera attached to a LCD monitor. The baseball game scenes generated with CG are overlaid onto images of the field model where multiple planar markers are distributed. The baseball game played on the field model is the replayed game, which is reproduced by input history data of an actual game. Our system can help the user to understand the game history easily via watching the replayed game by virtual 3D players. For the registration of the virtual baseball game scenes onto the images of the real world captured with the web-camera, the camera motion is estimated by multiple planar markers distributed at arbitrary positions and directions. This system can automatically estimate the geometrical arrangement of the markers via multiple projective 3D spaces, which are constructed by some reference images. Therefore, manual measuring tasks in advance is not required. The virtual baseball game can be watched from various view points with moving around the wide space. Various arrangements of the markers also realize the stable registration of the virtual objects. This system will provide a new style of watching and enjoying the baseball game.

Keywords: registration, planar markers, projective space

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 projective 3D spaces defined by two reference images, respectively[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 as shown in Fig. 1.

2 Demonstrations

Fig. 2(a)-(c) show example snapshots of the game played on the tabletop. Multiple markers are distributed inside and outside the field model without measuring the positions and directions of them. Even though particular markers are not continuously captured over the frames, the virtual game scenes (players and ball) can correctly overlaid onto the tabletop field model.

In Fig. 2(d),(e), one marker is placed at different direction 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 plane. If all the markers exist on the same plane, in this case, the registration is not possible because no marker is detected. In our registration method, however, the markers can face various directions because of projective spaces. Therefore, the registration can stably be continued even if the user moves the camera to favorite view point as shown in these figures. This is a big advantage of the proposed system for applying to entertainment AR applications.

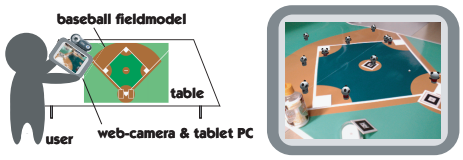
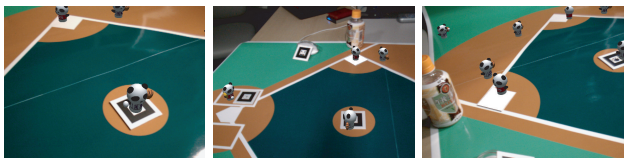


Figure 1: AR Baseball Presentaiton System.



(a) frame 0 (b) frame 29 (c) frame 89

(d) Detection of markers (e) Augmented View

Figure 2: Virtual players are playing on the real tabletop field model.

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References

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