2014 AASRI Conference on Sports Engineering and Computer Science (SECS 2014)

An Integrated Computer Assisted Training System for the Baseball Defense Concepts and Cases

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Abstract

The successful execution of a baseball strategy in time is very important in the baseball game. The key point for this successful execution capability of a player does not only depend just on the daily routine practice, but also depend heavily on the correct concepts a player has. In this paper, we design and implement two animation assisted sport simulation subsystems, the Cutoff Play Training Subsystem and the Editable Fielding Strategy Training Subsystem, for general baseball fielding training. These two integrated training subsystems allow users to choose what happens once the baseball is put into play, and provides many different scenarios and cases that probably will occur in the baseball field. By using these animation simulation subsystems, players, especially those at the amateur junior level, can improve greatly on all aspects of fielding plays in a short period of time.

Keywords: Baseball Fielding Concept Training; Animation Platform; Tactical Cases Simulation; Temporal Spatial Relationship;

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1. Introduction

A baseball game relies on teamwork, and consists of two basic parts: offense and defense. Defense plays an integral role in the success of a team. The team that makes the fewest number of mistakes in fielding will likely be the team that wins the game. In defensive plays, every player has a specific task that needs to be completed. Coaches need to instruct all the fielders involved in a play on defense strategies, i.e., how to properly execute a play quickly and instinctively. Fielders must comprehend their proper roles and the most efficient responses to various situations that can occur. Among the most widely instructed defense strategies are the "cover, relay and cutoff" methods designed for stopping the base runners from advancing bases [4]. These strategies require a great deal of practice and teamwork in order to consistently result in successful outcomes. There are many standard paradigms in the baseball textbooks for the general defensive cover, relay and cut-off play drills [3][6]. But, these standard paradigms are planar and static still images. These static graphs are unable to illustrate the movement and timing between fielders and runners.

In recent years, with the help of information technology and computer software, it has become easier to use animation simulation in athletic training [1][5] and competition management [7]. These technologies also can provide an excellent foundation for simulation based training. Therefore, we designed two economic, portable, reusable and flexible training tools, the Cutoff Play Training Subsystem and the Editable Fielding Strategy Training Subsystem, can help train players, especially amateur junior student players, to understand and remember each aspect of defense "cover, relay and cutoff play" situations and to study many different salient play cases. We followed a standard paradigm commonly used by the Taiwan national baseball team, and present a methodology to design and implement an animation based simulation subsystem that can help the general training of the "cover, relay and cutoff" play.

2. System design

2.1. Ball field object classes design

Before we started to design this simulation system, we needed to understand the actions that take place on a baseball field. Baseball is a team sport comprised of many actions such as throwing, catching, batting, and running. According to the baseball rules [2], a pitcher throws a baseball toward home plate, a batter attempts to hit the ball with a bat into the field of play, a batter who hits the ball into the field must begin running toward 1B and beyond, a fielder tries to catch the ball cleanly and throw to the proper location in order to stop the runner from advancing on the bases, especially to home plate. There are nine defensive players on the field, and at minimum one, up to a maximum of four offensive players on the field for a given play. We treat the baseball and each player as an independent "object" and each object has its own objective, such as catching a ball within their assigned defensive area, moving to cover a particular base, throwing the ball to the correct place, running to the next base, or just moving to a designated location, etc.

To design this system platform, we used a tree-structured scene description to define the spatial and temporal position of these objects and their movement in a given simulation. The system's compositor uses the scene description information, together with each objects data, to determine the final outcome. We use the 45 degrees view projection to create our view of the baseball field, and use Adobe Flash and Action Script language to create a Windows user interface, and generate a series of animations. A full simulation consists of many animations of various objects which perform actions in adherence to the cutoff play and the base running strategy rules. For example, a fielder's action is displayed by a fielder moving (running) animation, a fielder catching animation and a fielder throwing animation accompanied with ball movement animation.