An Entertainment Robot for Playing Interactive Ball Games

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Abstract. This paper presents a minimalistic robot for playing interactive ball games with human players. It is designed with a realistic entertainment application in mind, being safe, flexible, reasonably cheap, and reactive. This is achieved by a clever, minimalistic robot design with a 2 DOF roll tilt unit that moves a bat with a spherical head. The robot perceives its environment through a stereo camera system using a circle detector and a multiple hypothesis tracker. The vision system does not require a specific ball color or background structure. The paper motivates the proposed robot design with respect to the above mentioned requirements, describes our solution to the tracking, calibration, and control issues involved and presents indoor and outdoor experiments where the robot bats balls tossed by different players.

1 Introduction

RoboCup Soccer has been founded as a basic research endeavour, as "an attempt to foster AI and intelligent robotics research by providing a standard problem where a wide range of technologies can be integrated and examined" [15]. However, unlike other basic research questions robot soccer is easily understood by the general public making the RoboCup competitions both a scientific and a public event. As Kitano said, a "publicly appealing but formidable challenge". This unique combination also motivates other "sport robotics" research activities, such as ball catching [5]. Now, being a basic research program, RoboCup soccer and other sport robotics activities are far from actual applications, they only contribute indirectly, e.g. by stimulating household robotics research. This paper is an attempt to identify a direct, commercially realistic application of sport robotics technology in the entertainment industry.

Our proposed system (cf. Fig. 1) is a minimalistic ball-playing robot serving at events, such as office parties, fairs or open house presentations. The robot is stationary and if a human throws a ball towards the robot it is supposed to hit it back, engaging the human in a robot-human ball game (at the moment it can technically only intercept not hit back). It is intended not as a long-term game, but rather as a short exciting experience being driven by the fascination