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Real-time camera motion tracking in planar view scenarios

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Abstract We propose a novel method for real-time camera motion tracking in planar view scenarios. This method relies on the geometry of a tripod, an initial estimation of camera pose for the first video frame and a primitive tracking procedure. This process uses lines and circles as primitives, which are extracted applying classification and regression tree. We have applied the proposed method to high-definition videos of soccer matches. Experimental results prove that our proposal can be applied to processing high-definition video in real time. We validate the procedure by inserting virtual content in the video sequence.

Keywords Camera motion tracking · Camera calibration · Tripod · Primitives tracking · CART

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1 Introduction

Camera motion tracking of video sequences is an important issue in computer vision. It is a challenging problem that involves different techniques, such as feature extraction, feature tracking or camera calibration. It has many applications like, for instance, in 3D scene reconstruction, surveillance applications, broadcast [1], augmented reality [2], virtual reality [3], mosaicking, change of the viewpoint, automatic summarization or virtual objects insertion. Some of these tasks require a highly precise and fast motion tracking of the cameras which are usually mounted on a tripod. These cameras are fixed in location and can freely rotate and change their intrinsic parameters by zooming. Cameras mounted on a tripod have 3 degrees of freedom: pan, tilt and zoom (PTZ). Pan and tilt represent the tripod axis rotation angles and zoom represents the lens focal distance.

Most methods for camera motion tracking consist of several stages: initialization, feature extraction (e.g., primitives, key points), movement estimation, tracking and camera parameters computation. We propose a novel method for real-time camera motion tracking in planar view scenarios. An inherent difficulty related to this problem is the small number of visible primitives, or the large size of HD video sequences. To overcame this problem, we make the following assumptions: the camera is fixed on a tripod, and background (grass) and white lines in the scenario show an appreciable visual contrast in the RGB space. Additionally, we assume that the color of the background is presented as rather uniform.

The main contribution of this paper is the design of a new method to obtain real-time camera calibration in planar view scenarios using cameras mounted on a tripod. The proposed method is a combination of the tripod geometry

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