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AN AUTOMATIC ALGORITHM FOR ACCURATELY LOCATING CALIBRATION MARKERS ON A CHESSBOARD

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Abstract. *Locating the calibration markers of a chessboard is a prerequisite step to camera calibration. The efficiency and accuracy of this step has a crucial influence to the final results. This paper presents an automatic method for detection and location the internal corners of black and white squares by using Multi-Radon Transform (MRT) and image segmentation methods. The whole procedure mainly includes two steps: (1) rough positioning of the markers by using a Triple Radon Transform algorithm (TRT); and (2) precision positioning of the markers by using the Radon Transform and image segmentation comprehensively. Using this method, experiments show that a fully automatic camera calibration could be achieved, and the proposed approach is robust in dealing with different pictures that vary in different circumstances.*
Keywords: Camera calibration, Corner detection, Radon transform

1. **Introduction.** Camera calibration is the procedure of calculating the internal and external parameters of a camera, and in recent years, it has a widely usage and been extensively studied in many areas, such as photogrammetry, computer vision, robotics communities and so on. In addition, in daily life, consumer-grade digital camera has been widely popularized, and was used by the broad masses of people in different applications, such as object measurement, 3D models to support web-delivered, animations, etc. Most of this applications need the parameters of the camera firstly, and this drive people to finish the camera calibration procedure which limited in the professional fields before by themselves. So a more convenient or totally automatic camera calibration technique was needed. There are many calibration techniques: reference object-based calibration [1-3], self-calibration [4,5], vanishing points-based calibration [6,7] and rotation-based calibration [8,9], and there also exist many other new methods and techniques of camera calibration developed by different researchers [10-19]. One of them, the plane-based calibration methods as a typical category of object-based techniques have brought more convenience to many users and researchers. In the methods, a chessboard that has an obvious feature of alternating black and white squares was introduced as the planar checkerboard pattern. Z. Zhang adopted this pattern and proposed a flexibility new technique to easily calibrate a camera [20]. It only requires the camera to observe a planar pattern shown at a few (at least two) different orientations. This technique mainly consists of five steps [3], and the first indispensable one is detection and extraction the internal corners of those square in the images. The accuracy and efficiency of the step have a crucial influence for the