Real World Coordinate from Image Coordinate Using Single Calibrated Camera Based on Analytic Geometry

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Abstract. The determination of real world coordinate from image coordinate has many applications in computer vision. This paper proposes the algorithm for determination of real world coordinate of a point on a plane from its image coordinate using single calibrated camera based on simple analytic geometry. Experiment has been done using the image of chessboard pattern taken from five different views. The experiment result shows that exact real world coordinate and its approximation lie on the same plane and there are no significant difference between exact real world coordinate and its approximation.

Keywords: real world coordinate, image coordinate, analytic geometry.

1 Introduction

The determination of image coordinate of a point in real word coordinate system can be easily calculated using a transformation after camera parameters that are used in image acquisition are known [1],[2] and [3]. Generally the reverse of this problem is cannot be performed, since the transformation from real world coordinate system to image coordinate system is not invertible. Information about the depth of position loses during the transformation. But under certain condition, such as the point in real world coordinate system lies on a ground plane, determination of world coordinate from a point in image coordinate system still can be performed [4]. The determination of real world coordinate has many applications in computer vision including robot positioning [5], object reconstruction [6], and measurement [4],[7] and [8]. Therefore, determination of the real world coordinate of a point from image coordinate is challenging problem in computer vision.

Common method to determine real world coordinate of a point from image coordinate is triangulation. Triangulation is problem of determining the real world coordinate of a point from a set of corresponding image locations and known camera parameters [3]. Mohamed et al [9] and Zhang [10] have used triangulation to determine the real world coordinate of a point using two corresponding image

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