

ScreenFinder : Demo for joint rectangle detection and perspective correction

Naoki Shibata^{1,a)} Yang Wu^{1,b)}

In this demo, we will show our implementation for automatically recognizing prominent rectangular regions from the image, and make perspective correction on them. We are planning to compare our implementation to Microsoft Office Lens, which is an existing application with the same function, to show how robust our implementation is.

1. Introduction

We sometimes take pictures of white boards or projector screens. It would be handy if an app automatically detects a screen and reshape the image so that the resulting image looks like a head-on image. In this demo, we will show such a program that runs on a PC. The program consists of two parts : rectangle detection and perspective correction. Rectangle detection is a method for recognizing prominent rectangular regions from an image. From the shape of detected rectangles, the program makes perspective correction, which is to estimate the camera position and orientation, and reshape the image.

2. Related Works

Rectangle detection based on a windowed Hough transform¹⁾ would be the most commonly used method for detecting rectangles from an image. In this method, peaks of a Hough-transformed image, which correspond to line segments in the image, are extracted, and a rectangle is detected when four extracted peaks satisfy certain conditions. This method is not directly applicable if the rectangles in an image have perspective distortion.

Hasan et al. proposed a hierarchical detection method of rectangles in images²⁾. In this method, contour curves are extracted and its edges are fit to straight lines. These contours are split into segments, and classified into a number of classes according to their probability of being a rectangle. Rectangles are detected by searching for suitable lines in the neighborhood.

Haralick proposed an analytic method for determining camera parameters from the perspective projection of a rectangle³⁾. He showed that even if the width and height of a rectangle are unknown, the look angle is computable from the perspective projections of the four corners of the rectangle.

3. Proposed Method

The proposed method consists of the following steps. 1) Applying posterization to remove irrelevant lines in the input image. 2) Edge extraction and polyline conversion 3) Finding candidates of rectangular shapes 4) Pose estimation and

perspective correction. An example input image and the corresponding image after posterization are shown in Fig. 1 and 2.

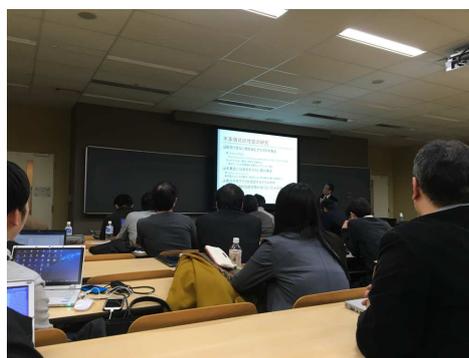


Fig 1. An input image



Fig 2. The image after posterization

Reference

- 1) Claudio Rosito Jung and Rodrigo Schramm : ``Rectangle Detection based on a Windowed Hough Transform,`` In Proceedings of the Computer Graphics and Image Processing, XVII Brazilian Symposium (SIBGRAPI '04). IEEE Computer Society, Washington, DC, USA, 113-120, 2004.
- 2) Mohamed Hasan, Mohamed Abdellatif and Noborou Babaguchi : ``Hierarchical detection of rectangles in images,`` Proc. SPIE 10011, First International Workshop on Pattern Recognition, 1001105, 2016.
- 3) Robert M. Haralick : ``Determining camera parameters from the perspective projection of a rectangle,`` Pattern Recogn. 22, 3, 225-230, 1989.

¹ Nara Institute of Science and Technology.

a) n-sibata@is.naist.jp

b) wuyang0321@gmail.com