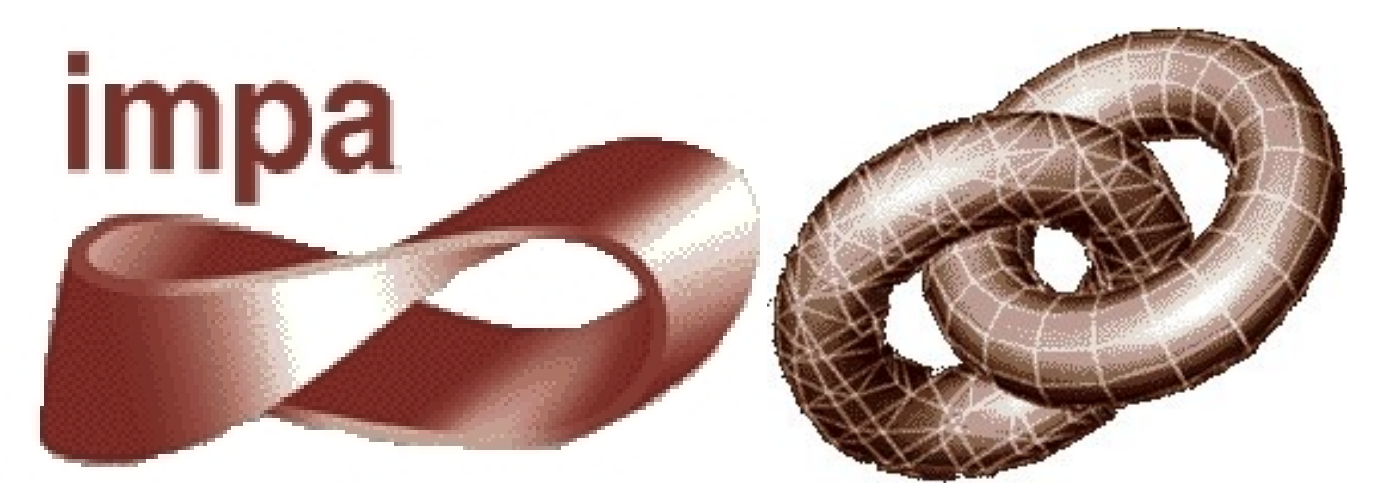


Face and Straight Line Detection in Equirectangular Images

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Introduction

Panoramic images have been theme of intense research in the last years. A well-known format for panoramic images is the equirectangular one (examples can be seen in the result section).

Equirectangular images may be input data for methods that create less distorted panoramic images. The method proposed by Carroll et al. [1] and detailed by Sacht [2] uses the localization of lines and faces to control the distortions of the final projection in these regions. These works present an automatic method to detect faces in the image but the straight lines are marked by the user himself. Our paper presents an extension of the ideas proposed by Carroll et al. [1] to automate the feature selection process.

Projections

Since equirectangular images represent the entire viewing sphere around the viewpoint, we can use projections from the sphere to the plane in order to obtain useful images for feature detection.

Below we show examples of images generated by the Mercator and the perspective projections:



Since the Mercator projection preserves shape and orientation of faces and the perspective projection preserves straight lines, we use them in our detection methods.

Face Detection Method

The method proposed to detect faces in equirectangular images consists of the following steps:

- Obtain the Mercator Image;
- Process the Mercator image;
- Detect faces in the Mercator image;
- Map the faces back to the equirectangular domain.

Straight Line Detection Method

The method we developed to detect straight lines in equirectangular images consists of the following steps:

- Obtain six different perspective images that correspond to the perspective projection of the entire sphere onto the unit cube;
- Filter the images with bilateral filter;
- Detect edges in each filtered image using Canny's detector;
- Process each one of the binary edge images in order to discard points that are not likely to belong to a straight line, using the technique described in Szenberg [3];
- Detect line segments in each binary image using OpenCV's Probabilistic Hough transform;
- Map the detected segments back to the equirectangular image.

Acknowledgements

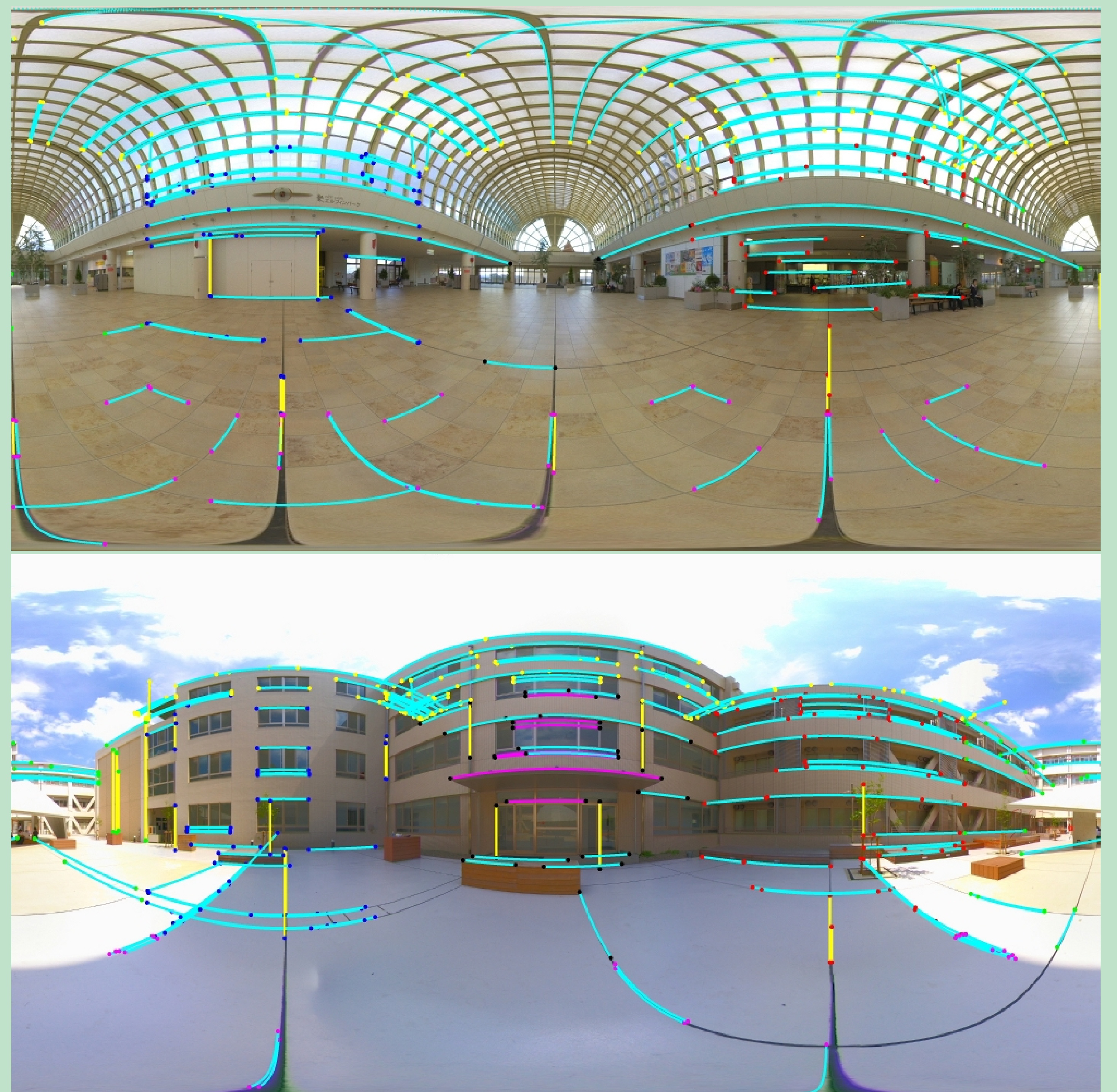
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Results

We show below two results of the face detection method:



For the line detection method we also show two results. In the first one, 161 line segments were detected and, in the second one, 225 segments were detected.



References

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