SURF-based Line Marker for Augmented Reality

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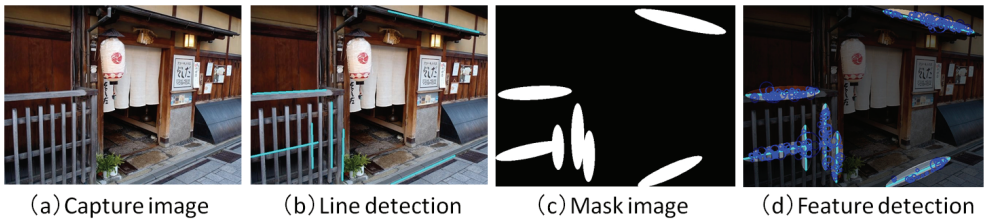

Figure 1. Line-based Marker

ABSTRACT

A SURF-based Line marker for Augmented Reality (AR) and AR tourist guide system for an iPhone is presented in this paper. In some tourist spots like Kyoto, putting up a sign is prohibited for landscape policy. However the AR marker may be put freely without ruining the landscape. In this system we display information on structures like temples, shrines, and shops. Most of them are composed of straight lines.

Hence detecting feature points around the lines, using the Hough transform, enables to reduce computational cost and memory usage.

KEYWORDS: natural features, Augmented Reality, object recognition.

INDEX TERMS:

H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems – Artificial, augmented, and virtual realities; I.4.8 [Image Processing and Computer Vision]: Scene Analysis – Object recognition

1 BACKGROUND

When using features as a marker, it is not matching step but feature detection step which takes most of the computation time. By limiting target area to domain around the straight lines, we can reduce the area by 90%. Therefore detecting features time also can be reduced dramatically.

This approach is not improving on feature detection itself like [2] but restrict on target area. Then it enables to use both other approaches like [2] and this one at the same time.

2 OVERVIEW

This system is composed of two steps: feature detection, feature matching. In the detection step, the straight lines (b) are detected using Hough transform to an image (a) (see Figure 1&2). Next a mask image (c) which is drawn ellipses around each straight lines is created and feature detection (d) is done using it at last. In this approach, we use this set of feature points contained in one ellipse as a marker and store in the database.

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In the matching step, this system uses Nearest Neighbor Search and recognition rate is about 70%. On the other hand it is effective approach to reduce memory usage since the number of detected feature points are reduced by 90%. It is also effective to reduce computational cost and reduces detecting time by 60%.

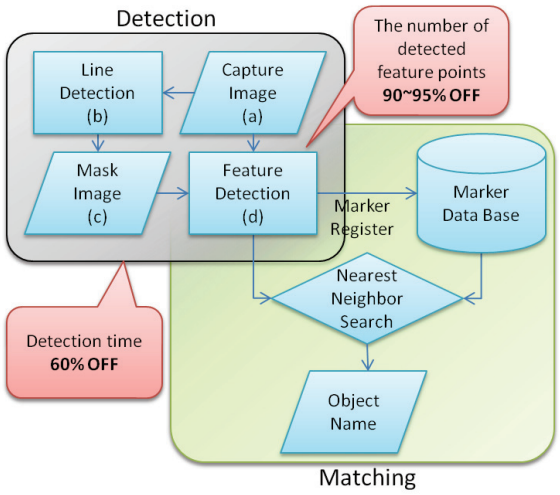

Figure 2. System Flow

3 DEMONSTRATION

In our demonstration, this system is actually run on an iPhone. Although it is originally a guide system for tourist, some substitutes are used instead of buildings this time. We register those data as markers in advance and display the name and information when you take a picture of them.

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