Implementation of Object Detection and Tracking

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ABSTRACT This paper proposes a robust object detection and tracking method to localize and track the interesting objects from input video stream, which is consisted of 3 modules; object detecting, tracking and learning. The experimental results show that the proposed approach is more robust in the appearance changes, viewpoint changes, and rotation of the object in the view, compared to the traditional method.

Keywords: Object Detection, Object Tracking, Object Learning, Speeded-Up Robust Feature (SURF), Locality Sensitive Hashing (LSH)

1. INTRODUCTION

Object tracking is one of the most important components in computer vision, such as surveillance and human computer interaction [1]. The goal of object tracking is to keep track of an object in a video sequence. A tracking algorithm is initialized with a frame of a video sequence and a bounding box to indicate the location of the object we are interested in tracking [2]. This paper presents and implements a robust object detection/recognition and tracking system to localize and track cultural heritage objects, which is consisted of three modules; object detection, tracking, and re-detection. Object detecting module speedily recognizes the cultural object using locality sensitive hashing (LSH) based on the constructed database, and then initializes and update the object information for the use of tracking. This module can also re-detects object using the learned object information, and aligns the learned information based on current frame when the object tracking failed. Tracking module traces the wanted object by using feature points and histogram, and learns the object information after estimating the obtained information about the object.

2. THE PROPOSED SCHEME

Figure 1 shows a work flow of the proposed scheme based on set of cyclically inter-connected three modules. Each module deals with specific type of input data, which is elaborated to provide appropriate data to the next module.
First, the proposed system is initialized by feeding video from a camera view of mobile phone. The first step of the proposed approach is distinguishing foreground objects from stationary background. To achieve this, we use a combination of adaptive background subtracting and image pre-processing to create a foreground pixel map at every frame. The object recognition module extracts feature points and identifies a tracking object by using SURF and Locality Sensitive Hashing (LSH) algorithm. The output of the extracted object information is required by the object tracking module which traces the interest object using feature points, descriptors, sub-window of the object, and its histogram. This module should re-detects the object using the learned object information, when the interest object is missing in the tracking.

To evaluate a performance of the proposed detection and tracking method, we use 3 sample images, which are trained offline by training image data. Experimental tests focus on target object modelling and matching with the trained object, and these are concentrated on how well does it detect the target object and how robust does it on appearance changes, changes scale, and covered object. Figure 2 shows an example screenshot of the execution results, running on the change of rotation and scale for interesting object.

3. CONCLUSION

This paper presents and implements a robust object detection and tracking scheme, which uses the improved feature extracting, matching, and tracking with low complexity for using in real-time environments. The proposed algorithm recognizes objects with invariant features, and reduces dimensions of the feature descriptor for using on mobile devices. Experiments show that the proposed method is more robust than the traditional methods,

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REFERENCES