International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2017): 7.296

To Design and Develop Grid Object Detection System

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Abstract: ***A method to detect and identify multiple objects in an image using grid voting of object center positions estimated from local descriptor keypoint matches. For each keypoint match, the proposed method estimates the object center position using scale and orientation associated with the keypoints. Then, it casts a vote for an image grid where the estimated object center is located. For the grids with high number of votes, geometric verification of the keypoint matches is carried out to accurately localize multiple objects in the image.***

Keywords: Sift feature**,** feature extraction, Object detection, matching

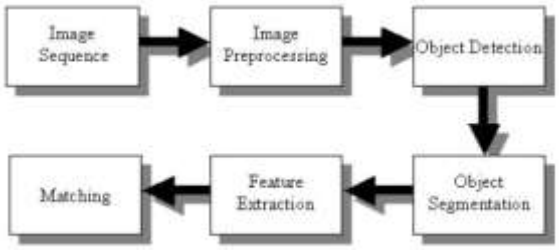
1. Introduction

The area of intelligent systems, object detection which is the task for searching and localizing objects in a scene is deliberated as prime feature for autonomy. This fact has impelled unprecedented research in this field and as a result several algorithms have been proposed in last two decades. The performance of all these algorithms has been promising up to some extent but the global acceptance of a single algorithm is still debatable. It has been frequently regarded that human visual system works on the pattern in which it makes series of fixations at various conspicuous locations in an image while observing static or dynamic scene. It has spurred many researchers but unfortunately very little is known about operations carried out in human eye while fixation. In our proposed method, we postulate that during a fixation, before recognizing any object human eye first of all segments that object out of that image in lieu of segmenting the entire image at once. So, we perform region based segmentation with the help of fixated points. In computer vision SURF is patented as local feature detector and descriptor. SURF detector has been used to locate and recognize objects. SURF was first presented by Herbert Bay at 2006 European Conference on Computer Vision [2]. Interest points are detected using SURF method in which determinant of Hessian and Blob detector approximate values are calculated. Its feature descriptor is based on sum of the Haar wavelet response around the point of interest. SURF algorithm is implemented in three divisions as Interest point detection, local neighbourhood description and matching.

2. Related Work

Various local descriptors, such as SIFT and SURF which are robust to scaling and rotation of an object, have been proposed for identifying objects between query and database images. A conventional method to detect and identify objects extracts local descriptors around keypoints detected in the query image, and computes local descriptor distances to find keypoint matches between query and database images.

3. Methods



1. Image sequence: A digital image is produced by one or several image sensor which, besides various types of light-sensitive cameras, includes range sensors, tomography devices, radar, ultra-sonic cameras, etc. Depending on the type of sensor, the resulting image data is an ordinary 2D image, a 3D volume, or an image sequence. The pixel values typically correspond to light intensity in one or several spectral bands (gray images or colour images), but can also be related to various physical measures, such as depth, absorption or reflectance of sonic or electromagnetic waves, or nuclear magnetic resonance.

2. Pre-processing: Before a computer vision method can be applied to image data in order to extract some specific piece of information, it is usually necessary to process thedata in order to assure that it satisfies certain assumptions implied by the method. Examples are

a) Re-sampling in order to assure that the image coordinate system is correct.
b) Noise reduction in order to assure that sensor noise does not introduce falseinformation.
c) Contrast enhancement to assure that relevant information can be detected.
d) Scale space representation to enhance image structures at locally appropriate scales.

3. Feature Extraction: Image features at various levels of complexity are extracted from the image data. Typical examples of such features are

a) Lines, edges and ridges.
b) Localized interest points such as corners, blobs or points.

More complex features may be related to texture, shape or motion.

4. Detection/Segmentation: At some point in the processing a decision is made about which image points or regions of the image are relevant for further processing. Examples are

a) Selection of a specific set of interest points
b) Segmentation of one or multiple regions which contain a specific object of interest.

4. Conclusion

An automated recognition system for the sample image using scale invariant feature transform. It is observed that the system result in better classification during the recognition process. Using Grid voting scheme, method runs much faster than the conventional method using mean shift, while identification accuracy is maintained. The proposed method can accurately detect and identify multiple identical objects. The proposed method reduces the computational time by approximately 60% compared to the conventional method, while identification accuracy is comparable.

References

[1] D. Lowe, "Object recognition from local scale in variant features," IEEE International Conference on Computer Vision, vol. 2, pp. 1150-1157 1999.
[2] H. Bay, et al., "SURF: Speeded up robust features", Computer Vision and Image Understanding (CVIU),vol. 110, no. 3, pp.346-359, 2008.