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Smart Surveillance Security Systems 4s for Detection using SIFT and SURF in Image Processing

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Abstract— Surveillance video is used for security purpose in our daily life in various places. It is used to observe the unusual activity that is taking place around us. Today in most of the shop owners have CCTV cameras to record, the uncertain activities and even it is used in houses in remote places. A system must be smart enough to detect. This paper uses SIFT and SURF algorithm for detection. Image registration is a development in which more than two images from various imaging equipment are reserved at various angles and at various times from the identical prospect and geometrically aligned for further exploration. Data may be from different sensors, CCTV taken at different times, depths, or perspective. Feature-Detector-Descriptor plays a vital role in feature matching application for selection of feature; this paper presents a comparative analysis of SIFT, SURF, algorithms. Experiments have been conducted on a wide range of images taken from datasets. A quantitative comparison is presented. This paper gives an useful ideas for making important decisions and it also helps in providing a smart security system.

Keywords—SIFT; SURF; image registration; nearest neighbor distance ratio; feature matching; scale invariance; rotation invariance; affine invariance; image matching; feature detection;

I. INTRODUCTION

Image registration applications are Real Time Alerts which includes user defined alerts, Generic Alerts, Classic Specific Alerts and Behavioral Alerts for Video Processing. Developing an optimized method that suits for all users as there are wide ranges of application due to images geometric radiometric distortions and noise disturbance, data characteristic and accuracy threshold level are still in process.

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The significance of image registration techniques develops with developing number of different types of data acquisition devices and their increasing availability. Objects needed for image registration can be aligned that can be simply translated and rotated to one another.

II. LITERATURE SURVEY

A. Scale Invariant Feature Transform (SIFT):

The most renowned feature-detection-description algorithm, Scale Invariant Feature Transform (SIFT) was introduced by D. G. Lowe in 2004 [13]. SIFT detector is based on Difference-of-Gaussians (DoG) operator, an approximation of Laplacian-of-Gaussian (LoG). DoG is preferred because of low computational complexity and it does not need partial derivative computation. It also obtains local extrema of images with a difference of the Gaussian.

SIFT algorithm can be divided into four steps:

- DoG Generation
- Keypoint Detection
- Orientation assignment
- Feature descriptor generation.

It is a technique used for detecting prominent, stable feature points in an image. It also responsible for a set of ―features‖ describes a small image region around the point. These features are invariant to rotation and scale. The applications need to sense the unwavering points in two or more image and determine the communications between them. In order to determine the communications correctly, we need some features portraying a significant point. These features obligation does not change with the Object position or pose, Scale, Enlightenment and the Minor image artifacts.

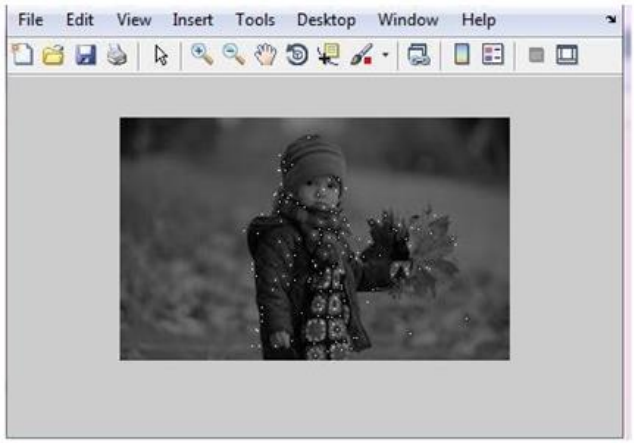
We can also continue with the nearby matching patches around the feature points, but they will transformed to themselves, if there is a change in pose or illumination and they may lead to false matches. It remains invariant to changes in scale or rotation.

DoG images are produced by image convolving with Gaussians at each octave of the scale space in the Gaussian Pyramid. Gaussian image is based on the number of octaves. It is down sampled in every iterations.Key point generation involves key point localization. Each pixel in the DoG image is matched to its neighboring pixels. Key points can be local maximum or local minimum. The final sets of key points exclude low contrast points.

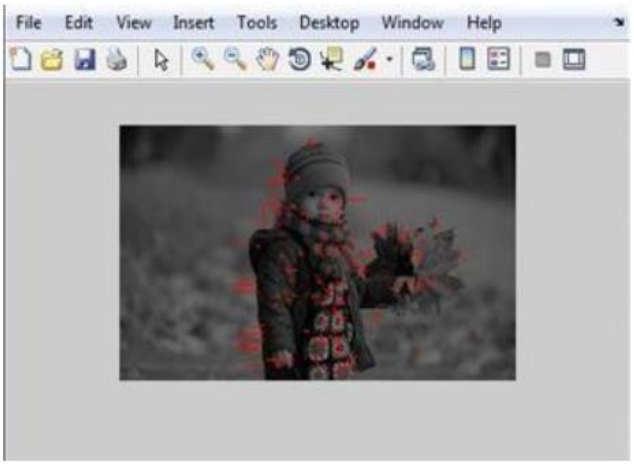
Key point orientation is the local image gradient histogram in the neighborhood of the key point. Dominant orientations are selected as the peaks in the histogram. For each key point, feature descriptors are computed.

Original Image

Gray scale Image



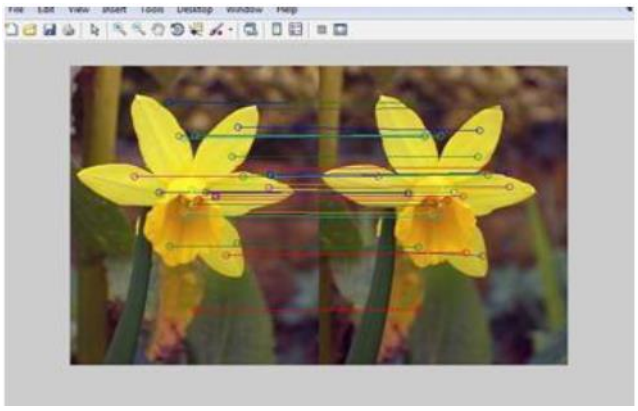
SIFT Feature Extracted



SIFT Feature Extraction with Gaussian Value

B. Speeded Up Robust Features (SURF):

It is a upgraded technique of SIFT. It uses approximate Gaussian second derivative mask to an image at varies scales. SURF is a fast technique, because of the procedure of an integral image where the assessment of a pixel (x,y) is the amount of all ethics in the rectangle defined by the source and (x,y). The foundation image can be found as the outcome of 4 operations. It facilitates a very little computing time, as it allows a rectangular mask of any size to be applied. To detect features, we assemble the Hessian matrix. The SURF descriptor is designed to be scale invariant and rotationally invariant. After generating feature descriptor, the dominant orientations of the area are rotated to the dominant orientation of the feature points. For analysis we used the functions SURF.detect(), SURF.compute() for finding keypoints and descriptors. 1199 keypoints is too much to show in a picture. We reduce it to some 50 to draw it on an image. While matching, we may need all those features, but not now. So we increase the Hessian Threshold. If we apply U-SURF, we won't find the orientation. All the orientations are shown in same direction. It is faster than the SIFT.



Output of the wrapped figure

III. EXPERIMENTS & RESULTS

To verify the effectiveness of the two algorithm images are taken as the experimental data. Features are detected for images using SIFT and SURF algorithm. In SIFT number of scale space intervals are given as 3. Gaussian kernels also calculated.

For calculating accurate local key point set the threshold value as
0.03. The patch size for dominant orientation calculation is 9 and the patch size for feature transformation is 16. With the scale space corner index the features are extracted and the output is displayed for SIFT. SURF detects the points by a vector which is robust against rotation, Scaling and noise. Hessian response threshold is given as 0.0002. With the help of many sub functions the SURF extract the features from the given image and the output are mentioned above. The investigational outcomes provide amusing figures and different original insights that are treasured for producing critical assessments in Smart Surveillance Security System. The Table 1 shows how the feature extractions of two algorithms are analyzed with some parameters.

Table 1: Comparison between SURF and SIFT

S.No	Parameters	SIFT	SURF
1	Accuracy	High	Moderate
2	Detect High Quality Of Features	Moderate	High
3	Computational Efficiency	Moderate	High
4	Matching Per Feature-Point for effective matching	Moderate	High

IV. CONCLUSION

This paper provides a complete assessment of SIFT and SURF based on feature-detector-descriptors. SIFT, and SURF are conventional as the most balanced invariant feature detectors established on the foundation of repeatability, that have persisted comprehensive extent scale dissimilarities. SIFT have greater accuracy as associated with SURF for image rotations. The comprehensive accurateness of SIFT is establish to be maximum than SURF for all categories of geometric conversions and SIFT is determined as the most truthful algorithm compared to SURF. The capability to distinguish great quality of structures is SURF than SIFT. The computational efficiency of feature-detection- description per feature-point is better in SURF than in SIFT. But the order of proficient feature-matching per feature-point is better in SURF as mentioned in table. Further we implement this technique in video registration.

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