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Image Processing using SIFT

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Abstract: Nowadays, computer Vision Technology is playing a very important role to understand the information present in image format. The object details those are in the form of an image can be treated to find.This paper proposes the object finding method to help visually impaired people. The SIFT can extract distinctive features in an image to match different objects. The proposed recognition process begins by matching individual features of the user queried object to a database of features with different personal items which are saved the database.

Keywords: SIFT, Key Points, Morphological Operations, Matching, Descriptor.

I. INTRODUCTION

According to the estimates of WHO it is recorded that about 2.6% of the world population was blind in records found in 2002. These Visual impairments present severe consequences on certain capabilities related to visual function, to meet the challenge of finding the daily needs it is essential to have the effective object detection method. Features extraction is the process by which certain features of interest within an image are detected and represented for further processing, For this reason, we are interested in finding the most robust and invariant method to detect the object. In this paper, we develop a method to help blind people finding missing items based on speed and the matching feature extraction. Devices for the visually impaired often use the idea of sensory substitution, in this paper, we are proposing to find the most efficient method that can find more features within variations within less time.

II. SIFT OVERVIEW

In SIFT algorithm key points of objects are extracted from a set of reference images and stored in a database. An object is recognized in a new image by individually comparing each feature from the new image to this database and finding candidate matching features based on the Euclidean distance between their feature vectors. From the full set of matches, subsets of the key point that agree on the object and its location, scale, and orientation in the new image are identified to filter out good matches. Each of the SIFT key points specifies a 2D location, scale, and orientation, and each matched key point in the database has a record of its parameters relative to the training image in which it was found.

III.MORPHOLOGICAL OPERATIONS

Dilation and Erosion are fundamental morphological operations.

A. Dilation

Dilation usually represented by $\oplus$. Dilation finds local maxima in binary or intensity images. The dilation operation usually uses a structuring element for probing and expanding the shapes contained in the input image.The Dilation block rotates the neighborhood or structuring element 180 degrees. Then it slides the neighborhood or structuring element over an image, finds the local maxima, and creates the output matrix from these maximum values. If the neighborhood or structuring element has a center element, the block places the maxima there. If the neighborhood or structuring element does not have an exact center, the block has a bias toward the lower-right corner, as a result of the rotation. This block uses flat structuring elements only.The block places the maxima there, as illustrated in the following figure.

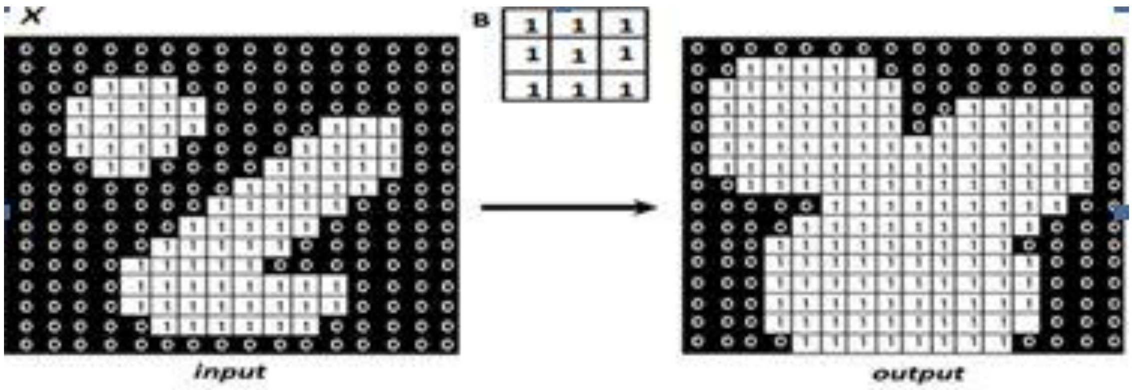


Fig. 1 Effect of Dilation on 3x3strucural element

Here are some properties of the binary dilation operator

- It is translation invariant.
- It is commutative.
- It is associative
- It is distributive over set unit

B. Erosion

Erosion usually represented by ⊖ .Denoting an image by f(x) and the grayscale structuring element by b(x), where B is the space that b(x) is defined, the grayscale erosion off by b is given by

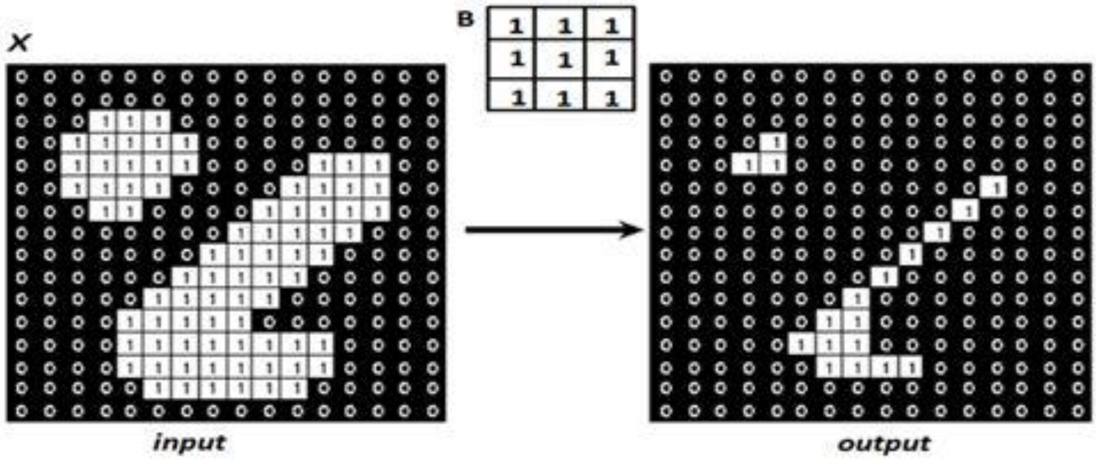


Fig. 2 Effect of Erosion on 3x3strucural element

In other words, the erosion of a point is the minimum of the points in its neighborhood, with that neighborhood defined by the structuring element. In this way, it is similar to many other kinds of image filters like the median filter and the Gaussian filter.

Here are some properties of the binary dilation operator

- The erosion is translation invariant
- It is increasing
- If the origin of E belongs to the structuring element B, then the erosion is anti-extensive.
- The erosion is distributive over set intersection.

C. Image Filling

Region filling is based on the set dilation, complementation & intersection. The image filling process replaces values in the region with values that blend with the background. It uses an algorithm based on morphological reconstruction. Mathematically given as,

$$X_k = (X_{k-1} \oplus B) \cap A^c \qquad for \;\; k=1,2,3.......$$

Where $X_{0}=p$ and B are symmetric structuring element. The dilation process fills the entire data if left unchecked, the intersection at each step with A^c limits the result to inside the region of interest.

D. Opening

The Opening block performs an erosion operation followed by a dilation operation using a predefined neighborhood or structuring element. The block operates on a stream of intensity values. Opening generally smooths the contour of an object, breaks narrow isthmuses and eliminates thin protrusions. Mathematically represented as

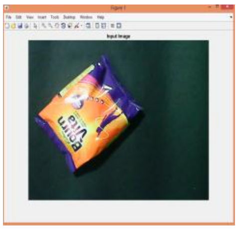
$$A \circ B = (A \ominus B) \oplus B$$

Thus, the opening A by B is the erosion of A by B, followed by a dilation of the result by B

E. Segmentation

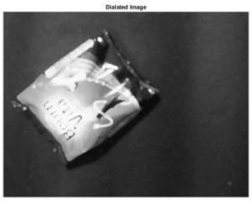
Segmentation subdivides an image into it constitutes region or object. The level to which the subdivision is carried depends on the problem .hence segmentation should stop when the object of interest in an application have been isolated.Image segmentation algorithms generally are based on one of the two basic properties of intensity values as discontinuity and similarity. Thresholding, region growing and region splitting, and merging are a case of segmentation.

III. OUTPUT

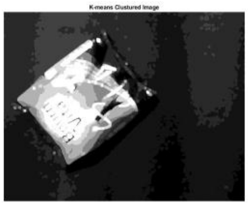


Input Image

Filtered Image



Dilated Image



Cluttered Image

Segmented Filled Image

Segmented Dilated Image

Detected Image

Fig. 2 OUTPUT IMAGES FOR IMAGE 1

TABLE I
Output Result Summary

Image No.	Parameter		
	Object Identified	Time(sec)	Key point
1	Bournvita	8.018	314
2	Bournvita	8.325	342
3	Bournvita	22.12	352
4	Mortin	8.21	412
5	Mortin	8.1217	530
6	Mortin	8.1808	536
7	Colin	7.6905	319
8	Colin	7.773	354
9	Colin	7.7632	316

CONCLUSIONS

SIFT is scaled invariant feature detection technique used here to detect the object. Using SIFT object has detected for different angles of rotation. The sufficient key points are detected with the satisfactory time span.

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