PROJECT TITLE: Pre-Processing Images for Classification Algorithms Using SIFT And SHI-TOMASI

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ABSTRACT

Diving deep into the realm of computer vision, I intend to acquire deep and structured processing of a photo and its visible components, to derive a whole perception of the contents of the photo and its descriptors. I have tried to put into effect the critical processing and consciousness algorithms to a given picture to extract a characteristic vector that categorizes them into the respective classification of objects. The important goal of this assignment is to get a robust basis and thorough grasp by way of exploring every technical purpose of this task as in-depth as possible. Feature detection is a low-stage image processing operation. When it's a far segment of a massive set of rules, then the set of rules will commonly entirely study the photograph inside the region of the functions. Features in all likelihood particular homes with inside the photograph which includes points, edges, or objects.

Feature detection consists of strategies for computing abstractions of photograph information. The fundamental photograph functions edges and corners. Corners are used to consult point-like functions in a photograph. Earlier algorithms carried out area detection, after which analyzed the rims to locate speedy modifications in the course i.e. corners

INTRODUCTION

This paper gives an approach for Feature Extraction or Detection is a key thought in photo processing, as these assist the laptop to locate the relation between pictures i.e discovering patterns in images. Typically any photo consists of a lot of information, the photo as a total is the grouping of more than one smaller portion of information, simply like a puzzle in which the separate portions are organized to shape a greater picture. Identifying these small portions of statistics and getting to know what it is and discovering an associated piece of data in different pix is function extraction and description. In images, objects can be recognized with the aid of their edges, corners, or flat surface. SIFT or Scale Invariant Feature Transform is a characteristic detection algorithm, that helps in discovering elements in unique scaled pictures and oriented

images. This algorithm finds key factors in exceptional scales for every octave (Image Pyramids) and scales and orients the key factors so that these key factors can assist perceive the identical object in more than one image. Pre-processing the picture earlier than SIFT by way of making use of filters, to higher enhance the function extraction is the purpose of this project. A pre-processed photograph reduces the trouble prompted with the aid of the authentic image. pre-processing outcomes in higher results. Shi Tomasi is one of the strategies of nook detection that is to be briefed.

LITERATURE SURVEY

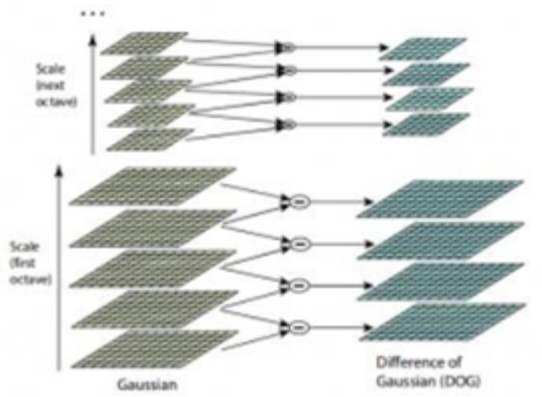
In This paper ,identify the objects among clutter and occlusion while achieving using Classification algorithm [1] The classification algorithm which they used a largest set of features to detect images [2].Feature points of the image are extracted by SIFT algorithm to find the method of local feature and shape similarity retrieval and classify the images [3].Automatic iris classification when dealing with missing information using face recognition, based on Scale Invariant Feature Transform (SIFT) [4]. The coloration SIFT strategy outperforms the grey SIFT strategy in phrases of processing time and accuracy [5]. The applica- tions of object recognition system and variaous challenges faced while recognizing the object [6]. Locality Preserving Projection (LPP) dimensionality reduction algorithm is explored to reduce the dimensions of obtained image feature vector. [7]. this paper is to introduce a revolutionary way of the usage of a low-pass spatial filter alternatively of window characteristic of Shi- Tomasi nook detector, which is an enhancement of the Harris nook detector [8] This paper describes a framework for steel surface defects detection and classification. We use SIFT for defects regions detection and features extraction [9]. This find out about targets to increase a

higher site visitors violations administration gadget in city-road intersections by means of the usage of a computer imaginative and prescient gadget that routinely identifies and tags site visitors violations dedicated in an intersection [10]

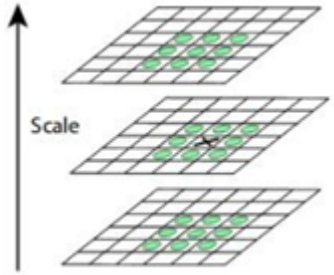
ALGORITHM

About Sift algorithm,

Constructing a Scale Space, this involves image pyramids. The image scaled is upto 4 octaves. In each Octave, 5 different scales are done. The Scaling involves Gaussian blurring, by altering the sigma values. The Gaussian blurring is used to reduce the noise. Just as Laplacian pyramid in Image pyramid, concept. A set of new images is got here. But that is done by the difference of Gaussian between the images of the same octave, and not between octaves. This produces an edge image.



Keypoint Localization. Here the new set of images is feed, to find the keypoints. Keypoints are found by local extrema. A pixel in a scale is compared with its neighbouring 8 pixels and 9 pixels each in the scales above and below. If the pixel is a local minima or maxima, it is a keypoint.



The keypoints can have low contrast and edges, these need to be removed. Taylor's series is done. The keypoints below a threshold value is discarded, next a second order Hessain matrix is done to discard the poor keypoints m such as edges or near edges. This method is just like the one in Harris Corner detection. Orientation Assignment. Here a neighborhood around the keypoint is taken, and the magnitude and oreintaion is found.

$$\text{Magnitude} = \sqrt{[(G_x)^2+(G_y)^2]} = 16.64$$

$$\Phi = \text{atan}(Gy / Gx) = \text{atan}(1.55) = 57.17$$

The above is an example taken from a sample where the Gx = 9 and Gy = 14 After this histogram is plotted for magnitude and orientation. The highest peak is

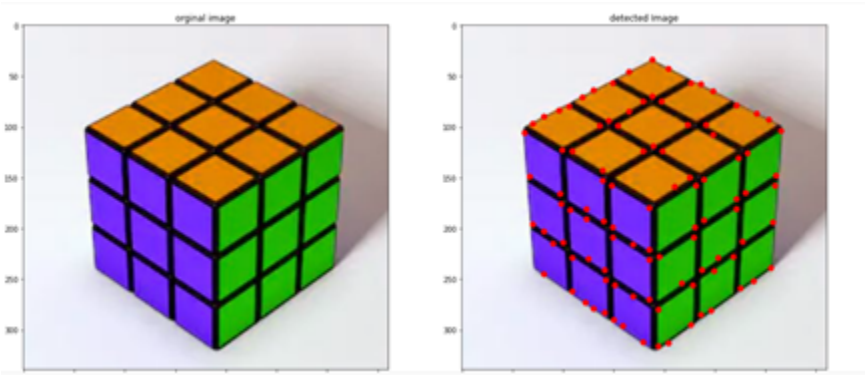
selected, also any peak above 80% is also selected. This stage can introduce new points, as number of peaks can be above 80%. Now keypoint descriptor is created.

PROPOSED WORK

In the first set of images we see, Eiffel Tower present in everything. But the difference is the Tower is in different scale and orientation. SIFT is a Feature Detection and Description method, which identifies the key points in a image. These key points generated can be matched with another set of key points. This allows the computer to recognize the same object in different scales. In the second picture, we see the matching od key points in two different images.

Figure 1: Sift Scaling image

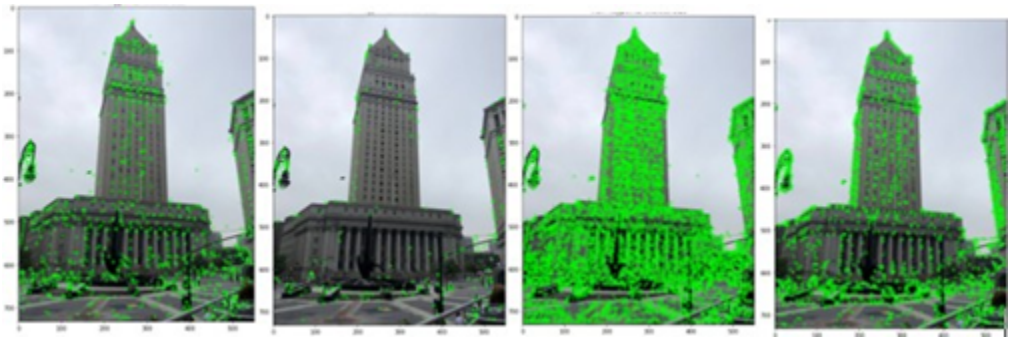
Shi Tomasi is an upgraded version of harris corner detection,which fantasised me to explore more about it. The Shi-Tomasi Corner Detector uses a different score to find the corners compared to Harris corner detection. The value of R score is thresholded to find the required corners and edges in the photo. Research paper was referred ,This detection method is found to be used as an low pass filter . It detects corners for several applications : image alignment, image stitching , object recognition and so on. Shi-Tomasi corner detection method is a really cool and easy algorithm to detect-those-corners using the simple concepts of intensity gradients. Now We can understand how exactly the theShi-Tomasi Corner Detection algorithms work and see how to implement them in OpenCV.



RESULTS

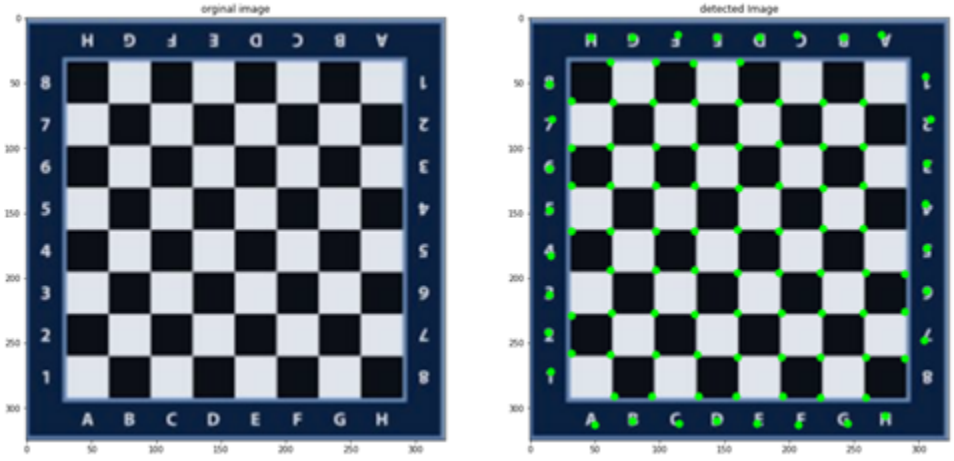
Since SIFT set of rules works on nearby gradients, edges identity and noise elimination are necessary, in order that undesirable capabilities aren't detected. A Gaussian excessive by skip clear out or gaussian blur with side detection may be carried out to pre-procedure the image Also in working, the

Sift uses DOG (Difference of Gaussian) which is similar to the Laplacian of Gaussian. The out- put of this stage looks similar to that of a High Pass Filter. Even Gaussian blur with image sharpening can be done in the spatial domain. Explored Techniques that made the project understandable and easy to point using these techniques are :High Pass Filter: This filter removes noise with Gaussian smoothing and then sharpens the images. This results in a clear-cut image (edge or outline). But the outcome of Sift showed fewer key points. Spatial Blur + Sharpening: The image is first Blurred and then Sharpened. This makes the image brighter and resulted in more number of key points. High Pass Filter + Spatial Blur + Sharpening: This combination produced similar results as the one before.Spatial Blur + Sharpening + High Pass Filter: This Improved better to the only HPF method, but produces key points lesser than the Spatial Filters combined. But the results produce a decent number of key points. Looking at the output of SIFT, we can see some key points located in the background(clear sky), If our aim is to just want the for ground objects, those points are unnecessary. Tech- nique 1 produces very minimal amount of points to train the model. But doesn't take the unnecessary points. Technique 2 reflects the bad points but found more number of key points, which is useful as more key points to identify an object, but the con is too many points are so closely clubbed like a cluster of noise. The same happens to Technique 3. Technique 4 combination those produces mini- mal points compared to Technique 2 and 3, does an decent job, by providing enough points without cluster of noise to identify images. Technique 4 can be used to pre-process the image to improve the results of sift.



Shi-Tomasi is nearly comparable to Harris Corner detector, aside from the way the rating (R) is calculated. This offers a higher result. Moreover, in this method, we can locate the pinnacle N corners, which would possibly be beneficial in case we don't desire to become aware of every and each corner.To conclude, Harris & Shi-Tomasi nook detection strategies are some truely cool and effortless algorithms to detect-those-corners the use of the easy ideas of depth gradients. Shi-Tomasi is a barely higher model after simply altering the rating formula. We realize corners for various purposes : photo alignment,

photo stitching (object recognition, 3D reconstruction, movement monitoring and so on.



CONCLUSION

The SIFT keypoints described in this paper are in particular beneficial due to their distinctiveness, which allows the right in shape for a keypoint to be chosen from a massive database of other keypoints. This strong point is done by using assembling a high-dimensional vector representing the picture gradients inside a neighborhood vicinity of the image. The keypoints have been shown to be invariant to photograph rotation and scale and strong throughout a enormous vary of affine distortion, addition of noise, and alternate in illumination. Large numbers of keypoints can be extracted from normal images, which leads to robustness in extracting small objects among clutter. The reality that keypoints are detected over a whole vary of scales skill that small neighborhood aspects are reachable for matching small and rather occluded objects, whilst large keypoints function nicely for pics concern to noise and blurFeature detection is a low-level photograph processing operation. When it is section of a large algorithm, then the algorithm will usually solely take a look at the picture in the area of the features. Features can also be precise constructions in the photo such as points, edges, or objects. Feature detection consists of

techniques for computing abstractions of picture information. The primary photo points edges and corners. Corners are used to refer to point-like facets in an image. Earlier algorithms carried out area detection, and then analyzed the edges to discover speedy modifications in course i.e. corners

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