A MORE CONVENTIONAL METHOD FOR IMAGE MATCHING OF HAZY IMAGES

Ashwini M. Meshkar
P.G Department of Computer Science & Information Technology
Sant Gadge Baba Amravati University
ashwinimeshkar@gmail.com

Abstract

This paper presents a conventional method for matching problem of hazy and blurred images. In such images it is difficult to extract the local features effectively because the features get affected by the change of scale, illumination, haze, contrast and blur. So digging into this problem and proposed a method which will help to extract those features with prediction of being more discriminate and able to perceive the difference among two or more images with more accuracy. And hence makes the procedure easy to match two images by using their feature's similarity. It is unique and first method to work with such combination of SIFT descriptor with SMR instead of using the ambiguious Euclidian distances.In recent years, a lot of local feature schemes have been proposed to improve the image matching performances. In this paper, SIFT descriptor is used along with stepwise multiple regression(SMR) method to exctract the features which are more able to discriminate among images and can successfully give the matching results among the query image and the reference image.The paper is divided among several sections.At first the need is discussed along with that the existing methodologies and their advantages and disadvantages are stated. Next proposed the method in detail.SMR method is described in detail. At last the paper conclude with the advantages of proposed methodology.

INTRODUCTION:

Image matching is of great importance in the field of computer vision. It is widely used in medical imaging, website image retrieval, military automatic target recognition, and also optical imageanalyzing Especially in case of those images which are affected by environmental factors it is a tedious task to exactly extract the image features. Because there may exist affine transformations in terms of its shift, rotation, zoom and shape deformation and variety of surroundings between samplings of the same object. Therefore, regarding the extraction of features from images degraded by contrast and haze many method,based on image matching has been extensively presented in the past years. There are two types of image matching algorithms [1]: the template-based and [2]the feature-based.

The first ones recognize targets through the comparison of the gray-scale diversity between the reference and observed images. It can perform good for the images with small size and small gray-scale range.But it seems to be invalid when changing the viewpoint of sensors or the gray-scale range. Hence, it is not suitable for actual target recognition. Compared with the template-based algorithms, the feature-based ones have better robustness for the change of viewpoint,change of scale and illumination. But it is found that the development of the image matching algorithms based on features has been limited by the weak robustness for disturbance and the invalidation problem during extracting features and the low computing performance [4][5].

In this work, in order to extract the features from hazy images accurately the focus is given on best method using SIFT descriptor has been proposed. Feature descriptors must be invariant

to small changes in illumination ,viewpoint and noise. In case of SIFT features ,descriptors are based on histogram [4] .The method uses SIFT descriptor
based on affine invariant feature to address these challenges,because among local features SIFT has become one of the most impressive method for image matching and object recognition.Then after the keypoints detection the features are selected using the regression concept that is the forward and backward stepwise multiple regressssion. Generally the Euclidian distances are used to selet features but the drawback here is they are limited as it is used only for uncorrelated variables .The regression step will result in smaller subset of features with correlation coefficient value that explains a significantly large amount of the variance. More the variance easier will be the matching process.The method can be proven to be more accurate and optimal. Since among the final subsets the optimum valued features will be used for the process of image matching. Hence it can resolve the problem of exact feature extraction from hazy images and further their comparison problem and seems to be optimistic approach as compared to the other state-of-the-art methods.The advantage is that it increases the feature diversity of different targets to reduce misjudgment rate during recognizing targets.The performance enhancement and better robustness for noise, gray-scale change, contrast change, illumination can be achieved with the proposed method.

BACKGROUND:

In this work,a conventional method for image matching of hazy images has been proposed. Feature descriptors must be invariant to small changes in illumination ,viewpoint,contrast and noise. Haze is the atmospheric phenomenon that dims the clarity of an observed scene due to the particles such as smoke,fog and dust.As a result the original contrast is degraded and gradually the scene features are faded.therefore selection of correct feature exctractor is important.In this work scale invariant feature transform (SIFT)is used.Whereas in some methods[7] SURF descriptor is used but when compared SIFT has good scale invariance and robust to illumination and viewpoint changes. Owing to the scale invariance of the detector and the descriptiveness of thr descriptor ,SIFT-based methods have been successfully used in image matching and registration. Compared with the template matching feature based matching such as SIFT has higher precision. Selection of the features is done using the forward and backward stepwise multiple regression.The regression step will result in smaller subset of features with correlation coefficient value that explains a significantly large amount of the variance. Among the final subsets the optimum valued features will be used for the process of image matching.The advantage is that it increases the feature diversity of different targets to reduce misjudgment rate during recognizing targets.The performance enhancement and better robustness for noise and contrast can be achieved with this method.

PREVIOUS WORKDONE:

Many methodologies have been proposed regarding image matching using local features. The method of probabilistic feature matching by Ziming Zong et.al.[1] presented a novel image similarity learning approach based on Probabilistic Feature Matching (PFM).Matching process in here is considered as the bipartite graph matching problem, and defined the image similarity as the inner product of the feature similarities and their corresponding matching probabilities, which are learned by optimizing a quadratic formulation. This approach is the generalization of a family of similarity learning approaches, including SK, MK, and OAK. Also the fast image matching algorithm(FIMA) proposed in this more suitable for actual ATR applications. FIMA and AD-FIMA increase the feature diversity of different targets and expected to reduce misjudgment rate in recognizing single target in optical images. “Fast image matching algorithm based on affine invariants”has been presented by Zhang Yi et.al.[2]which utilizes the geometry feature of extended centroid to build affine invariants and have better robustness Also the “simple block matching” method[3] was proposed by Hong-Chang Shin et.al. where practical solution was given for intermediate view interpolation using simple block matching and guided image filtering.“A novel robust descriptor for image matching” methodology by Wen Zhou et.al.[4] is also proposed previously to perform reliable image matching under large variations.The main advantage is that two controllable parameters of elliptical sampling can generate descriptors with different viewpoints and rotations. But the optimality of results is less than proposed methodology in this paper. In the method by Cosmin Ancuti et.al.[5] the method for "effective contrast-based dehazing for robust image matching" have been presented. User interaction is not required by enhancing such images by restoring the contrast of the degraded images. The degradation of the finest details and gradients is constrained to a minimum level.This dehazing technique is suitable for the challenging problem of image matching based on local feature points, but it does not intend to fully recover the original colors of the scene.

EXISTING METHODOLOGY:

The method of probabilistic feature matching[1] was presented which is a novel image similarity learning approach based on Probabilistic Feature Matching (PFM).This approach actually represents the generalization of a family of similarity learning approaches, including SK, MK, and OAK . Also "Fast image matching algorithm based on affine invariants"[2] has been presented which utilizes the geometry feature of extended centroid to build affine invariants and have better robustness. The "simple block matching" method[3] was proposed where practical solution was given for intermediate view interpolation using simple block matching and guided image filtering."A novel robust descriptor for image matching" approach [4] was also proposed previously to perform reliable image matching under large variations in scale.Built the descriptor based on elliptical sampling which samples image pixels according to the elliptic equations.The method for "effective contrast-based de-hazing for robust image matching" was presented by previous researchers where single-based image technique is used that does not require any geometrical information or user interaction and enhancing hazy images by restoring the contrast of the degraded images.

ANYLASIS AND DISCUSSIONS:

Different strategies can be utilized in the feature matching process. Summation Kernel (SK) to measure the image similarity,Max-selection Kernel (MK) and the Optimal Assignment Kernel(OAK)[1] to maximize the similarity score between two structured objects by finding exactly one-to-one matches between the parts of these objects.In contrast,the authors have introduced a probabilistic matching strategy in the matching process and further proposed a novel similarity learning approach as a generalization of a family of similarity learning approaches, including SK, MK, and OAK. In this approach, the similarity between two images is defined as the inner product of their feature similarities and the corresponding feature matching probabilities(FMP), which are learned by optimizing a quadratic formulation.(FMP)between featuresdenotes their similarity.The aim is to perform the probabilistic feature matching between two images automatically.The results outperformed the state-of-the-art methods.On average achieved 89.4% similarity on Graz-01 and 87.4% on Graz-02 datasets, respectively when experiment is performed.But there is no guarantee that the similarity matrix generated by this approach is a valid kernel.The another method called"Fast image matching algorithm based on affine invariants". plays an indispensable role in automatic target recognition (ATR) by utilizing geometry feature of extended centroid to build affine invariants. Based on affine invariants of the length ratio of two parallel line segments, FIMA overcomes the invalidation problem of the state-of-the-art algorithms based on affine geometry features.

An advanced FIMA(AFIMA)[2] is also designed having better robustness for Gaussian noise, gray-scale change, contrast change, illumination and small three-dimensional rotation. Compared with the latest fast image matching algorithms based on geometry features, FIMA reaches the speedup of approximate 1.75 times. It can be understood very well from the following diagram how does the robustness is achieved against noise as compared to other algorithms.

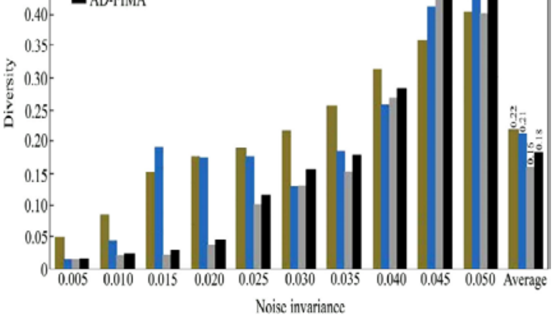


Fig 1.noise invariance[2]

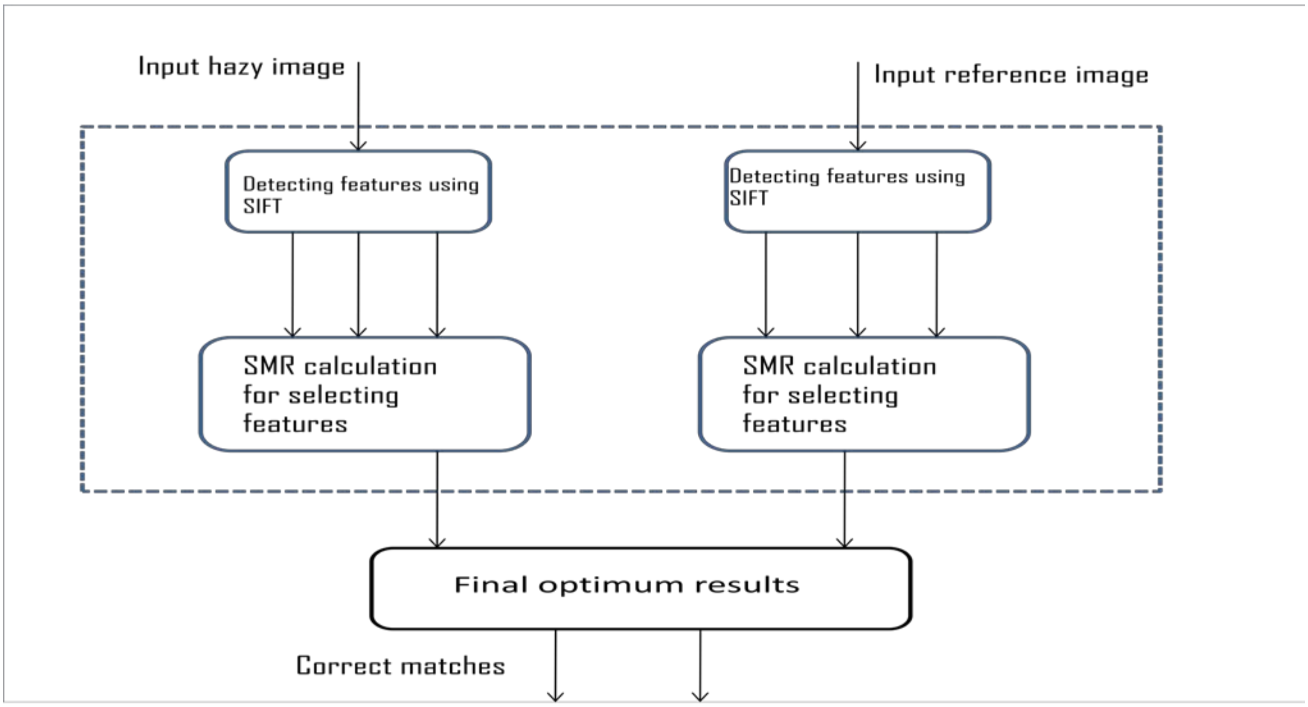
The method however better for ATR applications but when partial occlusion happens or multi targets are contained in a complex optical image, they may be invalid. Local stereo matching methods have focused on robust cost computation and edge-aware cost aggregation.Some researches have been seriously paid to the disparity refinement. They showed that the simple box aggregation with weighted median filter can be almost as good as the other sophisticated aggregation method. Their discovery reveals that the disparity refinement step can be as important as other steps[3]. And they also

claimed that the algorithm is a compelling choice, considering both speed and accuracy. As the size of image increases, the disparity range to accumulate histogram, required to obtain a median value, also increases. It leads to an increase in the amount of computation hence a method was suggested to provide a simple and practical solution for intermediate view interpolation using a simple block matching and a guided image filtering.But since it uses a hierarchical block matching to estimate disparity map, makes it computationally ineffective.However there is still scope of improvement regarding visual quality of images.

Already, Scale Invariant Feature Transform (SIFT) method has been proposed [4]to address the challenges of image matching.Also a novel fast interest point detector and descriptor: SURF has been proposed to scale down the computational complexity.The descriptor based on sampling operation is robust to viewpoints because the viewpoint variations correspond to the variations of two controllable parameters in elliptical sampling. Then, image matching corresponds to find the optimal value of these two controllable parameters for elliptical sampling. First do elliptical sampling according to the elliptic equations.Then,createorientation histograms over the gradient magnitudes of these image pixels to build local descriptor.Given the original image and matched image apply SIFT detector to extract keypoints from and to fairly compare with SIFT. The only difference is the local descriptor.Since the circular regions in the original image are transformed to the elliptical regions in the matched image, perform circular sampling in the original image and elliptical sampling in the matched image respectively.But here keypoints are choosen randomly.Since SLD encodes more details with large values of sampling points , the distinctiveness of SLD increase with and when it is large enough, there is no improvement in performance.The first dehazing approaches[5] proposed employ multiple images presented additional information such as depth map and specialized hardware.Physically based techniques restore the hazy images based on the estimated transmission map.The strategy of restoring the airlight color by assuming that the image shading and scene transmission are locally uncorrelated and estimated a rough transmission map version based on the dark channel.Contrast-based techniques aim to enhance the hazy images without estimating the depth information.Since the haze effect is not constant across the scene, various locations in the image are spoilt differently. As a result, such classical contrast enhancing operators, since they perform the same operation for each image pixel, do not represent reliable solutions for the dehazing problem.A novel strategy to enhance images degraded by the atmospheric phenomenon of haze has been developed earlier called as single-based image technique, does not require any geometrical information. Method is built on the basic observation that haze-free images are characterized by a better contrast than hazy images.

PROPOSED METHODOLOGY:

Figure: system overview 1



The main idea of a local feature scheme is to detect interest points in an image and then to describe the surrounding pixels' information around each keypoint as a local feature. The advantages of local feature schemes are that they are robust to image changes such as scales, rotation, illumination change, and contrast which is the aim of this paper work. Most popular local feature scheme is SIFT, which is widely accepted as the highest-quality scheme currently available. Therefore in this work SIFT is used along with the combination of forward and Backward stepwise multiple regression to select the features which maintains good robustness giving final optimal solution. This will enrich the distinctiveness of the SIFT descriptor. The method can be proven to be a fully affine invariant which is the necessity for image matching process of hazed images. The flowchart of the proposed method can be very well described from following figure. The step by step procedure is shown in the flowchart.In this section, a scheme based on combination of SIFT with stepwise multiple regression (SMR) is explained.It should be overcame.The main and query images are processed. SIFT is used to obtain a high speed feature detector.This dedicated design can further give the real time performance.The proposed method can be overviewed making it possible to solve the exact feature selection problem and the blur problem .

The SMR overview :-

Here SIFT detector is used to extract interest points with respective scale from each image.But instead of using the classic Euclidian distances go for the use of forward and backward SMR method.The forward will detect the features but along with that the apllied backward method will help to eliminate the feature or components those contribute least to the prediction of membership.Thus as a result only important features are kept,that is those features that seems to be contributing more.The process discrimination will be covered along with this procedure described above. Discrimination stands for perceiving the differences among the features extracted.The SMR method will definitely be able to recognize or draw the fine distinctions.

1]Discriminant function analysis used to determine which features discriminate between two or more selected query images.

2]Model:- This terminology can be put in other way. A “model” wanted to be build up ,of how can best predict to which image a feature belongs. Use the term “in the model” in order to refer to features that are included in the prediction of membership and refer to features as being “not in model” if they are not included.

3]Forward stepwise analysis:-

In stepwise discriminant function analysis, a model of discrimination is built step-by-step. Specifically at each step all features are reviewed and evaluated to determine which one will contribute most to the discrimination between two images.That feature will then be included in the model and the process starts again.

4]Backward stepwise analysis:-

One can also step backwards:in that case all features are included in the model and then ,at each step,the feature that contributes least to the prediction of membership is eliminated.

Thus as a result of successful procedure one would only keep those features that contribute the most to the discrimination between groups which further used for getting optimized results leading to correct matches.

CONCLUSION:

In this paper, a conventional method for matching problem of hazy images and extraction of effective features is proposed. By using a proper scale invariant feature detector along with forward and backward stepwise multiple regression method, this process can be robust to a strong blur and scale changes and also change of illumination. First of all, it is being discussed here why does the Euclidian distances are not used to extract features in this process because it may lead to ambiguity problems while matching is performed. There are many methods used for image matching using SIFT but this method is unique and advantageous because of its property of successfully finding out the exact features from the hazy and blurred images. However the calculation scope is enlarged with the use of SMR. But the final results will be the optimized results.

FUTURE SCOPE:

As a matter of future scope it can be said the results can be further improved by choosing the subsets among the optimal results.

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