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A SINGLE VIDEO ANOMALY DETECTION USING DEEP LEARNING

Sujeetha D[1], Muhammed Askkar*[2], Mohammed Sahid A[3], Muhammad Roshen[4]

[1-4]Department of Computer Science and Engineering, Mahendra Engineering College Autonomous, Namakkal, Tamilnadu, India.

Corresponding Author: Muhammed Askkar
Email: mhdaskkar.klm@gmail.com

ABSTRACT

Anomaly detection is an area of video analysis that has great importance in automated surveillance. Although it has been extensively studied, there has been little work on using deep convolutional neural networks to learn spatio-temporal feature representations. In this thesis we present novel approaches for learning motion features and modelling normal spatio-temporal dynamics for anomaly detection. The contributions are divided into two main chapters. The first introduces a method that uses a convolutional auto encoder to learn motion features from foreground optical flow patches. The auto encoder is coupled with a spatial sparsity constraint, known as Winner-Take-All, to learn shift-invariant and generic flow-features. This method solves the problem of using hand-crafted feature representations in state of the art methods. Moreover, to capture variations in scale of the patterns of motion as an object moves in depth through the scene, we also divide the image plane into regions and learn a separate normality model in each region. We compare the methods with state of the art approaches on two datasets and demonstrate improved performance.
The second main chapter presents a end-to-end method that learns normal spatio- temporal dynamics from video volumes using a sequence-to-sequence encoder-decoder for prediction and reconstruction. This work is based on the intuition that the encoder-decoder learns to estimate normal sequences in a training set with low error, thus it estimates an abnormal sequence with high error. Error between the network's output and the target output is used to classify a video volume as normal or abnormal. In addition to the use of reconstruction error, we also use prediction error for anomaly detection. We evaluate the second method on three datasets. The prediction models show com- parable performance with state of the art methods. In comparison with the first proposed method, performance is improved in one dataset. Moreover, running time is significantly faster.

Keywords: Fog Removal, spatio-temporal, sequence-to-sequence

INTRODUCTION

Images plays key role in all real world problems such as road or railway track images are used for traffic analysis. But images captured in open environment suffer from low contrast. When weather conditions are not good and clear, the light capture by the lensis spread by the atmosphere. Therefore conventional techniques for image enhancement are not enough to remove weather effects from captured images. The cloudy, foggy, or hazy weather conditions result as image color alteration and shrink the resolution and the contrast of the captured object in open- air. This work, analyze existing techniques used in image processing to remove bad weather effect. On the basis of this analysis this work proposes an efficient technique for more visibility from a gray scale and color images. This paper proposes an efficient and fast fog removal technique with quality enhancement.
Any image captured in open environment depends on atmospheric conditions if the weather is good image capture is clear and understandable, if the weather is bad then image quality decrease and objects are not identified. One most universal weather environment is fog that has blur or dim effect on the landscape, fall the atmospheric visibility that causes to the refuse of image contrast and generates vagueness to the image. There are reduced visibility records in awful weather condition due to the extensive occurrence of atmospheric particles that have a large volume and distribution in the contributing medium. Light reflected by any object is absorbed and scattered by particles presents in atmosphere, causes degradation in the visibility of the scene. Due to these abstractions objects extraction and object tracking is very difficult from outdoor image monitoring applications. Fog is responsible for degraded image quality and information such images contain a low gray value is strengthened whereas high gray value becomes weaken, that causes over-concentrated distribution of pixel gray value hence the contrast poverty problem
Car accidents are common during bad weather. It is estimated that about two million people die of car accidents across the world per year. Poor visibility is the biggest cause

of accidents. Statistics showed that between 1999 and 2002, about 10% of accidents in Spain occurred during bad weather. Statistics cited by the US department of transportation road. weather management program state that during 11 years from 1995 to 2005, an average of 17% of crash fatalities occurred due to bad weather conditions; this translate to an average of 7,400 people killed each year in USA alone[1]. According to NHTSA, in year 2008 alone, 3,280 fatal car crashes resulted by bad weather conditions in USA.

Images of outdoor scenes are basically degraded by the presence of different particles and the water droplets in the atmosphere. Haze, fog, smoke are such atmospheric phenomena due to atmospheric absorption and scattering. While capturing a scene in the camera in a bad weather condition the irradiance received by the camera from the scene point is attenuated along the line of sight. The incoming light flux is blended with the light from all other directions called the airlight. The amount of scattering depends on the distance of the scene points from the camera; the degradation is variant in nature. Due to this the there is a resultant decay in the color and the contrast of the captured degraded image.[1][2]The target of haze removal is to improve the reflected light (i.e., the scene colors) from the mixed light. The constancy and strength of the visual system can improve by the usage of effective haze removal of image. There are many methods available to remove haze from image like polarization, independent component analysis; dark channel prior etc.

LITERATURE SURVEY

Factorizing scheme albino and depth from single foggy image

Atmospheric conditions induced by suspended particles, such as fog and haze, severely degrade image quality. Restoring the true scene colors (clear day image) from a single image of a weather-degraded scene remains a challenging task due to the inherent ambiguity between scene albedo and depth. In this paper, we introduce a novel probabilistic method that fully leverages natural statistics of both the albedo and depth of the scene to resolve this ambiguity. Our key idea is to model the image with a factorial Markov random field in which the. scene albedo and depth are. two statistically independent latent layers. We show that we may exploit natural image and depth statistics as priors on these hidden layers and factorize a single foggy image via a canonical Expectation Maximization algorithm with alternating minimization. Experimental results show that the proposed method achieves more accurate restoration compared to state-of-the-art methods that focus on only recovering scene albedo or depth individually.

Proposed by Louis Kratz; Ko Nishino

Removing Weather Effects from Monochrome Images

Images of outdoor scenes captured in bad weather suffer from poor contrast. Under bad weather conditions, the light reaching a camera is severely scattered by the atmosphere. The resulting decay in contrast varies across the scene and is exponential in the depths of scene points. Therefore, traditional space invariant image processing techniques are not sufficient to remove weather effects from images. In this paper, we present a fast physics-based method to compute scene structure and hence restore contrast of the scene from two or more images taken in bad weather In contrast to previous techniques, our method does not require any a priori weather-specific or scene information, and is effective under a wide range of weather conditions including haze, mist, fog and other aerosols. Further, our method can be applied to gray-scale, RGB color, multi-spectral and even IR images. We also extend the technique to restore contrast of scenes with moving objects, captured using a video camera. Proposed by S. G. Narasimhan; S. K. Nayar

A New Threshold Segmentation Method Based on the Genetic Algorithm for Enhancing the Images

According to the degraded phenomenon of images, establishing shot is a gray-scale distribution of some more concentrated and closer to the sky brightness of the region, while the close-range part can tell, the gray distribution is symmetrical. A new threshold segmentation method based on the genetic algorithm for enhancing the misty images is proposed. The method seeks the threshold value using genetic algorithm which segment the establishing shot and the close shot[1] then two different enhance method are used respectively. At the same time, the moving template processing method is adopted to resolve the edge effect in the flat region, and images are fused to improve the quality of image. The experiment shows that the method proposed above is very effective to improve the degradation of images and can enhance the clearness of images. Proposed by Hong Xia Fei; Ye Qing

Enhancement of image degraded by fog using cost function based on human visual model

In foggy weather conditions, images become degraded due to the presence of airlight that is generated by scattering light by fog particles. In this paper, we propose an effective method to correct the degraded image by subtracting the estimated airlight map from the degraded image. The airlight map is generated using multiple linear regression, which models the relationship between regional airlight and the coordinates of the image pixels. Airlight can then be estimated using a cost function that is based on the human visual model, wherein a human is more insensitive to variations of the luminance in bright regions than in dark regions. For this objective, the luminance image is employed for airlight estimation. The luminance image is generated by an appropriate fusion of the R, G, and B components. Representative experiments on real foggy images confirm significant enhancement in image quality over the degraded image. Proposed by Dongjun Kim; Changwon Jeon; Bonghyup Kang; Hanseok Ko

Enhancement of fog degraded images using empirical mode decomposition

Images can have poor visibility, contrast and colors in foggy weather conditions. Therefore it is required to enhance visual quality of the fog-degraded images. In this paper we present a new method based on an Empirical Mode Decomposition (EMD) for fog-degraded image enhancement. Initially each spectral component of the fog-degraded image is decomposed into Intrinsic Mode Functions (IMFs) using EMD. Then the enhanced image is constructed by combining the IMFs of spectral channels with optimum weights in order to obtain an enhanced image with increased visual quality. The optimal weight estimation process is carried out automatically using genetic algorithm. Eventually, image enhancement is completed performing color correction followed by a de-quantization. Proposed by Aysun Tasyapı Çelebi; M. Kemal Güllü; Sarp Ertürk

EXISTING SYSTEM

Image Enhancement Techique

Visibility Restoration Technique

For removing haze, fog from the image various techniques are used.[5] Typical techniques of image restoration to the haze are:

- Dark Channel Prior
- Bilateral Filtering

Dark Channel Prior

Characterize truncations and acronyms the first time when they are utilized as a part of the content, even after they have been characterized in theory. Shortened forms, for example, IEEE and SI don't need to be characterized. Try not to utilize shortened forms in the title or heads unless they are unavoidable.Dark channel prior (Wang, Yan et al, 2010) is used for the estimation of atmospheric light in the dehazed image to get the more real result. This method is mostly used for non-sky patches; in one color channel have very low intensity at few pixels.

The low intensity in the dark channel is predominant because of three components:

- Colorful items or surfaces
- Shadows (shadows of car, buildings etc.)
- Dark items or surfaces (dark tree trunk, stone)

As the outdoor images are usually full of shadows the dark channels of images will be really dark. Due to fog (airlight), a foggy image is brighter than its image without fog. So we can say dark channel of foggy image will have higher intensity in region with higher fog along these lines, outwardly the force of dim channel is an unpleasant estimation of the thickness of fog.

PROPOSED SYSTEM

Our proposed work computes image enhancement in two phases. The first phase is used to remove fog from an image. Second phase enhance quality of image for improved visibility and noise reduction using FFT (Fast Fourier Transformation). The model of the foggy image In computation visual the model of foggy image is shown as follows,

$$I(x) = J(x)T(x) + A(1 - t(x)) \qquad (1)$$

where I(x) is the foggy image, J(x) the image without fog, A the atmosphere light, t(x) the ratio of transmission. The object of remove fog is to recover J(x), A and t(x). The first item in the right hand side of equation (1) J(x)t(x) is called direct attenuation, and the second item A(l -t(x)) is called air light component. The direct attenuation describes the scene radiance and its decay in the medium, while air light results from the scattered light previously and will lead to the color shift of the scene. Because the atmosphere is homogenous, the ratio of transmission is expressed as,

$$t(x) = e^{-\beta d(x)} \qquad (2)$$

Where β is the scattering coefficient of the atmosphere. It indicates that the scene radiance is attenuated exponentially with the scene depth d. According to equation (1), it can be obtained,

$$t(x) = \frac{\|A - I(x)\|}{\|A - J(x)\|} = \frac{A^C - I^C(x)}{A^C - J^C(x)} \qquad (3)$$

Where

$C \epsilon \{r, g, b\}$, is the color channel index

RESULTS AND DISCUSSION

Run the code in your machine, take snaps and describe here in your own words as per the proposal .In this paper, novel, efficient and fast fog removal algorithm for video is proposed. It is found that any fog removal algorithm can be extended for video by making use of temporal correlation present among frames. Airlight map for I frame is computed using any image fog removal algorithm. For P/B frames, the airlight estimate can be derived from the reference frames using the motion-vector information. Results confirm that there is a significant improvement in speed of video fog restoration. Theoretically, this technique can be applied till there is a scene change. However, the increase in the number of P/B frames increases the degradation of restored image. Low degradation in reconstruction can be obtained with the appropriate choice of the number of P/B frame in GOP. Hence, it may be concluded that with the use of temporal correlation, computation time per frame reduced significantly irrespective of the algorithms, which paves the way for real-time implementation of fog removal along with video encoding or decoding. It is found that algorithm proposed by Tripathi et al. is computationally efficient and suitable for video application. Proposed video fog removal framework has a wide application in tracking and navigation, consumer electronics, and entertainment industries.

CONCLUSION

In this proposed a dehazing algorithm based on the difference-structure-preservation prior, which can estimate the optimal transmission map and restore the actual scene. To obtain the rough transmission map, we use two basic properties in the haze model to resolve the optimal parameter at the same depth. Afterwards, we assume that an image patch can be approximated by a sparse linear combination of elements from a neighbor basis set to obtain a more accurate transmission map that can better preserve the structures of images. Experimental test results were also used to verify that the method effectively achieves accurate and true representation.

FUTURE ENHANCEMENT

Moreover, the atmospheric scattering model cannot be used to describe the sun's influence on the sky region and the scattering in inhomogeneous atmosphere. In future work, more features such as texture, structure, sunlight and inhomogeneous atmosphere should be considered to design a more robust and effective image dehazing algorithm. Also this method will be studied in global air-light to improve operational efficiency and target the problem of color error, and further applications in video dehazing will be explored.

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