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Real Time Fog Removal with Improved Quality and Accident Prevention using V2X Communication in Automobiles

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Abstract: Imaging in poor weather is often severely degraded by scattering due to suspended particles in the atmosphere such as haze and fog. Vehicles which are travelling in hill stations or in the early morning during winter season will face problems due to fog formation in the atmosphere. In this method various methods have been used to clear the fog and to get a clear view of the road. The system uses a camera to detect the object present in the foggy region. The object can be a human or any inhuman material. The video captured by the camera is processed to detect the object. If the object is detected then that data will be given to the controller and it will be intimated to the driver by voice. Vehicle to vehicle also established in this system. If any vehicle goes near to another vehicle in foggy areas the two vehicles will communicate each other through WSN and it will be given by voice play back. Using this system accident can be prevented.
Keywords: Suspended particles, fog, detect, Vehicle to Vehicle, WSN.

I. INTRODUCTION

Nowadays public places are monitored by several CCTV cameras in order to increase public safety. In many applications, the trained and experienced human operators can do this monitoring very well. However, watching multiple camera images at the same time is not only too expensive but also practically impossible. Moreover, surveillance video data is currently used only "after the fact" as a forensic tool, thus losing its primary benefit as an active, real-time medium. The goal of visual surveillance is not only to put cameras in the place of human eyes, but also to accomplish the entire surveillance task as automatically as possible. Thus intelligent visual surveillance (IVS) becomes an active research topic in computer vision.

Detection of foreground objects of interest from a surveillance video sequence is a key step for an intelligent visual surveillance system. Unfortunately, this is not always true, such as when videos are taken under bad weather conditions, such as on a foggy day. The image suffers degradation and severe contrast loss. These low quality images are a nuisance for conventional object detection algorithms. Similarly, Murk is a thick cloud of tiny water droplets suspended in the atmosphere which obscures visibility. Diverse weather situations such as murk, smoke, rain or snow will cause multifaceted visual effects of spatial or temporal domains in images or video. Such artifacts may appreciably humiliate the performances of outdoor vision systems relying on image/video feature extraction or visual attention modeling such as event detection, object detection, tracking and recognition, scene analysis and classification, image indexing and retrieval. They generally fail to correctly detect objects due to low scene visibility. In order to get clear surveillance frames, enhancing visibility is an inevitable task. In recent years, as an active research topic in computer vision, considerable work has been done on haze removal techniques. Unfortunately, most countries in the world has an alarming record in number of death/disability due to tremendous number of accident. Accidents are occurred because of unawareness of the people. Researchers found that 57% of accidents where due to solely driver factors, which include his behaviour, decision making ability, reaction speed and alertness. The studies show that the accidents can be avoided if driver was provided with warning message few seconds before so that, they can take some alternative route or be cautious to avoid traffic congestion or accidents. The vehicular adhoc network was adopted to mimic the adhoc nature of highly dynamic network. In this network two vehicles can communicate with each other. For Vehicle safety a new technique can be created. VANET Communication is classified into two different types Vehicle to Vehicle communication and Vehicle to Infrastructure Communication. The vehicle to vehicle communication is a communication between two vehicles (i.e.) one hop communication, such as car to car communication. The vehicle to Infrastructure communication is communication between vehicle and road side Infrastructure. It acts as a multi hop communication. The vehicle to vehicle communication is a system designed to transfer basic safety related with vehicles to provide warning to drivers concerning accidents. The main objective of this system is to alert drivers when he closes to front vehicle. The communication between the vehicles takes place by means of LI-FI. The distance between two vehicles is measured using Ultrasonic sensor. The microcontroller controls the entire circuit and is programmed to notify the driver with a message when the vehicle comes within the Line of sight.

II. RELATED WORK

A. Evaluation of Various Digital Image Fog Removal Algorithms

This paper is a review on the various fog removal algorithms. Fog removal otherwise called visibility restoration refers to diverse systems that suppose to lessen or evacuate the degradation that have happened while the digital picture was being acquired. In this paper, various fog removal techniques have been analysed. It has been shown that each fog removal technique has its own features and drawbacks.

The presented methods have neglected the techniques to reduce the noise issue, which is presented in the output images of the existing fog removal algorithms. Not much effort has focused on the integrated approach of the CLAHE and Dark channel prior. The problem of the uneven illuminate has also neglected by the most of the researchers.

B. Research for Image Haze-Removal Algorithm Using the Dark-Channel Prior Based on Wavelet Transform

In this paper, having compared the image haze-removal algorithms for image restoration and image enhancement, the principle of image haze-removal algorithm using dark channel prior is analyzed and discussed. The shortcomings of the algorithm are pointed out. At the same time, image haze-removal algorithm using the dark-channel prior based on wavelet decomposition is proposed. There are three steps included: three channel wavelet transform for the image, image haze-removal algorithm using the dark-channel prior of the low frequency components for dark channel prior and upgrading sharpening for high frequency components. The experimental results show that the algorithm can improve the resolution of image after image haze-removal and have better performance in detail, but also can effectively reduce the running time, improve the operating speed.

C. Automatic Single-Image-Based Rain Streaks Removal via Image Decomposition

Rain removal from a video is a challenging problem and has been recently investigated extensively. Nevertheless, the problem of rain removal from a single image was rarely studied in the literature, where no temporal information among successive images can be exploited, making the problem very challenging. In this paper, we propose a single-image-based rain removal framework via properly formulating rain removal as an image decomposition problem based on morphological component analysis. Instead of directly applying a conventional image decomposition technique, the proposed method first decomposes an image into the low- and high-frequency (HF) parts using a bilateral filter.

The HF part is then decomposed into a “rain component” and a “non rain component” by performing dictionary learning and sparse coding. As a result, the rain component can be successfully removed from the image while preserving most original image details. Experimental results demonstrate the efficacy of the proposed algorithm.

III. EXISTING SYSTEM

Poor visibility becomes a major problem for most outdoor vision applications. Bad weather caused by atmospheric particles, such as fog, haze, etc., may significantly reduce the visibility and distort the colors of the scene. This is due to the following two scattering processes, (i) light reflected from the object surface is attenuated due to scattering by particles; and (ii) some direct light flux is scattered toward the camera.

These effects result in the contrast reduction increases with the distance. In computer vision, the atmospheric scattering model is usually used to describe the formation of a foggy or hazy image. Almost all established methods are based on this model. Some of them require multiple input images of a scene; e.g., images taken either under different atmospheric conditions, or with different degrees of polarization.

Another methods attempt to remove the effects of fog from a single image using some form of depth information either from terrain models or user inputs. In practical applications, it is difficult to achieve these conditions so such approaches are restricted. The very latest defogging methods are able to defog single images by making various assumptions about the depth or colors in the scene.

A. Video Processing In Existing System

1) In existing, they proposed murk/haze removal by using CLAHE and object detection using Curvelet Transform.
2) Initially the RGB image is converted to gray scale image.
3) The gray scale image is then filtered using median filter.
4) The filtered image is enhanced using CLAHE.
5) Finally the enhanced image is segmented by Curvelet Transform.

IV. PROPOSED SYSTEM

The proposed system uses camera to get the foggy view of the road. The video is pre-processed and it is cleared without fog. Using the MATLAB we are detecting the objects presents in the road view. If the object is detected then it is given as input to the micro controller. Then the intimation will be given to the driver as voice playback. During foggy condition in the road if any vehicle goes near to another then both vehicle will communicate using V2X communication. The vehicle which is going in front will intimate the rear vehicle through WSN. It will be intimated as voice output. Using this system vehicle accidents can be prevented.

The proposed model follows dictionary learning, bilateral and guided filter for enhancement and saliency map for object detection. It consists of five steps.

1) *Step 1:* Collecting the test images from public database.
2) *Step 2:* Image decomposition is proposed in fog image. In image decomposition, image is decomposed into low frequency part and high frequency part (details layers) based on bilateral filter.
3) *Step 3:* After that, dark channel prior based fog removal implement in original fog image; details layers (HF part) enhanced using guided filter for restore the dehazed image with initial fog removed image.
4) *Step 4:* The enhanced image is segmented and the object are detected based on saliency map. And also detected object or obstacles are classified based on the statistical feature i.e. Human, Vehicle and Animal.
5) *Step 5:* To avoid the accident distance was calculated between the detected object and camera mounted vehicle. Finally based on the distance, some alert system provided to drivers.

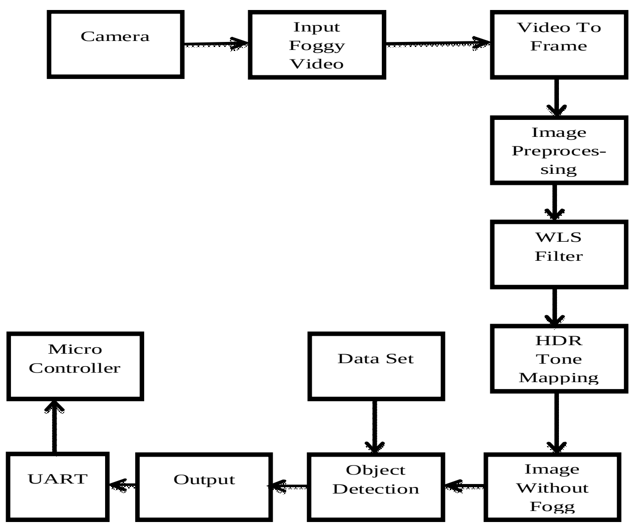

Fig 1. MATLAB section

V. SOFTWARE IMPLEMENTATION

A. *Image Acquisition*

Testing videos are acquired from Gallery.

B. *Image Enhancement*

1) In this stage, image is enhanced in terms of fog removal by image decomposition, fog removal and detail part extraction/restoration. The aim of image decomposition is to decompose the image I into its low frequency part LF and its high frequency part HF, namely, I = LF + HF. Image decomposition process done by using our novel method. The method is *bilateral* filter that is used for decompose of image in image decomposition.
2) Bilateral filter first extract the base layer that is called as low frequency part image (smoothed image). It's almost less fog free image but usually blurred, while *HF* contains details of the image. The detail layer or high frequency part image obtained as *HF = I – LF*. After that guided filter is proposed for enhance the detail part of image.
3) Next, initial fog removal is implemented by using dark channel prior. Dark channel prior is used for extract the transmission map and guided filter is proposed for smooth the transmission map. Finally we restore dehazed image by combining of smoothed transmission map and enhanced detail part.

C. Obstacle Detection & Classification

1) In this step, obstacles are detected by using hyper graph saliency map.
2) Thus enhanced image is segmented and then obstacle was detected. Finally statistical feature is evaluated for classify the detected obstacle i.e. human, animal and vehicle.

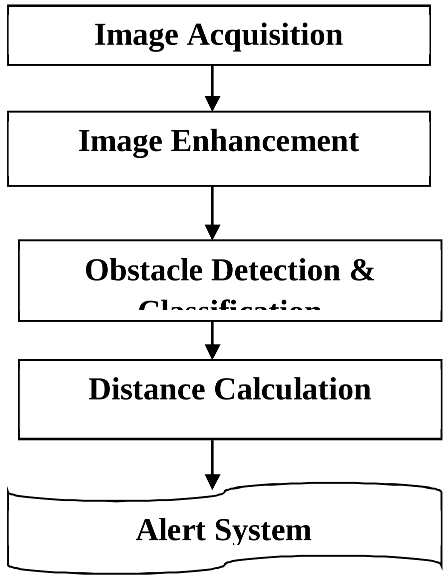

Fig 2. Data Flow Diagram

D. Distance Calculation

1) After obstacle detection, distance calculation is performed between detected obstacle and testing camera mounted vehicle. Then distance value is converted pixel into meters.
2) Based the distance of the obstacle from the camera mounted vehicle, three kinds of messages (indication) are given to the driver i.e. obstacle very near, if obstacle is very near to the vehicle, obstacle little far, if the obstacle is little far from the vehicle and very far, if the obstacle is very far and at a safe distance from the vehicle.

VI. SIMULATION

1) *Step 1:* Collecting the test images from public database.
2) *Step 2:* In image decomposition, image is decomposed into low frequency part and high frequency part based on bilateral filter.
3) *Step 3:* After that, dark channel prior based fog removal implement in original fog image; details layers (HF part) enhanced using guided filter for restore the de-hazed image with initial fog removed image.
4) *Step 4:* The enhanced image is segmented and the object are detected based on saliency map. And also detected object or obstacles are classified based on the statistical feature i.e. Human, Vehicle and Animal. Saliency map detection is done by using graph clustering or boundary contrast map.
5) *Step 5:* To avoid the accident distance was calculated between the detected object and camera mounted vehicle. Finally based on the distance, some alert system provided to drivers. Through camera we can detect the distance in pixels later on we convert the pixel into meters to easy identify for human.

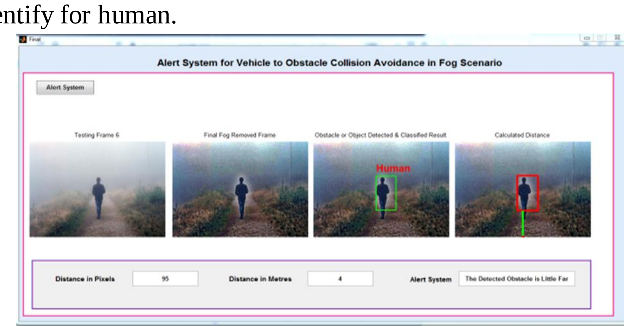

Fig 6. Human Obstacle detect

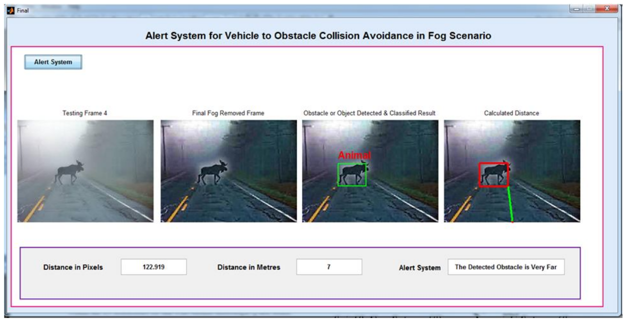

Fig 7. Animal Obstacle Detect

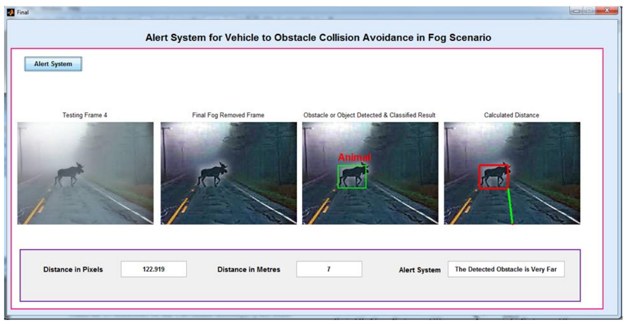

Fig 8. Vehicle Obstacle Detect

VII. CONCLUSION

The image enhancement has become one of the active areas in the field of image processing. In this project the fog images are filtered using Bilateral Filter, Dark Channel Prior and Guided Filter. Then objects or obstacles are yet to be extracted from the enhanced fog image based on the Saliency Map. Finally distance is calculated between detected object and camera mounted vehicle. Thus, efficient automatic vehicle detection and a warning system can help drivers in reducing the number of accidents occurring between the one vehicle and the any obstacles on roads and highways.

VIII. ACKNOWLEDGMENT

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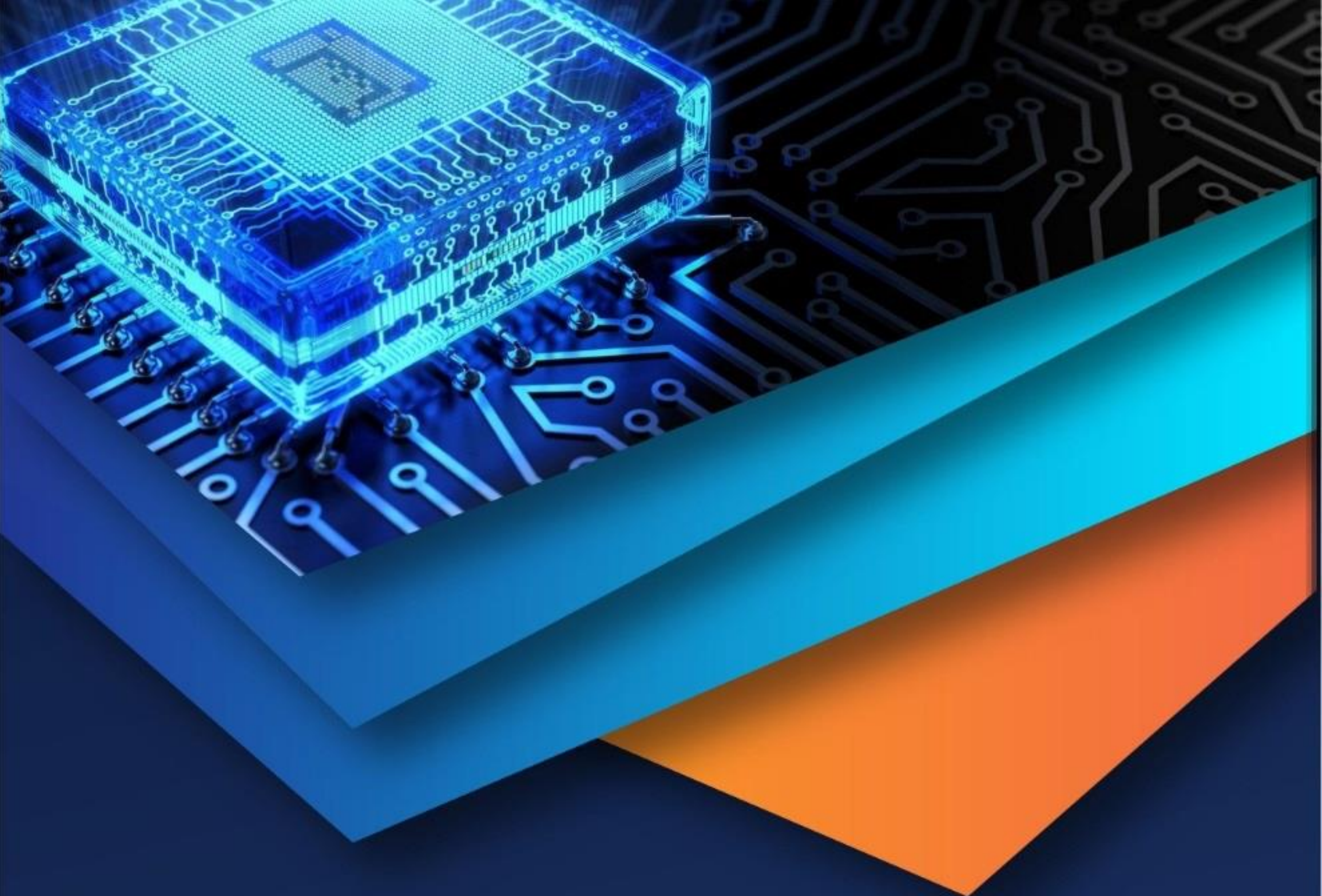
REFERENCES

[1] Akshata msonnad, anjana gopan, “Recent advancements in li-fi technology”, Dec-2013
[2] Alin-M. Cailean, Barthélemy Cagneau, Luc Chassagne, Suat Topsu, “Design and implementation of a visible light communications system for vehicle applications”, November 2013.
[3] Aman Sodhi, Jeslin Johnson, “Light Fidelity (LI-FI) - The Future of Visible Light Communication”, March-April 2015. Mehboob raza haider, manoj mdongre, “Vehicle to vehicle communication using visible light communication technology”.
[4] Ambuj Kumar and Rajendea Prasad Nayak,”An Efficient Group-Basd Safety Message Transmission Protocol for VANET”,IEEE International Conference on communication and signal processing,April 3-5,2013 India, pp. 1 -4
[5] Boukerche. A et al., “Vehicular Ad Hoc Networks: a new challenge for localization-based systems,” Computer Communications, Science Direct, 2008, pp. 1-12.
[6] Kiyoshi MIZUI, Masao NAKAGAWA, “Vehicle-to-Vehicle Multi Target Communication and Ranging System Using Spread Spectrum Technique”.
[7] Lina Altoaimy, Imad Mahgoub, and Monika Rathod, “Weighted Localization in Vehicular Ad Hoc Networks Using Vehicle-toVehicle Communication”
[8] Ravi Prakash, Prachi Agarwal, “The New Era of Transmission and Communication Technology : Li-Fi (Light Fidelity) LED & TED Based Approach”, February 2014.



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