Visibility Enhancement Techniques For Vehicles In Fog: A Review

Vikrant Sharma
School Of Computer Science and Engineering
Lovely Professional University, Punjab, India
vikrant.23738@lpu.co.in

Abstract
Fog is an environmental situation of suspended water particles in the atmosphere generally occurs in the winter time. The condition have large number of adverse effects on the day today life of the human beings and other animals. The prime limitation imposed by the fog is the visibility range. That is due to the suspended water particles in the air the light coming from the source to the destination is get refracted to large extent leading to the blurred appearance of objects. The situation largely faced by the transportation system as the drivers are not able to clearly visualize the roads ahead leading to large number of accidents, thereby causing a huge loss to the life and property.

Various researchers have proposed the mechanisms to deal with the foggy weather using various image enhancement techniques and other techniques. In this article we will briefly describe all the state of art models proposed by the researchers to tackle the situation of fog and various technique used by them.

Keywords: Fog, Visibility enhancement, vehicles.

1. Introduction
Fog is an environmental situation of suspended water particles in the atmosphere generally occurs in the winter time. The condition have large number of adverse effects on the day today life of the human beings and other animals. The prime limitation imposed by the fog is the visibility range[1]. That is due to the suspended water particles in the air the light coming from the source to the destination is get refracted to large extent leading to the blurred appearance of objects. The situation largely faced by the transportation system as the drivers are not able to clearly visualize the roads ahead leading to large number of accidents, thereby causing a huge loss to the life and property[2].

About 25-28% of accidents occurs due to the poor visibility[3], which results in the huge loss of life and property of the people[4][5].

Various researchers have proposed the mechanisms to deal with the foggy weather using various image enhancement techniques and other techniques[6]. In this article we will briefly describe all the state of art models proposed by the researchers to tackle the situation of fog and various technique used by them.

Defogging is a generalised term used to remove the fog effect from the actual foggy image. Defogging techniques can be broadly classified as image enhancement method and image restoration method [7].

2. Visibility Enhancement with Single Image Fog Removal Scheme using post-processing technique

Authors in [3] proposed a post processing based visibility improvement technique to enhance the vision in the foggy weather conditions. It uses the concept of dark channel prior to enhance the image and remove the foggy component of the image thereby removing the whitish component of the image and increasing the contrast of the image. The operation of the proposed scheme is shown in Figure 1.
The model considers the atmospheric conditions and air light to restore the captured foggy image in order to recover it.

3. Visibility enhancement based real-time retinex for diverse environments
Authors in [7] proposed an enhanced retinex based method to enhance the foggy image. The enhanced model shows that the results obtained are promising and model performs well in unfavourable weather condition. It is also observed that the algorithm performs well even in the night-vision.

4. Visibility enhancement using image filtering approach
Authors in [8] proposed a model based on adaptive total variation minimization to minimise the noise from the given image. This process is used to defog the image and make it more visible.

5. Contrast limited adaptive histogram method
Authors in [9] proposed a scheme based on CLAHE technique to recover the images affected by the fog. The model operates by converting the foggy image into HSI model and then applying CLAHE technique in order to enhance the image. After entire processing is done the image is again converted to RGB pattern.

6. Road visibility improvement model under heterogeneous fog
Authors in [10] the authors work on the enhancement of the foggy image thus captured by the camera mounted on the vehicle console. It is taken under consideration that in the image captured by the vehicle the major part of the image constitute of the road. The proposed algorithm claims to fast in comparison to other models as it takes into account the default colour of road, which makes it easy to refine the image by easily differentiating between the road and other components.

Authors in [1] proposed a method to enhance the fog affected image generated by the camera mounted on the vehicle. The proposed model works on the fact that the effect of the fog is minimum just in front of the camera and increases with the increase in the distance from the camera. The operation of the proposed algorithm is shown in Figure 1.

Figure 1. Image enhancement model.
7. Conclusion and future scope

Fog is an environmental situation of suspended water particles in the atmosphere generally occurs in the winter time. The condition have large number of adverse effects on the day today life of the human beings and other animals. The prime limitation imposed by the fog is the visibility range. That is due to the suspended water particles in the air the light coming from the source to the destination is get refracted to large extent leading to the blurred appearance of objects. The situation largely faced by the transportation system as the drivers are not able to clearly visualize the roads ahead leading to large number of accidents, thereby causing a huge loss to the life and property.

Various researchers have proposed the mechanisms to deal with the foggy weather using various image enhancement techniques and other techniques. In this article we will briefly describe all the state of art models proposed by the researchers to tackle the situation of fog and various technique used by them. A lot need to be done in the field of visibility improvement in real time scenario, moreover most of the researchers are working on the images. Whereas, in the real scenario the live video with foggy frames is an expected input to the system and the expected output is a fog-free clear video.

So, as a future perspective the work can be done to enhance the videos in order to make the system implementable to the real time scenarios.
References


