**Title-** **Image Dehazing Hybrid Technique GGIF and Bilateral Filter Deep Learning Technique**

**Objectives:**

The objectives are:

* To do extensive literature survey on dehazing techniques.
* To propose a method to improve currently existing dehazing techniques by the use of deep learning.
* To calculate the parameter of perceptual fog density and improve its value in proposed work.

**Abstract:**

Dehazing removal of haze in images. Many filters have been developed for haze removal. The latest existing technique is dehazing by the use of a globally guided image filtering. The main task is to remove haze from the image without hampering its originality. The structure of the image should be colour appropriate. For this, a deep learning method can be combined with the currently existing GGIF method. The efficiency of the software will be calculated by the use of a performance metric known as perceptual fog density.

**Problem Statement:**

In the currently existing techniques, the fine structure of the image is not preserved hence it has a higher perceptual fog density. This problem is need to be addressed to overcome the fine structure issue and reduce the parameter of perceptual fog density. The currently existing techniques which have failed to implement such are globally guided image filtering and weighted guided image filtering techniques. These techniques largely depend upon the equation base rather than the level of haze present in the images.

**Review of Literatures**

[1] Zhengguo Li et al., in this paper, GGIF (Globally Guided Image Filtering) is implemented on several images and compared with GIF (Guided Filtering) and WGIF (Weighted Guided Filtering) techniques. In some images GGIF is proved to be better than other existing techniques. The parameter of study is PFD (Perceptual Fog Density). “

[2] Ximei Zhu et al., Images and recordings taken in foggy climate frequently experience the ill effects of low perceivability. Ongoing examinations exhibit the eﬀectiveness of dull channel earlier and guided ﬁlter based methodologies for picture dehazing. Be that as it may, these techniques require high computational cost which makes them infeasible for continuous and inserting frameworks. Right now, propose Edge-Guided Interpolated Filter (EGIF) for quick picture and video dehazing. The primary commitments are twofold. Right off the bat, creator create Guided Interpolated Filter (GIF) to signiﬁcantly accelerate the estimation of transmission map, which is the most computational cost step in past techniques. Also, creator use edge map as direction picture in GIF to improve the ﬁne subtleties in dehazed pictures.

[3] HongyuanZhu et al., Single picture dehazing has been an exemplary subject in PC vision for quite a long time. Spurred by the environmental dissipating model, the way to agreeable single picture dehazing depends on an estimation of two physical parameters, i.e., the worldwide climatic light and the transmission coefﬁcient. Most existing strategies utilize a two-advance pipeline to assess these two parameters with heuristics which collect mistakes and bargain dehazing quality. Motivated by differentiable programming, creator reformulate the environmental dissipating model into a novel generative ill-disposed system (Dehaze GAN). Such a reformulation and ill-disposed learning permit the two parameters to be gained at the same time and consequently from information by upgrading the ﬁnal dehazing execution so perfect pictures with dependable shading and structures are straightforwardly created. In addition, our reformulation additionally enormously improves the GAN' interpretability and quality for single picture dehazing. As far as we could possibly know, our technique is one of the ﬁrst attempts to investigate the association among generative ill-disposed models, picture dehazing, and differentiable programming, which advance the hypotheses and utilization of these territories.

[4] W. Uma et al., Due to not well presented nature single picture haze evacuation has been an extraordinary test. The objective of utilizing this technique is to get an ideal transmission guide to expel hazes from a solitary info picture. An optical model is dissected and the underlying transmission map under an extra filter is reevaluated. For a superior conservation of haze picture, the globally guided picture filtering could be utilized with the end goal that the neighborhood consistency highlights of the transmission map are all around safeguarded after coefficient shrinkage. At long last, it protects the common appearance of the picture.

[5] Zheng Xu et al., Author propose a novel deep neural system engineering for the difficult issue of single picture dehazing, which plans to recuperate the reasonable picture from a corrupted foggy picture. Rather than depending available made picture priors or expressly assessing the segments of the generally utilized climatic dispersing model, our start to finish framework legitimately produces the unmistakable picture from an info dim picture. The creator proposed arrange has an encoder-decoder design with skip associations and occasion standardization. Creator embrace the convolutional layers of the pre-prepared VGG organize as encoder to misuse the portrayal intensity of deep highlights, and exhibit the viability of example standardization for picture dehazing. Our basic yet viable system outflanks the cutting edge strategies by an enormous edge on the benchmark datasets.

[6] Huimin Lu et al., Image differentiate upgrade for open air vision is significant for savvy vehicle assistant vehicle frameworks. The video outlines caught in poor climate conditions are regularly described by poor perceivability. Most picture dehazing calculations consider to utilize a hard edge suppositions or client contribution to evaluate climatic light. In any case, the most brilliant pixels in some cases are items, for example, vehicle lights or streetlights, particularly for savvy vehicle assistant vehicle frameworks. Basically utilizing a hard limit may cause an off-base estimation. Right now, propose a solitary streamlined picture dehazing technique that appraisals environmental light proficiently and expels haze through the estimation of a semi-globally versatile filter. The improved pictures are described with little clamor and great introduction in dim areas. The surfaces and edges of the handled pictures are additionally improved essentially.

[7] Boyi Li et al., Author present a far reaching study and assessment of existing single picture dehazing calculations, utilizing another largescale benchmark comprising of both engineered and true cloudy pictures, called Realistic Single Image Dehazing (RESIDE). Live features assorted information sources and picture substance, and is isolated into ﬁve subsets, each filling diverse preparing or assessment needs. Creator further give a rich assortment of criteria for dehazing calculation assessment, running from full-reference measurements, to no-reference measurements, to emotional assessment and the novel errand driven assessment. Analyses on RESIDE shed light on the examinations and confinements of best in class dehazing calculations, and propose promising future headings.

[8] Xumeng Chen et al., Author propose another methodology dependent on evaluating brightening cover. The calculation for non-uniform brightening of haze picture has a decent outcome. Given a corrupted picture, least force of RGB parts of each point can be made sense of as haze vitality cloak with the creator proposed guided filter, subtracting the murky vitality cover structure the dim picture, at that point most extreme power of leftover RGB segments of each point can determined and filtered as the scene brightening shroud. Thusly, the RGB reflectance of each point can be gotten from the light/reflection imaging model. The creator proposed approach can dehaze pictures and improve differentiate all the while, and the worldwide environmental light shouldn't be determined to keep away from the danger of estimation mistakes. The creator proposed calculation can likewise be applied to taking out the scene light. Examination results on an assortment of outside dim pictures show that the creator proposed technique accomplishes great rebuilding as far as perceivability and shading constancy.

[9] Nidhi Sen et al., It is notable that neighborhood filtering-based edge protecting smoothing technique experiences radiance curios. Right now, weighted guided picture filter is presented by consolidating an edge-mindful weighting into an available guided picture filter to address the issue. The WGIF acquire advantages of both worldwide and neighborhood smoothing filters as in: 1) the trouble of the WGIF is O(N) for a picture with N pixels, which is same as the GIF and 2) the WGIF can keep away from corona curio like the current worldwide smoothing filters. The WGIF is applied for single picture detail upgrade, single picture fog expulsion, and combination of diversely uncovered pictures. Investigational results show that the resultant calculations make pictures with better visual quality and simultaneously radiance antiques can be evaded from showing up in the last pictures with unimportant ascent on running occasions.

[10] Wenqi Ren et al., In this paper, creator propose an efﬁcient calculation to legitimately reestablish an unmistakable picture from a cloudy info. The creator proposed calculation depends on a start to finish trainable neural system that comprises of an encoder and a decoder. The encoder is abused to catch the setting of the inferred information pictures, while the decoder is utilized to evaluate the commitment of each contribution to the ﬁnal dehazed result utilizing the educated portrayals credited to the encoder. The built system embraces a novel combination based methodology which gets three contributions from a unique foggy picture by applying White Balance (WB), Contrast Enhancing (CE), and Gamma Correction (GC). Creator figure pixel-wise conﬁdence maps dependent on the appearance contrasts between these changed contributions to mix the data of the determined sources of info and safeguard the locales with wonderful perceivability. ”

**Present Investigation**

The investigations of this thesis are: The main aim is preserving the fine structure of the image and removing haze in the image by improving the present existing techniques. Haze is a customary climatic condition where residue, smoke and other dry particles darken the clearness of the air. Haze causes issues in the zone of earthbound photography, where the light infiltration of thick environment might be important to picture inaccessible subjects. This outcome in the special visualization of lost complexity in the subject, because of the impact of light dissipating through the haze particles. Hence, haze expulsion is wanted in both purchaser photography and PC vision applications. Haze evacuation is a difficult issue in light of the fact that the haze transmission relies upon the obscure profundity which shifts at various positions. Different methods of picture improvement have been applied to the issue of expelling haze from a solitary picture, including histogram-based [1], differentiate based [2] and immersion based [3]. What's more, strategies utilizing various pictures or profundity data have likewise been proposed. For instance, polarization based strategies [4] evacuate the haze impact through various pictures taken with various degrees of polarization. In [5], multi-limitation based strategies are applied to numerous pictures catching a similar scene under various climate conditions. Profundity based techniques [6] require some profundity data from client inputs or known 3D models. By and by, profundity data or numerous foggy pictures are not constantly accessible. Single picture haze expulsion has made huge advances as of late, because of the utilization of better presumptions and priors. In particular, under the supposition that the nearby difference of the without haze picture is a lot higher than that of murky picture, a neighborhood differentiates amplifying strategy [7] dependent on Markov Random Field was proposed for haze expulsion.

**Proposed Solution:**

The blend of existing GGIF and deep learning from neural system is relied upon to improve the exhibition by safeguarding the edge structure of the picture. Also including the bilateral filter is used to remove noise.

DehazeNet receives Convolutional Neural Networks (CNN) based deep engineering, whose layers are uncommonly intended to encapsulate the built up suspicions/priors in picture dehazing. Consolidating this with GGIF, will give points of interest of both the calculations. The way to accomplish haze expulsion is to assess a medium transmission map for an information murky picture. The proposed calculation strategy is relied upon to improve the parameter of haze, ordinarily known as perceptual mist thickness. This parameter ought to be as low as workable for better quality picture.

**Conclusion**

Hence, this work can be useful in image dehazing concepts. By the use of deep learning in GGIF it is expected to improve the accuracy of dehazed image. Dehazing of image has important applications in drones for capturing images haze free and in various camera based surveillance applications. It is important to define the best accurate perceptual fog density.

**Validation Tool-** MATLAB 2016a, dataset is same as for GGIF base paper

**References**

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