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Fog-Removing Method for the Monitoring Traffic Image along with Mathematical Analysis of Retinex Algorithm

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Abstract: In this paper, we have a tendency to propose an improved fog-removing technique along with mathematical analysis of retinex algorithm so as to form the pictures changing into more clear and less difficult to recognize. The projected technique combines the retinex algorithmic rule and wavelet transform algorithmic rule. The projected technique firstly uses Retinex algorithmic rule to reinforce the image, then the wavelet transform algorithmic rule is employed to reinforce the details of the image, finally, a clear image that is removed fog will be obtained once reduce the non-necessary coefficients. Through analyzing the PSNR (Peak S/N Ratio) of the image contrast, the pictures that are processed by our proposed technique have the PSNR values above the standard Retinex algorithms. In this, we intend to build up a novel picture defogging calculation by specifically anticipating the haze thickness of improved pictures as opposed to receiving earlier suppositions or requirements. The proposed method reduces the halo artifacts by adaptively limiting the boundary of an arbitrary haze image. A new multi-scale image fusion method for single image dehazing has also been proposed to produce a more natural visual recovery effect. The results show that this method outperforms state-of-the-art haze removal methods in terms of both efficiency and the dehazing visual effect.

I. INTRODUCTION

Ideal Transmission Estimation by means of Fog Density Perception for Efficient Single Fog Image Restoration by using the Retinex Algorithm is introduced to reduce traffic issues in the presence fog(like accidents that are happening because of weather changes). Nowadays, this Fog is very serious in everywhere, because of the pollution, climatic issues and so on.

These Foggy climates will create issues like whitening effect, image degradation all these kinds of situations will leads to a serious impact on transportation systems and outdoor visibility systems. So, there is a need for creative requirements to solve these problems and to deal with these climatic issues. Especially with this fog, to get a clear and perfect visibility. With the continuous development of computer hardware and software technology, it became possible to solve this problem (removing fog from the images). Before, We have existing methods to do reduce these fog issues By using image contrast enhancement method (using adjustments in grey values - but quality of image is missing), By using image restoration method (by reducing the depth information of an image helps) etc,. but every method is having their disadvantages and those are not giving clear and realistic images to visibility system. In this method of removing fog from single images, The structure is as follows : Introduction, literature survey, proposed method introduction, and the experiment results & Conclusion.

A. Retinex Theory and Retinex Algorithm

The fundamental Retinex model depends on the supposition that the HVS works with three retinal–cortical frameworks, each preparing autonomously the low, center, and high frequencies of the unmistakable EM range. Each free procedure frames a different picture that decides an amount called delicacy and signified by L. When Retinex is applied on advanced RGB images,10,12 the triplet _LR,LG,LB_ of softness esteems in the three chromatic channels is the data that decides, by superposition, the view of what we call the shade of each pixel of picture
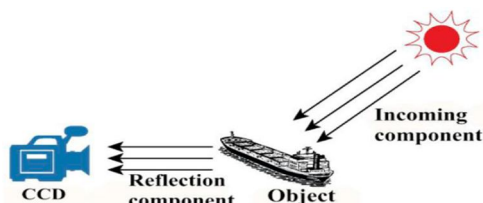

Fig: Image capture principle according to retinex theory

Enlivened by a few examinations, Land and McCann discovered that an effective method to process the softness estimations of a pixel i, in a picture was to think about a specific number of ways, beginning aimlessly focuses and finishing at i, and afterward to figure the normal of the results of proportions between the power estimations of consequent focuses in the ways, with these solutions :

1) In the event that the proportion doesn't vary from 1 in excess of fixed limit esteem, at that point, the proportion is viewed as unitary.

2) In the event that the chain of proportions passes the worth 1 at a point of the way, at that point the cumulated relative softness is compelled to 1, so the calculation restarts starting there.

The primary remedy is called edge instrument, and, appreciation to it, the computation disregards smooth changes in concealing due, for example, to smooth points of the illuminant.

The subsequent solution is known as the reset component, and it is liable for the supposed white-fix conduct of Retinex, implying that the focuses that empower the reset system become the nearby references for white.
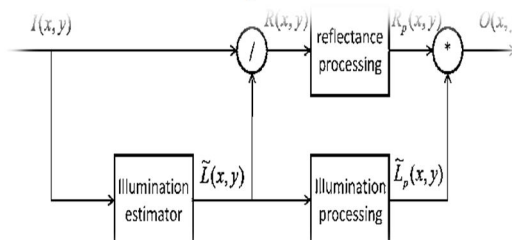

Fig: retinex principle block diagram

The only formulas available in the literature to describe the lightness L of a pixel i computed by Retinex in a given chromatic channel look like this:

$$L(i) = \frac{\sum\limits_{k} l^{i,j_k}}{N}, \qquad l^{i,j_k} = \sum\limits_{x \in \text{path}} \delta \log \left| \frac{I_{x+1}}{I_x} \right|,$$

where j_k is the starting point of the kth path (i is the end point of every path) and where

$$\delta = \begin{cases} 1 & \text{if } \log \left| \dfrac{I_{x+1}}{I_x} \right| > \text{threshold} \\ 0 & \text{otherwise} \end{cases}.$$

B. General Background for the Formula

Given a computerized picture, consider an assortment of N situated ways _k made out of requested chains of pixels beginning at jk and finishing at I. Let nk be the quantity of pixels went by the way _k, and let tk=1, . . . ,nk be its parameter, i.e., _k : _1, . . . ,nk_→Image_R2, _k_1_=jk and _k_nk_=i.

For effortlessness, compose two resulting pixels of the way as _k_tk=xtk and _k_tk+1_=xtk+1, for tk=1, . . . ,nk−1.

Consider, in each fixed chromatic channel c__R,G,B_, the pixels' forces I_xtk_, I_xtk+1_ and afterward figure the proportion Rtk=I_xtk+1_/I_xtk_.

For specialized reasons put R0=1 and standardize the forces to take their qualities in the genuine unit interim (the standardization factor is 1/255 if 8 bytes are utilized for every pixel in each chromatic channel).**Formula:** We claim that the (normalized) value of lightness given by Retinex for a generic pixel i, in every fixed chromatic channel c, can be obtained by this formula:

$$L(i) = \frac{1}{N} \sum_{k=1}^{N} \prod_{t_k=1}^{n_k-1} \delta_k(R_{t_k}),$$

where $\_k : R+ \rightarrow R+$, $k=1, \ldots, N$, are functions defined in this way: $\_k\_R0\_=1$ and, for $tk=1, \ldots, nk-1$,

$$\delta_k(R_{t_k}) = \begin{cases} R_{t_k} & \text{if } 0 < R_{t_k} \leqslant 1 - \epsilon \\ 1 & \text{if } 1 - \epsilon < R_{t_k} < 1 + \epsilon \\ R_{t_k} & \text{if } 1 + \epsilon \leqslant R_{t_k} \leqslant \dfrac{1+\epsilon}{\prod\limits_{m_k=0}^{t_k-1} \delta_k(R_{m_k})} \\ \dfrac{1}{\prod\limits_{m_k=0}^{t_k-1} \delta_k(R_{m_k})} & \text{if } R_{t_k} > \dfrac{1+\epsilon}{\prod\limits_{m_k=0}^{t_k-1} \delta_k(R_{m_k})} \end{cases}$$

e>0 being a fixed threshold.

The main alternative is fulfilled when the force of the pixel xtk+1 is obviously littler than the power of the pixel xtk; at that point _k repeats the estimation of the proportion Rtk.

The subsequent choice happens when just a little change in power is estimated between two ensuing pixels. For this situation, _k_Rtk_ is characterized to be 1, with the goal that the result of the proportions remains precisely equivalent to in the past advance. This is the numerical usage of the edge instrument.

The third choice is alluded to as the situation when the proportion Rtk is more prominent than 1+_ however the item _k_R1__k_R2_ . . . _k_Rtk−1_Rtk isn't more prominent than 1+_. In this circumstance, _k replicates the estimation of Rtk as in the primary choice.

At last, the fourth alternative holds when _k_R1__k_R2_ . . . _k_Rtk−1_Rtk _1+_, and for this situation _k resets the chain of items to 1 in light of the fact that a "nearby white pixel" has been come to. This alternative executes the reset instrument (thus the white-fix conduct) of the calculation. It is valuable to compose the commitment of the single way _k to L_i_ as Lk_i_=_tk=1 nk−1_k_Rtk_, with the goal that recipe (3) diminishes basically to the normal of these commitments:

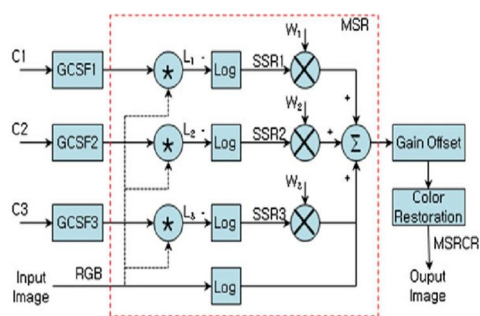$$L(i) = \frac{1}{N} \sum_{k=1}^{N} L_k(i).$$
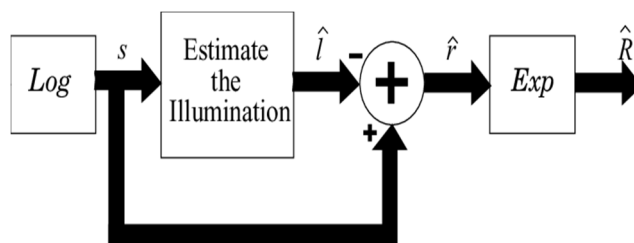

Fig 1: Block Diagram of Retinex Algorithm

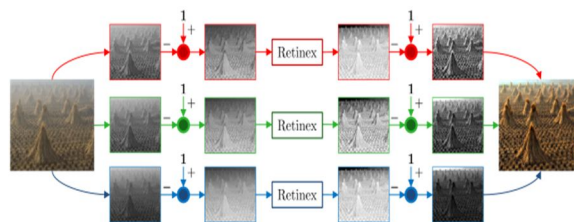
Fig: flowchart for retinex algorithm

Fig 2: Retinex Image

C. The Wavelet Transform Algorithm

The Fourier theory uses sine and cosine as basis functions to analyze a particular signal. Due to the infinite expansion of the basis functions, the FT is more appropriate for signals of the same nature, which generally are assumed to be periodic. Hence, the Fourier theory is purely a frequency domain approach, which means that a particular signal f(t) can berepresented by the frequency spectrum F(w), as follows:

$$F(\omega) = \int_{-\infty}^{+\infty} f(t)e^{-j\omega t}dt$$

The original signal can be recovered, under certain conditions, by the inverse Fourier Transform as follows:

$$f(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} F(\omega)e^{j\omega t}d\omega$$

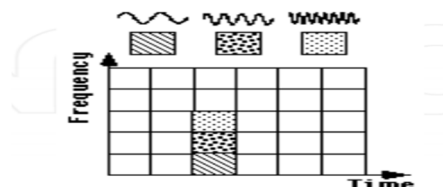Obviously, discrete-time versions of both direct and inverse forms of the Fourier transform are possible.

Fig: Wavelet Transformation

2-D discrete wavelet transform algorithm is a notable strategy for picture preparing. It utilize high-pass channel and low- spend channel multiple times separately at even and vertical heading, the disintegration results are as per the following: the estimated segment A, the degree of detail parts H, vertical detail coefficients V and corner to corner detail segment D. Inexact coefficients speak to the foundation picture which has the most minimal recurrence, detail coefficient speaks to the scene data which has the high recurrence.
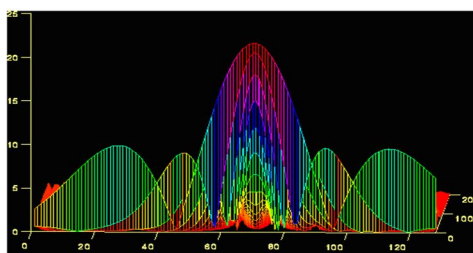

Fig: wavelet transform representation

II. LITERATURE SURVEY

A. Introduction

Ordinary plans of picture catch bring about a corrupted picture in terrible climate conditions which is hard to remake. Dimness expulsion from a solitary picture stays a difficult assignment as fog is subject to obscure profundity data. Throughout the years numerous scientists have endeavored to defeat this disturbance.

R. Fattal proposed another technique that can reestablish the picture just as locate a solid transmission map for extra applications, for example, picture pulling together and neon vision. In view of the refined model, the picture is separated into fragments of consistent albedo. It is accepted that surface concealing and medium transmission are factually uncorrelated. It utilizes a solitary

info picture. Results are physically stable and produce a decent outcome, in spite of the fact that it can't deal with overwhelming pictures. Likewise, it flops on the off chance that the suspicion of surface concealing and medium transmission being measurably uncorrelated isn't met.

Tan's technique saw that a dimness free picture must have a higher complexity contrasted with an information picture. It amplifies neighborhood differentiate. Dim direct preceding utilized in this technique. Environmental light is evaluated from the sky locale. Transmission is evaluated from a coarse guide by reclassifying a fine guide.

Two straightforward channels are consolidated based on neighborhood pixel data in this manner calculation cost is decreased. Results are outwardly engaging however physically not legitimate. Results are over-immersed. Transmission might be thought little of.

Tarel, authored in a technique that improves meteorological perceivability separations estimated in foggy climate by utilizing a camera on a moving vehicle. It is powerfully actualizing Koschmieder's Law which relates evident balance of the picture with sky foundation, at realized perception separation, to the characteristic difference, and to the barometrical transmissivity. Meteorological perceivability separation measure characterized by the International Commission on Illumination (CIE) as the separation past which a dark object of a suitable measurement is seen with a complexity of under 5%.

It is factually superior to [4], as far as perceivability levels. It utilizes a middle channel to figure environmental cover which brings out serious barometrical cloak discontinuities.

Zhang, performed visibility enhancement using image filtering. Based on Tarel et al's approach. Enhanced by using dimension reduction to correct preliminary haze layer estimation. He developed a new filtering approach based on projection onto the signal subspace spanned by the first K eigenvectors. Noise reduction and Texture reduction is also performed. It takes a longer time to compute than Tarel's method.

He et al, utilized guided picture separating, and proposed a basic yet successful technique for cloudiness evacuation utilizing dim channel earlier strategy. Most pictures contain a fog-free part which has exceptionally low power in at any rate one shading. Thusly, the thickness of the fog might be legitimately determined. The yield of one channel might be the contribution of the following guided channel. It very well may be utilized for edge-protecting and smoothening and has preferable outcomes over the famous reciprocal channel. It has fundamentally quicker handling time. An excellent profundity map is additionally made. May not work for pictures with objects innately like the barometrical light, transmission at that point will be thought little of as the dim channel has factual reliance.

The basic fog image model used for the removal of fog from image is as follows:

I(x) =J(x).t(x) + A (1-t(x))

Where J(x) is the Scene Radiance, A (1-t(x)) is Airlight and t(x) is the Medium Transmission. Direct attenuation will be zero in case t(x) tends to zero. In order to avoid such an ambiguity t(x) is restricted to a lower limit t0.

B. Existing System

1) The Global Image Contrast Enhancement Method: The worldwide mist picture improvement technique alludes to the change of the dim worth is dictated by the measurable data of the entire haze picture. There was no connection to the change purpose of the district. For example, Brian Eriksson exploits the curvelet change to programmed evacuates mist utilizing the evaporating point recognition dependent on curvelet.
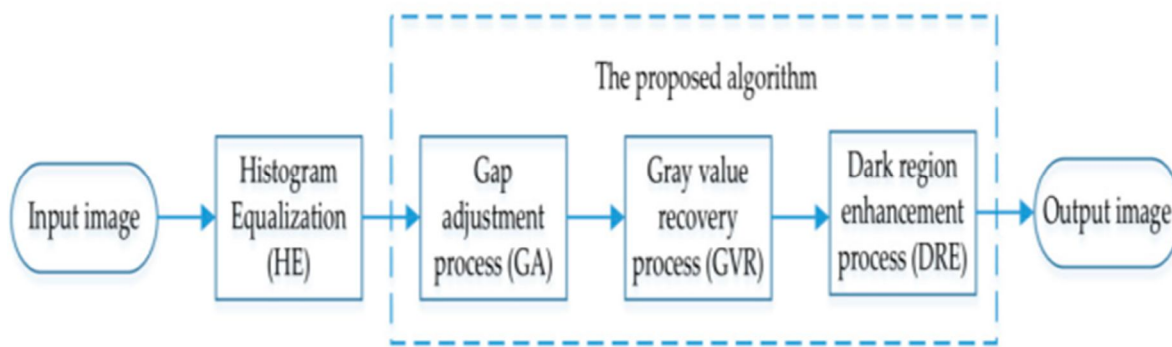

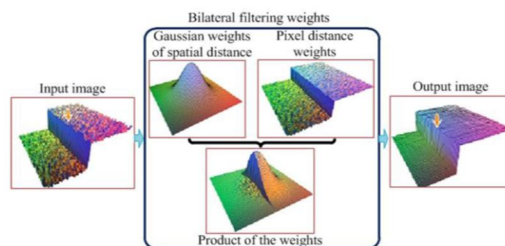Fig : Image contrast enhancement method

Fig : image contrast enhancement

a) *Disadvantages of Existing System:* The detriment of the calculation is just comparative with improve the nature of pictures, not in the genuine feeling of expelling mist from a picture. The absence of this calculation is the picture detail isn't self-evident.

2) *The Methods Based on the Depth Relationship of fog Image Restoration:* Diminish the profundity data of the picture is a significant intimation to the reclamation of mist pictures. As indicated by the scene profundity data is known, this recuperation strategy can be separated into two classifications. One strategy is expected scene profundity data is known. This strategy right off the bat proposed by Oakley. Another strategy is to utilize the helper data extraction technique. Intelligent profundity estimation calculation and the realized 3D model to get the scene profundity, for example, the Kopf technique is to get the profundity of field utilizing the known 3D model, in order to recuperate the haze picture.
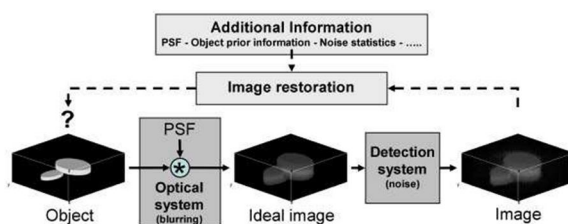

Fig: block diagram for fog image restoration

a) *Disadvantages of Existing System:* However this algorithm also has disadvantages: Firstly the 3D model conditions are very serious, and this algorithm is not automatic, it is difficult to be run in real-time.

3) *Image Restoration Based on Prior Information:* Numerous scientists center around how to unravel totally evacuating haze for a sign picture as per the variety in the mist focus. In this early work was finished by Tan. Besides, Fattal and others under the supposition that the transmission of light is neighborhood not related with and the scene target surface concealing part, to gauge the scene irradiance, and therefore inferred the engendering picture.

4) *Automatic Picture De-enduring Utilizing Bend Let-based Disappearing point Identification:* Under poor climate conditions (downpour, mist, and so on.), both the difference and shade of a picture will be corrupted. To switch these impacts, spatially versatile calculations have recently been created to improve pictures under these conditions. Because of the dispersing of light, the corruptions of a picture will be corresponding to the good ways from where the picture was taken this requires de-enduring calculations to get profundity data separated from the picture. Recently actualized techniques are constrained, in that an intelligent advance requiring the client to choose both the skyline shading and the disappearing purpose of the picture was required. Utilizing new strategies in geometric information portrayal (curvelets), a programmed de-enduring calculation has been created. Past Work - Turbid Mediums Poor climate conditions (haze, downpour, and so on.) in the scene condition can be thought of as a turbid medium that dissipates photons going through the scene. Photons going through a dispersing medium can be arranged into three sorts. Ballistic photons experience no dissipating and travel in an immediately viewable pathway to the picture plane. Snake photons experience some slight dissipating yet hold their direction data. Diffuse photons experience a lot of dissipating and land at the picture plane having lost the vast majority of their direction data.
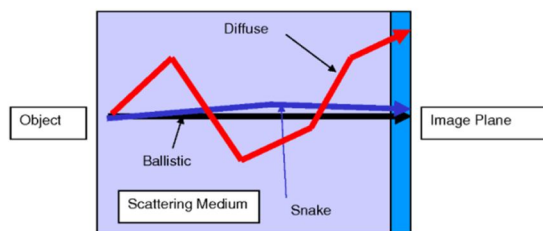
Fig: Automatic image de-weathering using curve let-based vanishing point detection

C. Proposed System

Fog removing method for the traffic image monitoring, which consolidates the Retinex calculation and the wavelet change calculation is proposed. The proposed strategy initially utilizes the Retinex calculation to improve the picture, at that point the wavelet change calculation is utilized to upgrade the subtleties of the picture, at last, a reasonable picture which is expelled mist can be acquired in the wake of decreasing the none-significant coefficients. The proposed strategy can successfully expel haze from the picture taken in an overwhelming haze climate. The estimation demonstrated that it is superior to the conventional calculations, for example, the Retinex Algorithm [2, 3] and Dark gray earlier.
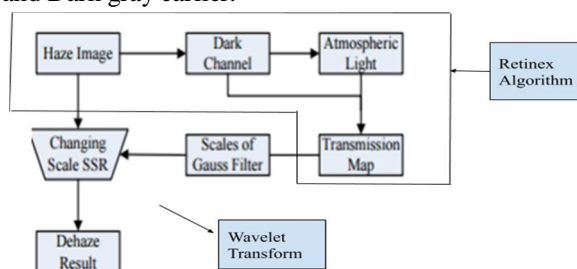
PROPOSED METHOD = RETINEX ALOGORITHM + WAVELET TRANSFORM

III. ANALYSIS OF FOG REMOVING AND MATHEMATICAL ANALYSIS OF RETINEX ALGORITHM

Fog removing method is having the process of combining both the retinex algorithm and wavelets transform methods to get clear and realistic image view for un conditional weather view of a transporting system or visibility system.

For this process of for removal for the foggy image we are using the requirements of :

1) Collected Foggy Images.
2) Experiments carried out on i5 Processor with system of 2.3GHz, and 8GB RAM.
3) Using MATLAB 2.0 for Development of this Project.

We using the traditional methods of both Retinex Algorithm[2,3] and Dark channel Algorithm[8], to compare with the propose method (R+WT method).

The proposed method is having the process of combining retinex and wavelet transform algorithm

A. Retinex Algorithm

Retinex algorithm[2,3] has indicated a decent impact on expelling haze from the picture. Retinex calculation is to diminish the impacts of episode light on the picture, and to reinforce the reflection picture as pursues:

$$R_l(x,y) = \log I_l(x,y) - \log[F(x,y) * I_l(x,y)] \quad l=1,\cdots,n$$

Rl(x,y) is the yield comparing to the L channel, II (x, y) is an info luminance picture pixel estimation of the L channel, the parameter * is the convolution activity, the parameter n in the shading channel number, F (x, y) speaks to the inside/encompass work, it is spoken to by Gauss work as detailing (2).

$$F(x,y) = Ke^{-(x^2+y^2)/\sigma^2}$$

The parameter (j controls focus/encompass work go, the worth is littler, the inside/encompass work is more honed.

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B. The Wavelet Transform Algorithm

2-D discrete wavelet change calculation is a notable strategy for picture preparing. It utilizes high-pass channel and low- pass channel multiple times separately at even and vertical course, the decay results are as per the following: the rough segment A, the degree of detail segments H, vertical detail coefficients V and askew detail segment D.
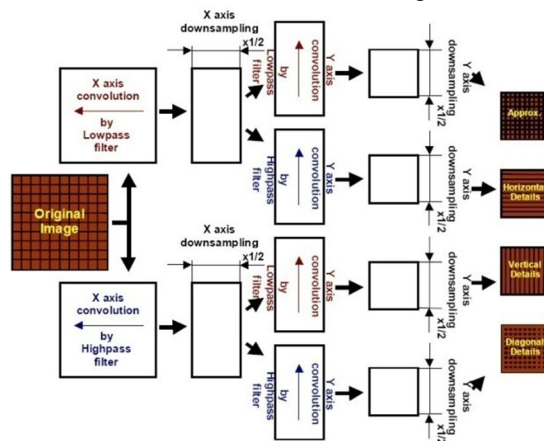

Fig: wavelet transform algorithm block diagram

Surmised coefficients speak to the foundation picture which has the most reduced recurrence, detail coefficient speaks to the scene data which has the high recurrence.

C. Proposed Method

Retinex algorithm can upgrade the majority of the data of a picture. be that as it may, however since it just builds the general diagram, the details of the picture are not extraordinary. Then again, wavelet picture improvement by smoothening low- frequency data of the picture and upgraded picture of high- frequency data in order to improve picture details and decreases picture outline noise simultaneously.

We propose an improved mist evacuating technique which has joined the benefits of Retinex calculation and Wavelet change calculation, this improved fog expelling strategy First uses Retinex algorithm to upgrade in general diagram data of the picture; at that point use wavelet picture improvement strategy to get high- frequency data from the Retinexed picture, at last, an all the more clear and fog evacuated picture can be gotten.
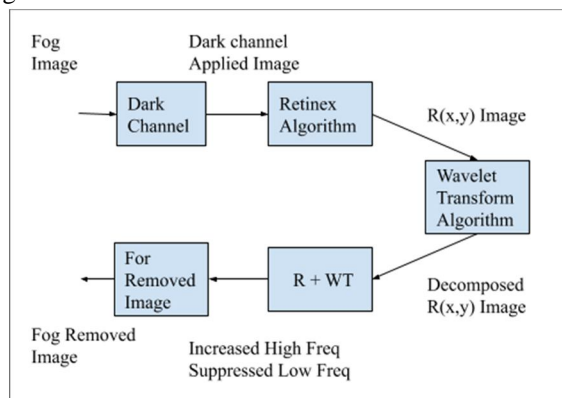

Fig : Block diagram of fog removing method

Here, we give Foggy image as an input for the process of fog removing image and then given to first block to applying dark channel, then that will enter into the block of retinex algorithm here this will enhance the image view and gives the detailing for the image in terms of color and detailing. After this process the output of the retinex algorithm will move to the process of wavelet transform algorithm block and it will combine the both R+WT method and Finally, gives the Fog removed Output Image as an output. The resultant output image is gives the clear and realistic image from an fog contained image. by this we can measure the PSNR the effectiveness of the fog removing technique and the performance of this process or proposed method.

D. Mathematical Analysis of Retinex Algorithm

Retinex Algorithm scientific examination within the sight of the limit makes this assignment difficult to figure it out. Truth be told, to make forecasts about the conduct of Retinex, we should realize what number of proportions are underneath the limit, however, this is difficult to realize except if we know the picture and the topology of the ways. Presently, on the off chance that we ignore the limit, at that point with the streamlined variant of the equation

$$L(i) = \frac{1}{N} \sum_{k=1}^{N} \prod_{t_k=1}^{n_k-1} \delta_k(R_{t_k}),$$

we can make forecasts about the subjective characteristic conduct of Retinex and furthermore about its conduct in connection to its parameters.

1) *Improvement of the Formula for* $\epsilon = 0$: *When* $\epsilon = 0$, *the Meaning of the Capacities* δ_k *Turns out to be a lot Less Complex*

$$\delta_k(R_{t_k}) = \begin{cases} R_{t_k} & \text{if } 0 < R_{t_k} \prod_{m_k=0}^{t_k-1} \delta_k(R_{m_k}) \leq 1 \\ \dfrac{1}{\prod_{m_k=0}^{t_k-1} \delta_k(R_{m_k})} & \text{if } R_{t_k} \prod_{m_k=0}^{t_k-1} \delta_k(R_{m_k}) > 1 \end{cases}$$

Henceforth when the edge is 0, δ_k it acts like the personality capacity or like the reset capacity. To stay away from an unwieldy documentation we can wipe out the subscript k from the talk by fixing consideration on a given way γ beginning in γ (1)= j and completion in γ (n)= i. Leave H alone the estimation of the parameter of γ to such an extent that $\gamma(H) = x_H$ is the pixel with the most noteworthy power in the entire way. the commitment of unequivocally as

$$\delta\left(\frac{I(x_2)}{I(j)}\right) \cdots \delta\left(\frac{I(x_H)}{I(x_{H-1})}\right) \delta\left(\frac{I(x_{H+1})}{I(x_H)}\right) \cdots \delta\left(\frac{I(i)}{I(x_{n-1})}\right),$$

we can see, the pixel xH empowers the reset instrument. Assume in certainty that no reset happens before xH; at that point we have

$$\frac{I(x_2)}{I(j)} \frac{I(x_3)}{I(x_2)} \cdots \delta\left(\frac{I(x_H)}{I(x_{H-1})}\right) \delta\left(\frac{I(x_{H+1})}{I(x_H)}\right) \cdots \delta\left(\frac{I(i)}{I(x_{n-1})}\right),$$

what's more, one can see quickly that the primary proportions drop each other to give

$$\frac{I(x_{H-1})}{I(j)} \delta\left(\frac{I(x_H)}{I(x_{H-1})}\right) \delta\left(\frac{I(x_{H+1})}{I(x_H)}\right) \cdots \delta\left(\frac{I(i)}{I(x_{n-1})}\right).$$

Presently, the proportion I(xH)/I(xH−1) is without a doubt more prominent than 1 in light of the fact that, by theory, Hx is the pixel with the most noteworthy force in _; besides, on account of the abrogation's, the result of this proportion and the past ones lessens to

$$\frac{I(x_{H-1})}{I(j)} \frac{I(x_H)}{I(x_{H-1})} = \frac{I(x_H)}{I(j)},$$

what's more, even this proportion is more prominent than 1, Thus the reset instrument is empowered, and the chain of items diminishes to

$$\delta\left(\frac{I(x_{H+1})}{I(x_H)}\right) \cdots \delta\left(\frac{I(i)}{I(x_{n-1})}\right).$$

After the pixel xH the reset component is restrained and the γ capacity diminishes essentially to the character work. This announcement can be demonstrated as pursues: If every one of the proportions stay under 1 until the finish of the way, at that point the announcement is inconsequentially valid; if, rather, there exists a pixel xK, K>H, with the end goal that I(xK+1)/I(xK)>1, the reset component can't be empowered on the grounds that the result of proportions R1 . . . RK decreases to

$$\frac{I(x_{H+1})}{I(x_H)} \frac{I(x_{H+2})}{I(x_{H+1})} \cdots \frac{I(x_K)}{I(x_{K-1})} \frac{I(x_{K+1})}{I(x_K)} \Big|= \frac{I(x_{K+1})}{I(x_H)} < 1.$$

On the off chance that there are different pixels with a similar trademark as xK, the end is unaltered. On the off chance that there is more than one pixel with similar power as xH, at that point, every one of the contemplations above must have alluded to the last pixel with the most noteworthy force went by _. Every one of these contemplations shows that the commitment of the way diminishes basically to I(i)/I(xH).

Since the contentions just displayed can be utilized for each way, we have that their commitments are

$$L_k(i) = \frac{I(i)}{I(x_{H_k})},$$

where xHk is the pixel with the highest intensity traveled by $\_k$ for every $k=1, \ldots, N$. Thus, The formula L(i) Becomes,

$$L(i) = \frac{1}{N} \sum_{k=1}^{N} \frac{I(i)}{I(x_{H_k})},$$ OR

$$L(i) = \frac{1}{N} \sum_{k=1}^{N} \exp(\tilde{I}(i) - \tilde{I}(x_{H_k}))$$

Finally, we recall that the intensity values are normalized, so $0 < I(x_{H_k}) \leq 1$ for every $k=1, \ldots, N$, and then $\sum_{k=1}^{N} 1/I(x_{H_k}) \geq N$.

It follows that $L(i) \geq I(i)$ for every pixel i :

this is thorough evidence of the way that a picture sifted with Retinex without limit is constantly more splendid than or equivalent to the first one.

IV. EXPERIMENT RESULTS FOR THE PROPOSED METHOD

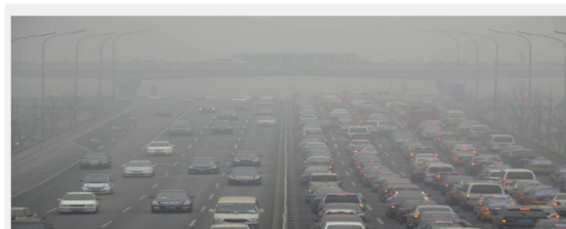A. *Experiment Results 1*

1) *Input Image*

Fig: Input Image of the proposed method
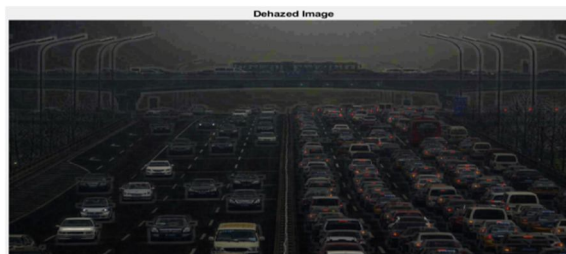
2) *De-hazed Image*

Fig: De-Hazed image of the Proposed method with the dark channel
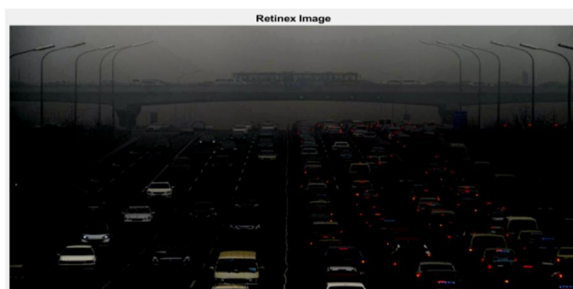
3) Retinex Image

Fig: Retinex Image of the Proposed method along with enhancement in the image
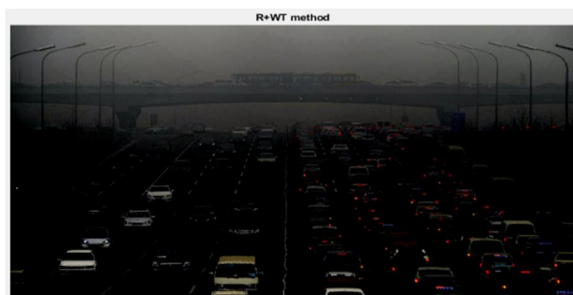
4) R + WT Image

Fig: R+WT Image

B. Experiment Results 2

1) Input Image

2) De-hazed Image

3) Retinex Image

4) R+WT Image

Finally, with this method we got more clear and realistic images than previous existing method .

We get clear image but this is not obvious, so here we are using another method to get clarity in image or to evaluate the effective of fog removing i.e, PSNR.

Pinnacle signal-to-clamor proportion, frequently truncated PSNR, is a building term for the proportion between the most extreme conceivable intensity of a sign and the intensity of adulterating commotion that influences the constancy of its portrayal. Since numerous sign have an exceptionally wide powerful range, PSNR is generally communicated as far as the logarithmic decibel scale.

PSNR is most effectively characterized through the mean square mistake (MSE). Given a clamor free m×n monochrome picture I and its uproarious estimation K, MSE is characterized as:

$$PSNR = 10 * \log10 ((2^n - 1)^2 / MSE)$$

$$MSE = \frac{\sum_{n=1}^{framesize} (I^n - P^n)}{framesize}$$

By using This PSNR formula, We can measure the effectiveness of the image quality.

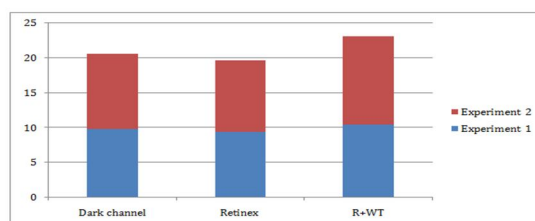| Experiment No	PSNR of Dark Channel	PSNR of Retinex	R + WT
1	9.7685	9.8965	10.8765
2	10.3533	10.8567	12.9636

Table: PSNR of Experiments

Fig: Chart for Experiments of algorithms

Finally, The effectiveness of the algorithms and the proposed method have been successfully completed by using the PSNR method of effectiveness.

V. CONCLUSION

The Proposed Project, For removing for the traffic monitoring image along with mathematical analysis of retinex algorithm has been completed along with the mathematical analysis and this gives the accurate and realistic results as we discussed in the starting The clear images and the PSNR analysis of Quality for the Images Along with the Retinex algorithm mathematical analysis.

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