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XXX-X-XXXX-XXXX-X/XX/$XX.00 ©20XX IEEE DEPTH SENSING IMAGING SYSTEM FOR AUTONOMOUS VEHICLE TO RESTORE FOG Dr.D.Menaga , Assistant Professor Department of Computer Science and Engineering St.Joseph‘s Institute of Technology, Chennai,India menagad@stjosephstechnology.ac.in Kavya N, Student Department of Computer Science and Engineering St.Joseph‘s Institute of Technology Chennai,India kavyanallasivam05@gmail.com Maria Delphiya A,Student Department of Computer Science and Engineering St.Joseph‘s Institute of Technology, Chennai,India mariadelfiya@gmail.com Abstract— In image processing, "edge-preserving smoothing" eliminates textures without removing their distinct edges. Image de-noising is one method for lowering photo noise in corrupted files. Enhancing an image's contrast, the way non-computer-aided viewers interpret information from photos, or the results of other automated image processing techniques are the goals of image denoising. Haze frequently detracts negatively from videos that were taken outside or in foggy conditions. Haze can be eliminated from hazy videos using a variety of techniques. The majority oversaturate the videos without hazing them. One of the greatest algorithms for removing haze from photos is the color attenuation prior approach.. Keywords— Dark Channel Prior (DCP), Adaptive Dehazing Methods,an image interpolation method based on GSAA and a spatial general AR model. I. INTRODUCTION One of the key steps in many computer vision applications and analysis is image segmentation. Its goal is to group pixels into multiple classes so that similar pixels exhibit a high degree of pattern recognition or match up with actual objects based on characteristics like color, texture, edge, and grayscale. Fuzzy clustering, which was created as a result of the fuzzy set theory, is one of the many clustering techniques that have been used to segment images. The most widely used c-means algorithm is unquestionably better than crisp c-means due to its higher tolerance for ambiguity. This approach is very successful in many real-world applications, particularly when it comes to processing data from medical images. Similar to other fuzzy clustering techniques, the FCM method is also susceptible to noise. An approach to fuzzy memberships that substitutes possibilities was proposed by Krishnapuran and Keller. Pal et al. presented an enhanced version of the method that generates possibilities as well as fuzzy membership values. Eliminating the requirement that the membership total equal one would allow noise points to be assigned more realistic and natural membership values, which is why this option is preferable. Because Pham believed that membership values should be consistent within a local neighborhood, he included a spatial penalty element in the FCM model. With regard to fuzzy membership values in neighborhoods, Yang introduced an additional penalty term, drawing inspiration from the neighborhood expectation maximum (EM) algorithm. Krinidis and Chatzis attempted something similar where the penalty term includes both the memberships of the neighborhoods and the grey levels. II. RELATED WORKS Richard d et al. (2018) [1] Recently, fog networking has drawn a lot of attention from a theoretical standpoint, but in order for such networks to be useful, 2 a number of unresolved issues must be resolved. 18 In order to optimize the average data rate and reduce transmission latency, this paper calculates the ideal number of nodes that should be upgraded to fog nodes with extra computing power. Alireza Momenzadeh et al. (2019) [2] Multi-radio smartphones will be able 10 to run high-rate stream applications thanks to the upcoming 5G paradigm. But because current smartphones still have limited resources and battery life, there will be new difficulties in supporting these applications in the 5G era. In theory, smartphones could benefit from dynamic resource augmentation through the Fog and Cloud Computing paradigms' service orchestration capabilities. Steven Beale et al. (2019) [4] Using GOES-16 imagery, Steven Beale and colleagues (2019) [4] created "A Probability-Based Daytime Algorithm for Sea Fog Detection." One dangerous weather condition that can jeopardize transportation, aviation, and navigation is fog.Satellite 5 remote sensing provides affordable images, but human detection and forecasting of offshore fog is limited in several ways. Xuewei Li et al. (2021)[5] The "Evaluation of fog warning system on driving under heavy fog condition based on driving simulator" was created]. 7 the idea of When there is a lot of fog, visibility is reduced, increasing the likelihood and severity of traffic accidents. Fog warning systems help to lower crash rates by alerting drivers to potential hazards. This study intends to investigate how the fog warning system's dynamic message sign (DMS) affects driver performance. In 2021, Ting Wang et al [6]. created "Blockchainenabled 13 fog resource access and granting." A new computing paradigm called fog computing brings processing power closer to end users, enabling it to meet latency-critical applications and ubiquitous massive access. The traditional methodology of network access control faces new challenges due to the geographical distribution and floating features, which may require autonomy.

The topic 6 "Characterization of Silicone Rubber Degradation Under Salt-Fog Environment With AC Test Voltage" was created by In the context of salt fog and AC voltage, this paper describes the various performances and properties of silicone rubber. Following salt-fog treatment, a significant degradation of the samples is revealed by analysis using methods like ashover voltage, static contact angle, Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and dielectric parameter. The 3 "Multi-Level Resource Sharing Framework Using Collaborative Fog Environment for Smart Cities" was created by Kadhim Hayawi et al. in 2021. For computation, storage, and communication where edge devices are used to facilitate the delay-sensitive applications, fog computing has demonstrated its superiority over legacy cloud architectures. Computational intelligence is now closer to the end devices thanks to the development of fog nodes. Numerous fog computing frameworks that use edge devices for computation have been proposed. 5 In order to improve Quality of Services (QoS), we suggested in this paper a simulation framework for fog devices that can leverage end devices to manage the peak computation load. The technique is predicated on the concentric receptive field, or three Gaussians, that function as the retinal neurons disinhibition characteristics. Employing 1 global histogram equalization with contrast limitation, we first improve the original fog images. Secondly, the video's details and depth information are restored using a local image enhancement technique. In a comparative experiment, the outcomes of the approach 5 used in this work were contrasted with those of the Contrast Limited Adaptive Histogram Equalization method and the dark channel prior based method. 1 Based on the experiment results, it was possible to avoid adding noise and oversampling light by using the contrast constrained global histogram equalization method. Additionally, the video's depth information was enhanced by the three Gaussians that enhanced the local details. The technique presented in this paper effectively eliminated fog from videos and improved their visibility. Fuzzy C-Means clustering with an adaptive threshold for background subtraction in moving object detection Soeleman, Moch Arief (2012). To improve visibility in cloudy weather, apply 11 image haze removal techniques. We have looked into how applying different filters—aside from the gaussian and fundamental mean filters—affects visibility improvement when it's foggy. The findings [12] indicate that the various filters have varying effects on improving visibility. Our research indicates that bilateral filters outperform the others. By lowering the contrast and saturation, fog and haze deteriorate [11] the quality of preview and captured images. The scene or object's visibility deteriorates as a result. The current work aims to improve a foggy video's visibility, saturation, contrast, and noise reduction. We suggest a single-frame technique that makes [12] use of a multilevel transmission map to improve hazy videos. The process is quick and devoid of noise or artifacts, which are common with these kinds of enhancement methods. The suggested method outperforms the current ones [9] in terms of processing time and quality, according to a comparison. With VGA resolution, the suggested approach operates [2] in real time. Additionally, the suggested work offers a plan to clear the fog, rain, and snow. III. METHODOLOGY A. System Overview The system's block diagram provides the following general overview of the system: Fig 1 Architecture Diagram of Depth sensing image system For autonomous vehicle B. Pre-processing of Images Pre-processing of data can involve data transformation, data cleaning, and data selection. Perhaps [12] the most important task when creating an AI model is gathering information. [8] It is a social affair where data related to errands depends on certain factors that are investigated in order to produce some meaningful outcome. In any case, some of the information may be controversial, such as if it contains false, insufficient, or erroneous information. Therefore, handling the data is necessary before decomposing it and moving on to the results. Information cleaning, information modification, and information determination should enable information pre-handling.

C. Feature Extraction Feature extraction in image processing takes an initial set of measured data and produces derived values (features) that are meant to be non-redundant and informative. These characteristics can aid in subsequent learning and generalization processes. A features vector, which is a condensed set of features, can be produced when the algorithm's input data is either too large to handle or appears redundant. Feature selection is the term for this procedure . The features that are chosen will include the relevant information from the input data such that the intended task may be completed with this reduced representation rather than the entire original set of data .Image segmentation and restoration Images restoration aims to "make up for" or "undo" flaws that cause a video to become less good. 8 There are various types of degradation, including noise, motion blur, and misfocused cameras. When dealing with situations such as motion blur, it is feasible to accurately estimate the blurring function and "undo" the blur to bring back the original video. The best we can do in situations where noise has distorted 2 the image is make up for the loss it caused. In this project, we'll present and put into practice a number of techniques. 9 Image segmentation is the process of breaking up a digital image into distinct, meaningful areas. In an aerial recognition application, the meaningful regions could be 16 objects in an image of a three-dimensional scene, or they could correspond to residential, commercial, agricultural, or natural terrain. A region is a collection of connected pixels. Depending on whether diagonally adjacent pixels are also taken into account, the objects may be eight or four connected. Four connected objects are those that are only laterally adjacent pixels. D. Training and Testing Using pre-processing methods, creating a diverse dataset of labeled images, and 2 training the model with CNN architectures in deep learning frameworks are all part of the adaptive dehazing model's testing and training phase. To guarantee peak performance, hyperparameter tuning is done and the model is validated. The efficacy of the model is evaluated through visual inspection and testing metrics like PSNR and SSIM. The comparison process is guided by benchmarking against current fog removal techniques, and any shortcomings are addressed through iterative finetuning to ensure ongoing optimization of fog removal performance. E. Data-set The Foggy Image Dataset, sourced from Kaggle, comprises a diverse collection of high-resolution 14 images captured in various environmental settings affected by foggy conditions. This dataset serves as a valuable resource for 2 research and development in computer vision, particularly for addressing challenges related to image processing and scene understanding in adverse weather conditions. Characteristics: Image Variability: The dataset 7 consists of a wide range of environmental scenes, including urban, rural, and natural landscapes affected by fog, mist, or haze. Weather Conditions: Images exhibit varying degrees of fog density, from light mist to thick fog, presenting different visibility levels. Scene Diversity: Encompasses scenes with different complexities, such as cityscapes, forests, highways, and landmarks, affected by fog, offering diverse visual scenarios. Annotations (Optional): Depending on the dataset version, annotations may include depth maps, segmentation masks, or metadata enhancing its utility for machine learning tasks. Figure 3: Sample foggy images from dataset IV. PERFORMANCE ANALYSIS The sheer number of variables involved in complex data analysis is one of the primary challenges. Large-scale variable analysis typically uses a lot of memory and processing power. It can also lead to overfitting of 11 training samples and poor generalization of the algorithm to new samples. The term "feature extraction" refers broadly to techniques for creating variable combinations that circumvent these issues while providing an accurate enough description 8 of the data.

Figure 2: Performance graph Table1:Comparision of different models Table 1 represents the comparision between different models 5 used for the fog removal method. Therefore from the above the table it is clearly shows the proposed method has highest range of accuracy. V. RESULT The result and discussion section of a research project 2 is crucial for presenting the findings obtained through the proposed methodologies. The experimentation is performed on the dataset using various machine learning algorithms. Figure 4: Sample output image Figure 4 is the final 19 output of the proposed model for the removal of fog from the image. The image containing fog is provided 2 as input and it is Preprocessed and segmented the final clear and quality image without fog is given as output. VI. CONCLUSION AND FUTURE WORKS The disinhibition 1 properties of the concentric receptive field of retinal neurons are the basis of our method, which functions similarly to three Gaussians. The technique first equalizes the image's global histogram before limiting the contrast. After applying three Gaussians models to the global processing images 7 to improve the depth information in the video, the defogging images are produced.According to experimental results, the method can successfully accomplish the goals of reducing fog, extending image contrast, and enhancing scene details. 12 Its ability to add depth to the scene makes it the most advantageous method when compared to the other two. The results 1 presented in this paper can generate a visual sensory experience that is more realistic and gentle than CLAHE. Our project's accuracy rate is 90.02%. The color of the processed results is brighter, but in certain photos the method performs better than 4 a single image based on channel dark. So, 2 in order to address the color problem and raise the paper's automation level, more investigation into the methodology is necessary. VII. 17 ACKNOWLEDGEMENT It

gives us great pleasure in presenting this paper named ―DEPTH SENSING IMAGING SYSTEM FOR AUTONOMOUS VEHICLE TO RESTORE FOG‖. On this momentous occasion, we wish to express our immense gratefulness to the range of people who handed inestimable support in the completion of this design. Their guidance and stimulant has helped in making this design a great success. We‘d like to deeply express our sincere gratefulness to our reputed St.Joseph‘s Institute of Technology. We‘re extremely thankful to all the staff and the operation of the council for furnishing us all the installations and coffers needed. REFERENCE [1] Lu, F., Huang, J., Zhan, K.: _Boosting classifiers for scene category recognition‘, J. Inf. Hiding MultimediaSignal Process., 2015, 6, (4), pp. 708–717 [2] Wang, Y.W., Chen, C.J., Huang, S.F., et al.: _Segmentation of median nerve by greedy active contour detection framework on strain ultrasound videos‘, J. Inf. Hiding Multimedia Signal Process., 2015, 6, (2), pp. 371– 378 [3] Lai, M.S., Huang, H.C., Chu, S.C., et al.: _Imagestexture segmentation with ant colony systems‘, Int. J. Innov. Comput. Inf. Control, 2006, 1, (6), pp. 652–656 [4] Qiao, Y., Zhao, Y.: _Rotation invariant texture classification using principal direction estimation and random projection‘, J. Inf. Hiding Multimedia Signal Process., 2015, 6, (3), pp. 534–543 [5] Huang, H.C., Chen, Y.H., Lin, G.Y.: _Fuzzy-based bacterial foraging for watermarking applications‘. Proc. Nineth Int. Conf. on Hybrid Intelligent Systems, 2009, pp. 214–217

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