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A NOVEL ON END TO END SINGLE IMAGE DEHAZING USING PIX2PIX GAN

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Abstract : Haze is a common atmospheric phenomenon that significantly degrades the quality of images, affecting various computer vision applications. In this project, we propose a Pix2Pix Generative Adversarial Network (GAN) based approach implemented in PyTorch to address the task of image dehazing. The Pix2Pix GAN learns a mapping from hazy images to corresponding haze-free representations by leveraging a paired dataset of hazy and clear images. Our method employs an adversarial loss along with a pixel-wise loss function to train the generator network, enabling it to effectively learn the complex relationship between hazy and dehazed images. We evaluate the performance of our model metrics such as generator loss, discriminator loss and L1 loss during both training and validation. Additionally, we present qualitative results demonstrating the capability of our approach to produce visually pleasing dehazed images with improved clarity and detail. The experimental results showcase the effectiveness and robustness of our Pix2Pix GAN-based approach for hazy image dehazing.

I. Introduction:

This study presents a novel approach to image dehazing using Pix2Pix Generative Adversarial Network (GAN) implemented in PyTorch. The GAN learns a mapping from hazy images to haze-free representations by leveraging a paired dataset of hazy and clear images. The method employs an adversarial loss along with a pixel-wise loss function to train the generator network, enabling it to effectively learn the complex relationship between hazy and dehazed images.The term "Pix2Pix" inherently signifies a process of converting pixels from one image to another. This model has shown its efficacy across various image-to-image translation tasks, such as transforming maps into satellite photographs, grayscale images into colored ones, and sketches of products into realistic product photographs. The utilization of Generative Adversarial Networks (GANs) in this context facilitates the synthesis of images from one domain to another.

Research Methodology:

The system architecture for the project "Hazy Image Dehazing using Pix2Pix GAN" employed a Pix2Pix Generative Adversarial Network (GAN) implemented in PyTorch to address the challenge of image dehazing caused by atmospheric haze. The Pix2Pix GAN was trained on a dataset of paired hazy and clear images, learning a mapping from hazy to haze-free representations. The architecture included a generator network trained with an adversarial loss and a pixel-wise loss function, enabling it to learn the complex relationship between hazy and dehazed images.

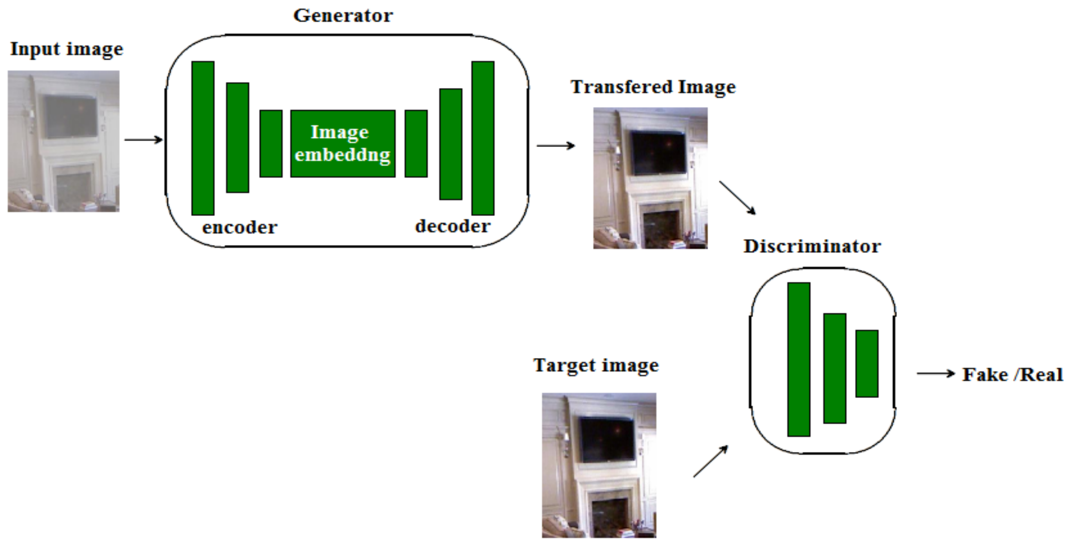


Figure 1 Model Architecture

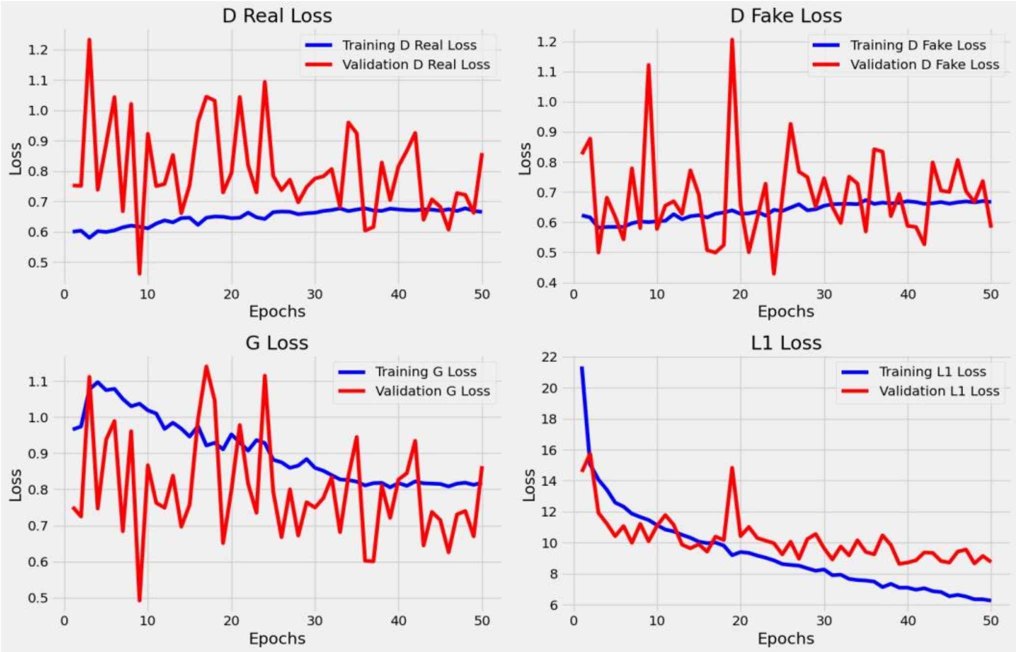
The model architecture for hazy image dehazing using Pix2Pix GAN involves a generator network that learns a mapping from hazy images to corresponding haze-free representations. This generator network is trained alongside a discriminator network in an adversarial manner. The generator aims to produce dehazed images that are indistinguishable from real, haze-free images, while the discriminator aims to distinguish between generated and real images. The architecture also includes a pixel-wise loss function, which enforces the generator to produce high-quality dehazed images. This combination of adversarial and pixel-wise losses helps the generator network to effectively learn the complex relationship between hazy and dehazed images, resulting in improved image quality.

RESULTS AND DISCUSSION

In the result analysis, the performance of the Pix2Pix GAN-based approach for hazy image dehazing was evaluated. Metrics such as generator loss, discriminator loss, and L1 loss were monitored during both training and validation stages. The outcomes of the trial proved how reliable and efficient the suggested strategy was.

Qualitative results showcased visually pleasing dehazed images with improved clarity and detail compared to the input hazy images. The analysis also highlighted the ability of the model to generalize well to unseen hazy images, indicating its potential for real-world applications in enhancing image quality affected by atmospheric haze.

I. Acknowledgment



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