

Major Project Phase-II

Zeroth Review

MULTISPECTRAL SATELLITE IMAGE DEHAZING

Presented By:

Shaistha M

19BTRCR014

Kushal Ageeru

19BTRCR047

G SAI AVINASH

19BTRCR048

Nishen

19BTRCR061

Overview

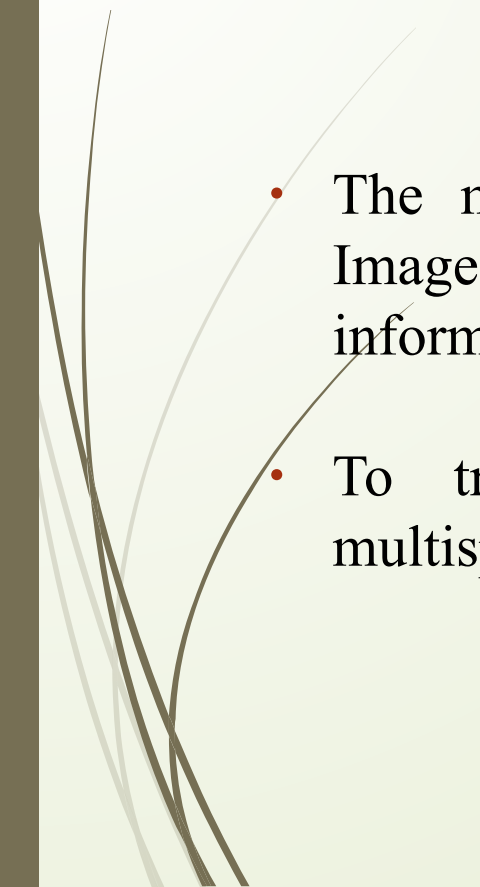
- ☒ Introduction
- ☒ Problem Statement
- ☒ Objectives
- ☒ Abstract
- ☒ Literature Survey
- ☒ Introduction
- ☐ State of the Art work
- ☒ Implementation
- ☐ Flow of the Project
- ☒ Non-Functional Requirements
- ☒ System/Software Requirements
- References

Problem Definition

- Images captured in hazy or foggy weather conditions make the object features difficult to identify by human vision. Accuracy is also the main drawback where we can find less average accuracy.




OBJECTIVE

- The main objective is to improve the visual quality. Images with good quality help users fully understand the information and see a clear quality image.
 - To train the network, which can synthesise hazy multispectral images highly closed to real conditions
- 



ABSTRACT



The task of image de-hazing has been a challenge in the field of Computer Vision since its inception. The images captured during adverse weather conditions often appear to be of low quality due to the presence of various atmospheric particles, which results in hazed images. This, in turn, causes trouble in detecting objects in an image. This causes problems for many computer vision problems that rely on the visibility of these images. In this paper we are implementing a deep neural Network for problems that rely on the visibility of these images



Literature survey



- Numbers of dehazing methods have been developed for multispectral remote sensing images. Earlier methods usually focused on dehazing for each spectral band of multispectral data
- Recently, supervised learning-based methods have been developed to solve the dehazing problem for outdoor images. Tang et al. extracted a set of haze-relevant features, with which a regression model based on Random Forest was learned to predict the medium transmission.
- Cai et al designed a convolutional neural network (CNN) model to regress the transmission to dehaze.

Introduction

- ❑ In recent years there has been a growing interest in using satellite imagery for different tasks in modeling the earth, e.g. creating accurate maps. For this to be possible the satellite images must have a high enough resolution to be able to detect small details.
- ❑ The usability of the images does not only depend on their resolution but heavily on the quality of their content as well.
- ❑ One great disadvantage when taking images from outside of the atmosphere is that the result will be distorted since the light is forced to pass through particles in the atmosphere which will scatter and absorb the light.
- ❑ The distortion will reduce the applicability of the resulting images if they are not corrected. Since these effects are inevitable in the field of remote sensing it is important to have effective methods to remove them.

Introduction

- ❑ A multispectral image dehazing tries to improve interpretability in the image regions affected by the presence of haze during acquisition.
- ❑ In remote sensing, optical multispectral satellite images often suffer from the presence of haze resulting in a lack of contrast and data interpretation.
- ❑ The process of dehazing tries to recover the information affected due to the presence of haze and therefore serves to increase the data interpretation for manual or automated operations. Haze detection and removal is a challenging and important task for optical multispectral data correction.

State of the Art-work

SL.N O	Author's Name/ Paper Title	Conference/J ournal Name and year	Technology/ Design	Results shared by author	What you infer
1.)	Yongfei Guo,1Zeshu Zhang,1and Hangfei Yuan1 Single Remote Sensing Multispectral Image Dehazing Based on a Learning Framework	Hindawi journal 2019	The processing of single hazy image has a significant progress in Some methods based on polarization have been developed in which the development of deep learning,	indicate that compared with the state-of-the art methods, our proposed dehazing method can effectively remove haze in each band of multispectral images under different scenes	The proposed haze synthesis method can generate haze highly close to real conditions, using which to train the dehazing network.
2.)	K. Mounika, N. Harika Reddy, Kalagasahitya, K.V. Alekhya, Karaka Jyoshna, P.Sai Gayathri, K SatyaPriya DEHAZING FOR MULTISPECTRAL REMOTE SENSING IMAGES	International Research Journal of Modernization in Engineering Technology And Science 2019	The hazy image and its corresponding transmission map is detected effectively based on learning the coefficients of the linear model.	A linear regression model with multiple variables is established and the gradient descent method is applied to the coefficients of the linear model. Then a hazy image accurate transmission map is obtained.	The proposed method can recover a haze-free remote sensing image with good visual effect and high quality.

State of the Art-work

SL.N O	Author's Name/ Paper Title	Conference/J ournal Name and year	Technology/ Design	Results shared by author	What you infer
3.)	Ravi Raj Choudhary, K K Jisnua, Gaurav Meenaa Image DeHazing Using Deep Learning Techniquesa	International Conference on Computational Intelligence and Data Science (ICCIDS 2019)	Using Computer vision, Convolutionary neural network to create a model to achieve dehazed image	This paper present a deep-learning approach that generates haze free images without any human intervention.	By chnaging the hyper paratmeters in the model we could achive more accuracy and get more clear dehazed image.
4.)	Manjun Qin,Wei Li. Dehazing for Multispectral Remote Sensing Images Based on a Convolutional Neural Network With the Residual Architecture	IEEE Xplore 2018	Designed Dehazing Framework, Adaptive Fusion, Haze Synthesis Method	The designed network includes two parts. One is the parallel connection of multiple CNN individuals with residual structure. Each individual is used to learn a regression from the hazy image to the clear image.	in this paper, a novel haze removal method based on the deep CNN is proposed for multispectral remote sensing image

State of the Art-work

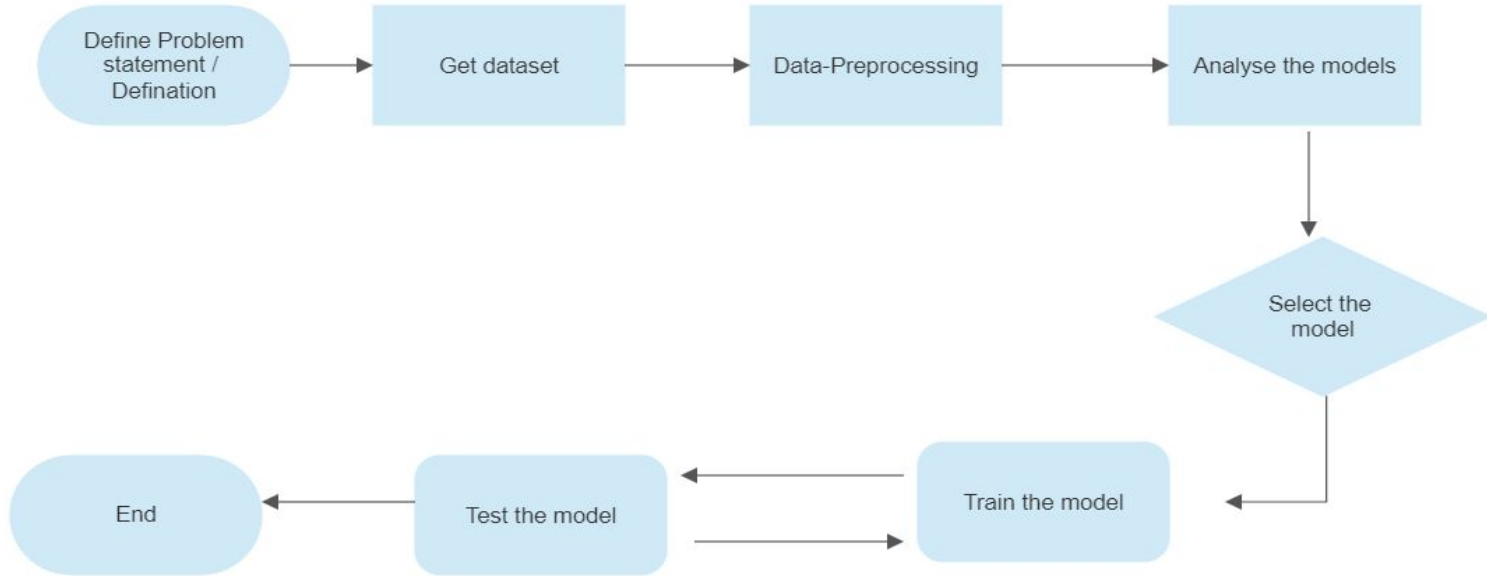
SL.N O	Author's Name/ Paper Title	Conference/J ournal Name and year	Technology/ Design	Results shared by author	What you infer
5.)	Juping Liu ^{1,2} , Shiju Wang ¹ , Xin Wang ¹ , Mingye Ju ^{1,*} and Dengyin Zhang ¹ A Review of Remote Sensing Image Dehazing	Multidisciplinary Digital Publishing Institute[MDPI] (2021)	Physical Dehazing, Estimating the Transmission. Data-Driven Based Dehazing, Dehaze Net, Remote Sensing Dehazing Image Quality Evaluation,	As a result, the anticipated models accounts for the majority of its success in terms of dehazing performance. The most frequent quantitative measures and the RS application scenario Dehazing techniques were also shown.	Here we have seen that the imaging theory of hazy data is ignored in image enhancement, which primarily emphasizes the maximization of local or global contrast.
6.)	ZHIJIE HE, CAILAN GONG, YONG HU, AND LAN LI Remote Sensing Image Dehazing Based on an Attention Convolutional Neural Network	IEEE Xplore (2019)	Remote sensing, Atmospheric modeling, Feature extraction, Kernel, Image restoration, Neural networks, Degradation	The heterogeneous haze in some areas of the remote sensing images were effectively removed. In both the haze residue level and evaluation index, this method was superior to the conventional dark channel method, DehazeNet, and AOD-NET	In this paper we have seen for images taken in the same area, the background information in hazy images acquired on different days varied due to factors like different lighting conditions.



IMPLEMENTATION

- The Novelty which we have included in our project is the testing of different methods to implement dehazation and coming out with the best method from it.
- Methods using :
 - CNN
 - GANS
 - matlab

Flow of the Project :



Functional Requirements

- Good quality dehazed image and help users fully understand the information from the image dataset.

The system should be able to do the following:

- The system accepts the inputs hazed image and extract.
- Provide a improvised version of the image with higher quality .
- Allow users view and download the clear image .



Non-Functional Requirements

- User friendly web interface.

The proposed project model is reliable as it classifies and generates text description of an image and audio signal.

- The proposed project model is robust as it undergoes data training.
- Basic interpretation of data over a given period.
- Provide basic analysis of the values read.
- Availability
- Good Accuracy

Software/System Requirements

System requirements

- Operating system : WINDOWS/LINUX/MAC
- RAM: 4-8GB
- 80 GB HDD
- GPU:4GB(NVIDIA/AMD)

Software Requirements

- Visual studio
- Python version 3 and above version
- Java version 8
- Python libraries (Numpy, pandas, sklearn, scipy, keras, TensorFlow).

References

- ❑ [1.] Liu J, Wang S, Wang X, Ju M, Zhang D. A Review of Remote Sensing Image Dehazing. *Sensors (Basel)*. 2021 Jun 7;21(11):3926. doi: 10.3390/s21113926. PMID: 34200320; PMCID: PMC8201244.
- ❑ [2.] Z. He, C. Gong, Y. Hu and L. Li, "Remote Sensing Image Dehazing Based on an Attention Convolutional Neural Network," in *IEEE Access*, vol. 10, pp. 68731-68739, 2022, doi: 10.1109/ACCESS.2022.3185627.
- ❑ [3.] Hindawi. "Single Remote Sensing Multispectral Image Dehazing Based on a Learning Framework." *Single Remote Sensing Multispectral Image Dehazing Based on a Learning Framework*, www.hindawi.com/journals/mpe/2019/4131378. Accessed 22 Sept. 2022.
- ❑ [4.] www.irjmets.com/uploadedfiles/paper//issue_6_june_2022/26642/final/fin_irjmets1655902241.pdfhttps://www.irjmets.com/uploadedfiles/paper//issue_6_june_2022/26642/final/fin_irjmets1655902241.pdf.

References

- [5.] Jisnu, K.K., & Meena, G. (2020). Image DeHazing Using Deep Learning Techniques. *Procedia Computer Science*, 167, 1110-1119.
- [6.] B. Huang, Z. Li, C. Yang, F. Sun and Y. Song, "Single Satellite Optical Imagery Dehazing using SAR Image Prior Based on conditional Generative Adversarial Networks," *2020 IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2020, pp. 1795-1802, doi: 10.1109/WACV45572.2020.9093471.
- [7.] M. Qin, F. Xie, W. Li, Z. Shi and H. Zhang, "Dehazing for Multispectral Remote Sensing Images Based on a Convolutional Neural Network With the Residual Architecture," in *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 11, no. 5, pp. 1645-1655, May 2018, doi: 10.1109/JSTARS.2018.2812726.
- [8.] Akash Ramjyothi, Santonu Goswami. CLOUD AND FOG REMOVAL FROM SATELLITE IMAGES USING GENERATIVE ADVERSARIAL NETWORKS (GANs). 2021. <hal-03462652>



THANK YOU