SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF DATA SCIENCE AND BUSINESS SYSTEMS

18CSP109L/ 18CSP111L- PROJECT FIRST REVIEW

Denoising Underwater Images

RA1911027010045
RA1911027010046
Dr. Divya G
Assistant Professor

Table of contents

- Abstract
- Introduction
- Motivation
- Literature Review
- Challenges and Limitations of Existing System
- Objectives of the Project
- Innovation of the Project
- Scope and Application of the project
- Architecture
- Proposed Modules and their algorithm description
- UML Diagrams

Abstract

- The aim of the project is to develop a solution for removing noise and restoring clarity in underwater images.

- The result of this project is to demonstrate the potential of various techniques to improve the quality of underwater images for various applications.

Introduction

- Underwater imaging plays a crucial role in various fields, ranging from oceanography to archaeology. However, capturing high-quality underwater images is a challenging task due to various sources of noise, such as backscatter, scattered light, and low light conditions.

- The goal of this project is to provide a more efficient and effective means of capturing and analyzing underwater information, with the potential to impact a wide range of fields and applications.

Motivation

- The motivation behind this project is to address the challenge of poor image quality in underwater photography. Underwater images are often affected by various sources of noise, such as backscatter, scattered light, and low light conditions, which can significantly reduce the quality and clarity of the images.
- This is particularly important in underwater research and exploration, where high-quality images are crucial for accurate analysis and interpretation of the data.

Literature Review

- The existing techniques and methodologies in place are highly specific and very expensive computationally. They either focus on various issues with underwater photos which have already been mentioned.

- There is still ongoing research in this field, and new techniques are being proposed to overcome the challenges posed by underwater imaging.

Challenges and Limitations of Existing System

- As mentioned in the previous slide, all the existing methods are very computationally heavy. This makes the application of these methods only possible is specialized systems.

- Apart from that there is also a lack of data in the field and the traditional denoising methods often result in a lack of details

Innovation of the Project

- The most important innovation of this project is providing a solution which can be run on any device and does not require a very expensive system, making underwater photography more accessible to everyone.

- Apart from that we also aim to challenge the limited annotated underwater image datasets by leveraging unsupervised methods.

Scope and Application of the project

- The scope of this project is to develop a solution to remove noise and restore the clarity of underwater images.
- The applications of this project are wide-ranging and can impact many fields-
  - Oceanography
  - Robotics
  - Military
  - Archaeology

Architecture

- The general architecture of the project is as follows-
  - Preprocessing- Preprocess the input images and converting them to a suitable format
  - Denoising- Removing noise and restoring the clarity of the images
  - Post-processing- Converting the denoised and restored images back to the original format

  This architecture is just a general flow as the final architecture will be determined based on the result of the performance of various models and solutions.

Modules and Algorithm

- Following are the proposed modules and the algorithm to implement the modules-
  - Backscatter reduction – This module will use Dark Channel Prior-based Backscatter Removal to remove the backscatter layer
  - Color Correction – Color balance Algorithm will be used to Shift the color channels of the image based on average water color and average illumination.

Modules and Algorithm

- Following are the proposed modules and the algorithm to implement the modules-

  - Contrast Enhancement– Adaptive Histogram Equalization will be used to adjust the contrast locally, preserving image details

  - Dehazing– Dark Channel Prior Dehazing will be used to create a transmission map to recover a clear image.

UML Diagrams
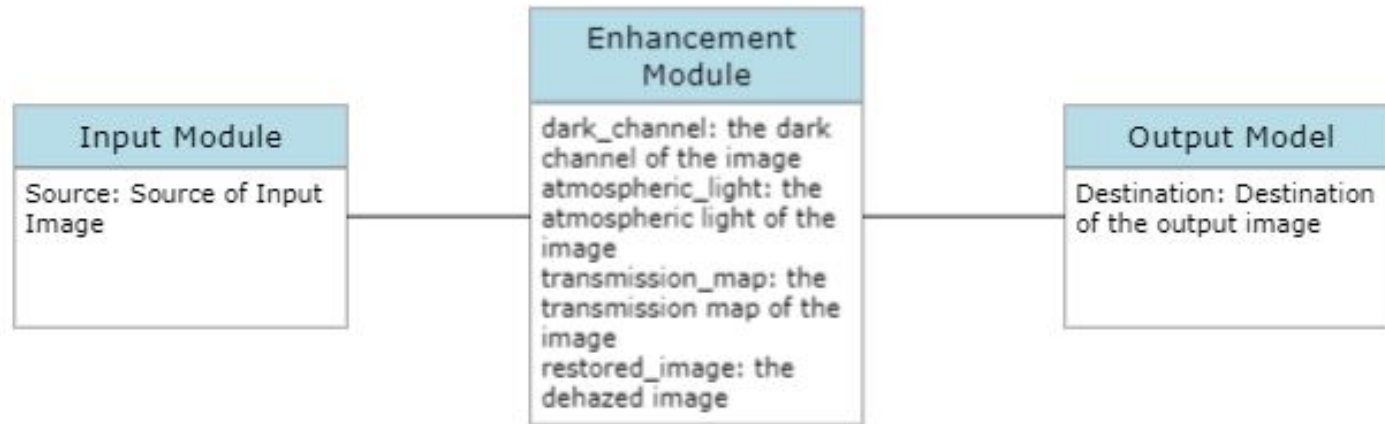
- The flow through the enhancement module is dependent on what order of the attributes provide the best results.

Thanks