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TED UNIVERSITY

CMPE 491_01: Graduation Project

Analysis Report

Instructor of the Course: Yücel Çimtay

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1. Introduction

In the past and nowadays, there are significant reductions in visibility in places where fog or haze is under the influence. When we look at recent times (2008 – 2022), technological devices and various developments in various fields (such as artificial intelligence, machine learning, and image processing) can display images even when this fog exists and at least enable us to distinguish objects under fog and haze are working with a certain success rate. But is it possible for these systems to be even better with various improvements and algorithms? In this project, efforts will be made to achieve this goal.

2. Current System (if any)

The system we are currently working on is the DehazeNet[1] structure, we are working on how image processing can be better using this structure. Estimating a medium transmission map for a hazy input picture is essential for achieving haze removal. In this regard, we suggest DehazeNet, a trainable end-to-end system for estimating medium transmission. The atmospheric scattering model is then utilized to recover a haze-free image using the medium transmission map that DehazeNet produces after receiving an input of a gloomy image. DehazeNet uses a deep architecture built on Convolutional Neural Networks (CNN) [2], whose layers are intended to encapsulate the established presumptions/priors in picture dehazing.

3. Proposed System

The system under consideration is designed as a system in which foggy images are purified with a greater success rate. Today, some systems provide this with a certain success rate, but they are insufficient for such situations. In this system, we will use the Capsule Networks[3] in DehazeNet to increase the success rate, our main goal is to increase the success rate to 80%. When this happens, the project will be successful, and in case of failure, it will try to apply purification for lower fog and haze (such a 50% success rate).

3.1 Overview

In short, removing fog or haze from photos and videos still has a low success rate today. To improve the ability to remove fog or haze from photos and videos, first DehazeNet We learn to work on its structure and understand its structure. After this stage, we aim to

increase the success rate by putting various improvements and algorithms we have designed. If we increase this rate, the project will have achieved its purpose.

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3.2 Functional Requirements

- Users will be able to upload photos of the product.
- The user will be able to see the improved version of the uploaded photo by clicking the improve button.
- The user will be able to compare the improved photo with the first version.
- The user will also be able to try the photos that have been trained.
- It will be able to show the performance increase according to the quality parameters
- Ssim and psnr. It will allow different image enhancement methods.

3.3 Non-functional Requirements

- Should have rtx2060 6 Gb.
- Should be an intel core i5-11400F.
- Should have a processing speed of 3.2 GHz.
- Should have 16Gb (ddr4).
- Required display 1920x1080.

3.4 Pseudo Requirements

- Application language should be Python programming language.
- DehazeNet must be used in this application.

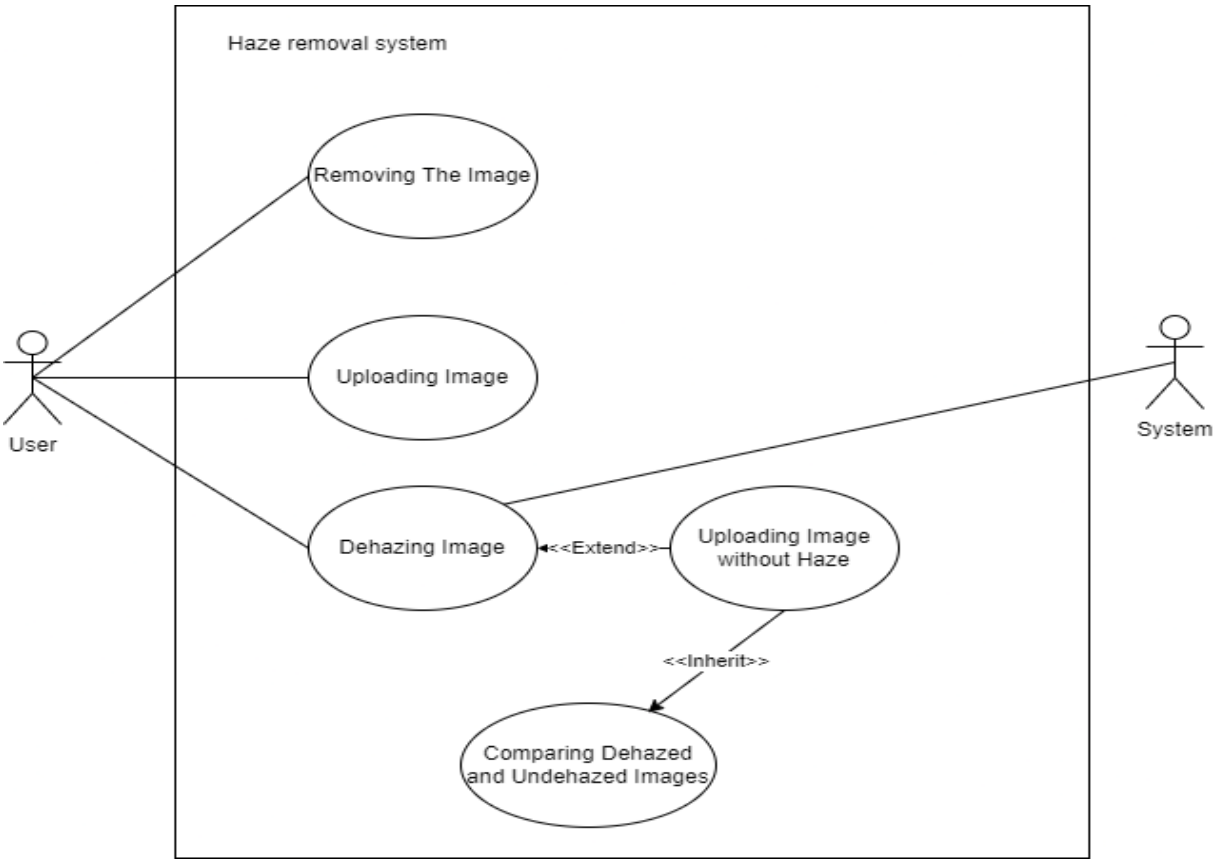
3.5 System Models

3.5.1 Scenarios

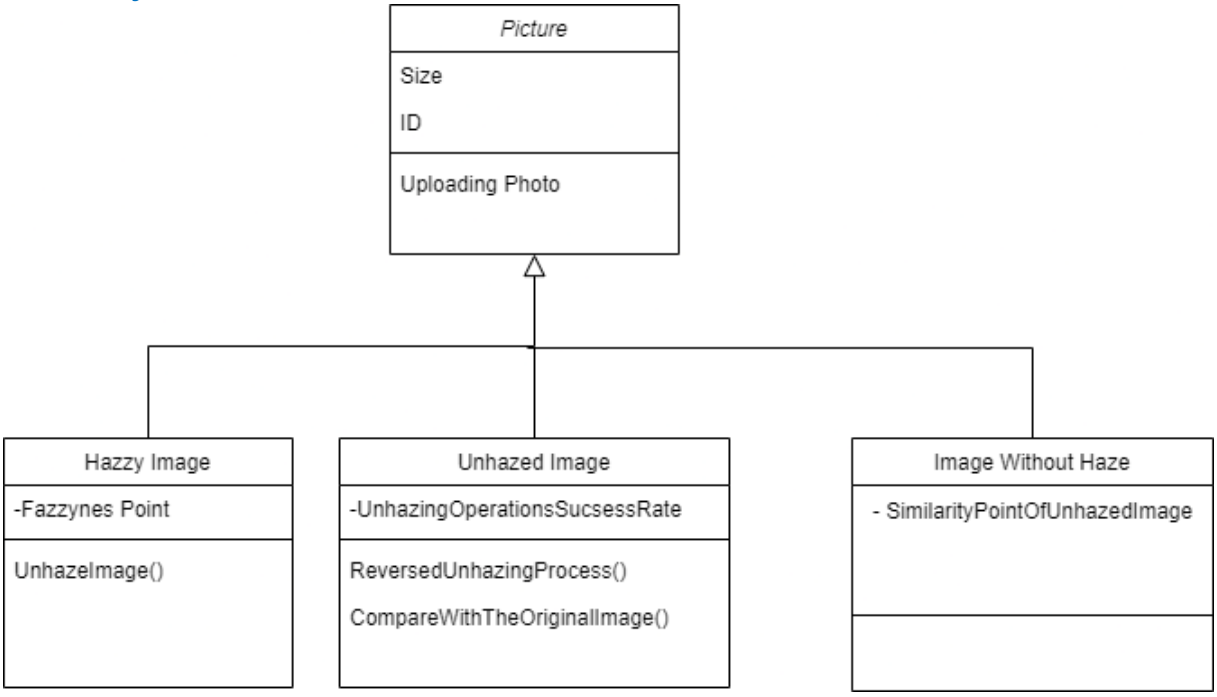
- The user who wants to dehaze a photo can reach the application interface by clicking on the application.
- The user can select the photo they want to dehaze.
- The user can see the cleaned image by pressing the button dehaze the selected photo.
- The user can compare the dirty and clean images.
- If the user refuses to dehaze, he can cancel the process by pressing the remove button

- User can download the dehazed photo.

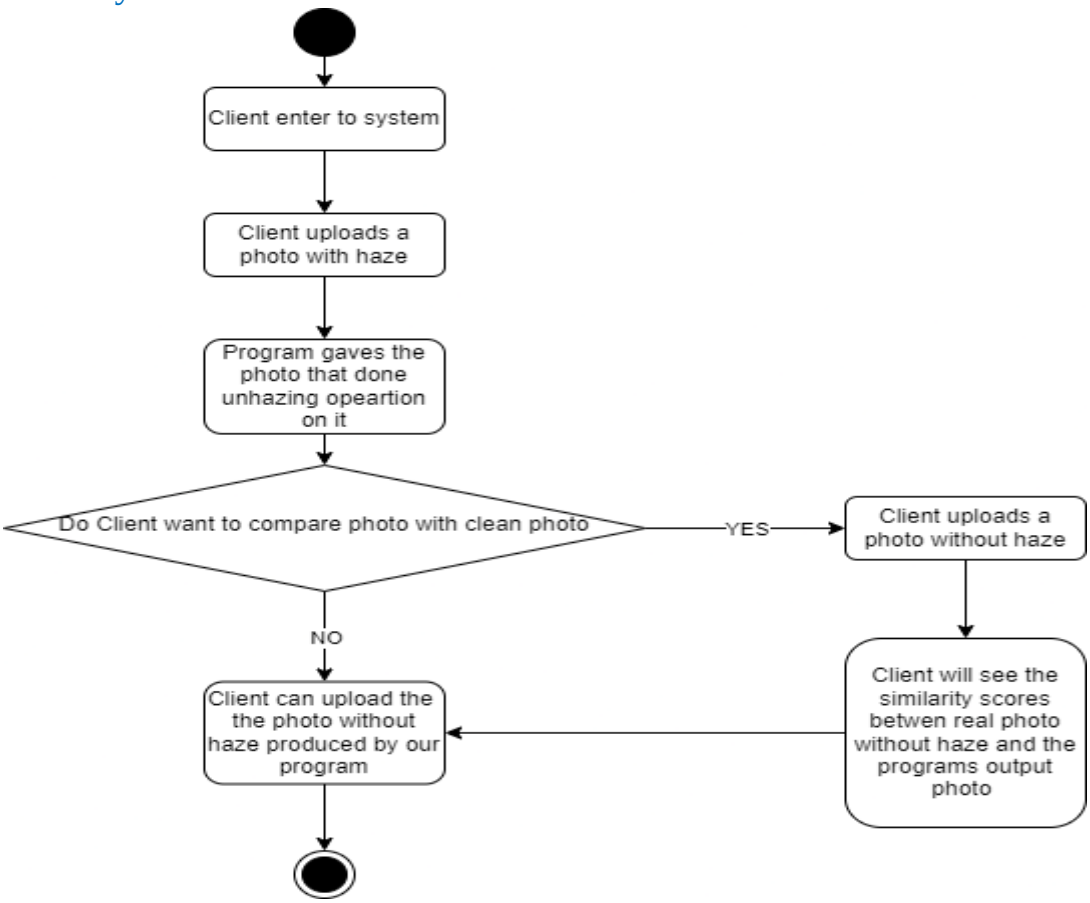
3.5.2 Use case model



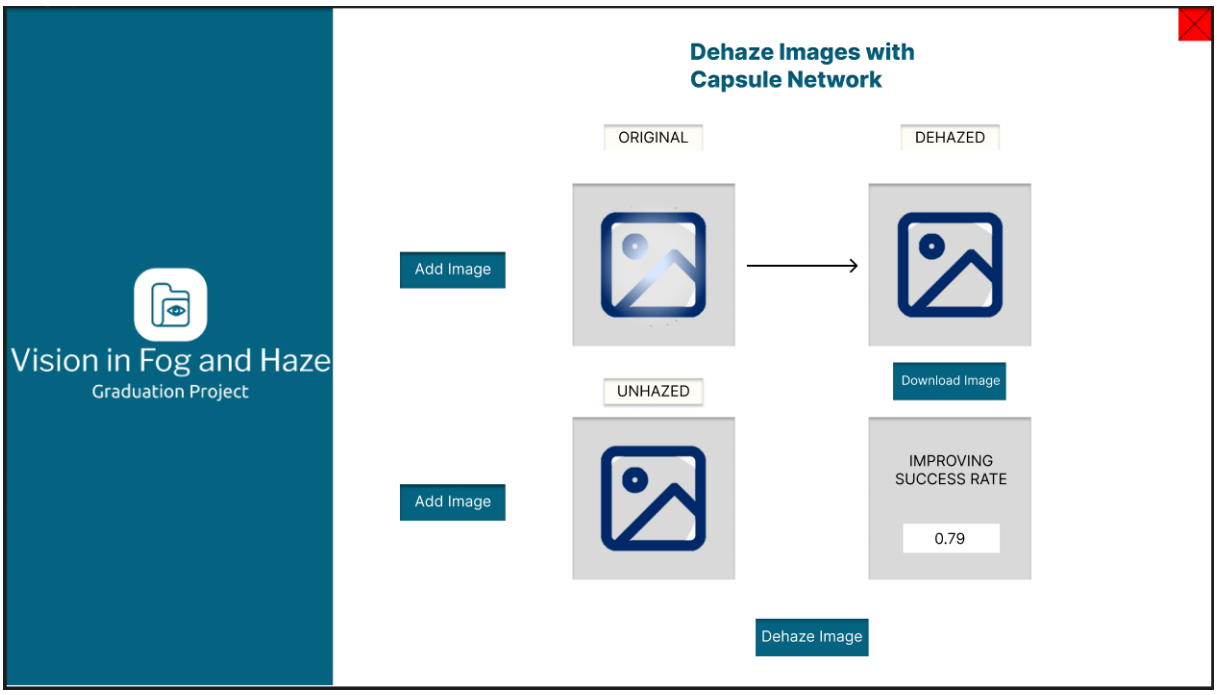
3.5.3 Object and class model



3.5.4 Dynamic models



3.5.5 User interface



4. Glossary

1: DehazeNet: An end-to-end system for single image haze removal.

2: CNN: A CNN is a kind of network architecture for deep learning algorithms and is specifically used for image recognition and tasks that involve the processing of pixel data. There are other types of neural networks in deep learning, but for identifying and recognizing objects, CNNs are the network architecture of choice.

3: Capsule Network: The network is trained by minimizing the euclidean distance between the image and the output of a CNN that reconstructs the input from the output of the terminal capsules.

5. References

- https://arxiv.org/pdf/1601.07661.pdf
- https://www.techtarget.com/searchenterpriseai/definition/convolutional-neural-network
- https://en.wikipedia.org/wiki/Capsule_neural_network