Non-Photorealistic Rendering with Spot Colour

Description

I plan to produce an AI model for processing images which produces an image in a different style and with spot-colour, this applies a rendering style and then applies the spot colour algorithm. Spot colour is when a colour or object within an image has been kept in colour or been made more vibrant while the rest of the image has had a greyscale filter put over it. The purpose of this is to allow an AI model to pick out an area within the image to make the image more interesting.

Non-photorealistic rendering techniques have already been produced, however this uses more traditional methods of image analysis, I want to produce an AI model and compare the effectiveness of that model to traditional techniques of spot colour. In order to train this model I will be collecting and generating training data, to accomplish this I will need to find approximately 100 different images so the effect is reproducible on any image. I plan to collect an unaltered image and then process that image through photoshop to be a non-photorealistic rendering with spot colour. This is an effective way to train the model as it requires less training data. Training data can have a bias, in order to attempt to prevent this I will have a variety of different types of images, this should prevent accidentally creating a bias within the model.

I think Python is the best option for machine learning, it's a popular language, it's easy to use and has many useful libraries to help me produce the required results. My Overall aim is to produce an AI model that will take an image as input and will apply various filters and rendering styles (non-photorealistic rendering with spot-colour) to produce interesting artistic effects to images.

Project Aims and Objectives

My project aims and objectives include:

- Research an effective model/framework to use for processing images

- By reading resources online I plan to identify which type of AI model to use.

- Reproduce a traditional non-photorealistic rendering technique with spot colour
- Collect training data for the model

- I will do this by using my own images and images that I have found on various websites online.

- Collect test data to test the model against to see how it performs with real world data
- Produce a simple non-photorealistic rendering technique without AI for a comparison to see which one is more effective
- Evaluate the model against the test data and attempt to tune the model if needed

- Tuning will only be necessary if there are obvious inconsistencies with the test data and don't produce results similar to what I am expecting.

- At the end I aim to produce a project write up that will cover everything I have worked on for this project.

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Work Plan

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 14
Project Sections	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	13/05/2022
Collect training data															
Collect test data															
Supervisor meeting	10/02/2022	17/02/2022	24/02/2022	03/03/2022	10/03/2022	17/03/2022	24/03/2022	31/03/2022	07/04/2022	14/04/2022	21/04/2022	28/04/2022	05/05/2022	12/05/2022	
Data preparation															
Develop traditional colour spot method															
Identify an appropriate model															
Initial training for salience maps															
Train AI model with training data															
Test AI model against test data															
Evaluate results from test and tune model															
Project Write-up															

Deliverables

- Write up describing what I have achieved and the development process, plus observations I made during the process. (PDF)
- AI model to process images (Python application)
- Spot colour algorithm for comparison (Python application)

For my project I plan to produce an AI model and this requires training data which is why in the first week I will produce all the training data that I will need for the project as well as test data which will be used once the model is complete. Before I work on learning how to with deep learning I will be producing a simple traditional non-photorealistic image rendering with spot-colour. This will be used as a benchmark to test the effectiveness of the model that I plan to produce. Ideally the model that I produce will be able to produce an output that will be a better image than the traditional methods are able to produce. Sometimes traditional techniques can unintentionally colour more than the desired part of the image so as long as the area which has spot colour is more consistent then I will consider that the AI model has out-performed the traditional methods.

In order to help the AI model learn about features within the image I plan to use salience maps to help the model to identify key features within the image. Salience maps helps highlight key features within an image in a greyscale format which can then be furthered by thresholding the image which will then Identify the areas of interest/ vibrant colour which we can use to identify the areas for spot colour.

I plan to produce the traditional image rendering technique within week 2 and 3 of development as I believe this to be a simple part to this project. I have slightly overestimated the time I think it will take me just in-case I encounter unforeseen issues that hinder my progress. This is why I will also start on the model development within the 3rd week as well. I plan to meet with my supervisor every Thursday at 15:00 to discuss my progress on the project to ensure I am on target with where I want to be. At the end of week 11 I will to be finished with my AI model, I have allocated the most time to this section as I will be learning how to use either Pytorch or Keras framework for implementing the model. I plan to do the write up on an on-going basis as I work through this project as well as take detailed notes to make sure I am tracking my decision making. When it comes to the final version of my write up I will use my notes and previous work to fully explain my thought process at each stage

within the development of this project. Testing the model against test data has more time allocated than perhaps required, however this is in-case I decide that the training data I provided isn't sufficient and the model requires some alterations to get the desired effect from the AI model. My time scale will be reviewed on a weekly basis most likely after meeting with my supervisor and adjusted as necessary.

Limitations

Some Images it may be difficult to identify where the spot colour should be in the processed version of the image if I use salience maps, there are a few different ways to approach this issue. One way to approach this is to choose one area of interest and highlight it with spot colour. The other way we could handle it is to decide that we will highlight all areas of interest.

I will also be limited by how much I can learn to make all of this work together, as progress through this project I will be learning new frameworks and image processing techniques which I will then implement into a program. It will be very important that I manage my time effectively within this project which is why I have made a timetable to ensure that I am working enough hours per week to get the work done before the due date.