Initial Plan
Artistic Style Transfer in a Mobile Application

One Semester Individual Project (40 Credits)

CM3203

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1 Project Description

The Artistic Style of a piece of visual art is the distinctive way in which the piece has been crafted. A work's style may be defined by a number of aspects, from brush strokes, to patterns, or its use of colour. In general, a work's art style fits in to a larger context in the world of art around it. The style may be attributable to many artists, for example the Cubism movement of the early 20th century, to a single artist, as in the commercial Pop-Art style of Andy Warhol, or even to periods within a single artist's body of work, Picasso's 'Blue Period' contrasts with his later 'African Period' for example.

Non Photo-Realistic Rendering is an area of Computer Graphics that focuses on rendering an image in some chosen style rather than in the Photo Realistic style of much of the rest of Computer Graphics. There is a diverse range of styles that can be imitated and a number of techniques to use in the imitation from traditional algorithmic methods to more modern machine learning based approaches.

Artistic Style Transfer is a subsection of the area of Non Photo-Realistic Rendering. Given a source image, the style of which we wish to copy, and a natural image, the content of which we wish to copy, the problem aims to generate a new image that as closely as possible matches these two aspects, thereby transferring the style of the source image to the natural image. This area of research has had much success in recent times using Deep Neural Networks to transfer the style of the source image, following on from the work of Gatys et al.[1] but this is just one of a number of techniques currently available in the area.

This project aims to create an application for some form of Mobile Device that can perform style transfer on an image supplied by the user, either from a single style or from a range of styles. The application will take into account the different User Interface and Optimization needs of a mobile device. Given enough time during the implementation of the application, this project will also aim to experiment with current techniques for styles in an attempt to create a new and improved version of the technique.

2 Project Aims and Objectives

The general aim of the project is to develop an application for Mobile Devices that is capable of performing artistic style transfer from some source images to an image supplied or captured by the user. Given enough time during the implementation process, it would also be desirable to allow the user to achieve this effect on short videos as well. The application will be developed according to the following objectives.

2.1 Core Objectives

- The Application should perform artistic style transfer from a source image to a supplied natural image.
  - The application should in effect construct a new image which matches the content of the supplied image, and the style of the source image.
  - The application will achieve style transfer using one or more neural networks trained on source image styles.
- The Application should allow the user to select a saved image to use as the natural image.
- The Application should allow the user to capture an image from within the application to use as the natural image.
- The Application user interface should be designed for a mobile device.
- The Application should be designed with the hardware available to a mobile device in mind.

2.2 Desirable Objectives

- Offer a number of styles for the user to choose from to transform their image.
- Allow for the transform of short videos as well as images.

3 Work Plan

Week 1

- Background Research.
  - Research into the technologies that may be needed in the project
- Initial Supervisor Meeting.
- Write and submit Initial Project Plan.

Week 2

- Further Background Research.
  - Investigate current Non Photo-Realistic Rendering Applications and Techniques.
  - Research Neural Networks, Convolution Neural Networks and their applications.
  - Research recent work on Artistic Style Transfer.
- Learn the basics of application development in preparation for building the front end of the application.
- Design an initial basis for the UI for the Application.
- Begin implementation of the front end of the Mobile Application.

Week 3

- Further Background Research.
  - Research into the algorithms used for Style Transfer.
  - Research the feasibility of implementing Arbitrary Style Transfer in the application.
- Continue and complete initial implementation of the front end of the Application.
- MILESTONE: Skeleton front end for Mobile Application complete.

  - The Skeleton front end should allow the user to select an image to transform (Be it saved already or taken in the App), and save the image back to the users phone.
  - No transformation will be performed at this point.

Week 4

- Write the Introduction, Background, and Approach sections of the Final Report.
- Decide on the approach to the style transfer problem to be taken based on the research performed into current approaches.
- Design the system architecture for the final application.
- MILESTONE: Final Report started, and Introduction, Background and Approach sections completed.
- MILESTONE: System Approach and Architecture decided on.
- REVIEW MEETING: Discussion of chosen architecture and approach to the application.

Week 5-9

- Decide on the design and perform the implementation of the back end system that will perform the Style Transfer.
  - This will involve deciding on the algorithms, and networks to be used in the application.
  - Once decided, work will be performed to implement the running of the systems.
- Once implemented the networks will be trained, and adjusted in this period.
- Once a basis for the back end system has been implemented the algorithms will be experimented on to attempt to find possible improvements.

Week 10

- Joining of the front and back end of the application into a single application according to the architecture decided on in Week 4.
- Decide on the final UI that will be used in the application and update the front end to match the chosen design.
- MILESTONE: Initial Minimum Viable Product of the complete application.
  - At this stage the application should be capable of applying style transfer to a supplied image.
  - The application will continue to be worked on and finalized from this stage on wards.

Week 11-12

- The final application should be completed in this time frame.
  - The design of the application can be tweaked during this time for best usage on a Mobile Device.
  - Any additional time available in this period can be used to work on additional desirable features for the application, such as applying Style Transfer to short videos.
- MILESTONE: Final Application completed.

Week 13

- Testing of the complete application.
- Writing of the report.
- Contingency: Continued work on application if not complete.
- REVIEW MEETING: Discussion of completed application and any additional work that may be needed.

Week 14

- Continued writing of the Report.
- Contingency: Continued work on application if not complete.

Week 15

- Completion and review of the Final Report.
- DELIVERABLE: Final Report.
- DELIVERABLE: Completed Application and Source Code.

Alongside the mentioned meetings regular weekly meetings will be held to discuss issues and progress with the project. Additionally to the specified sections of the work plan, the Final Report will be worked on throughout the project at relevent points.

References

[1] Gatys, L. A. et al. 2015. A Neural Algorithm of Artistic Style. Available at: https://arxiv.org/pdf/1508.06576.pdf (Accessed: 01 February 2018)