Kyffin Williams: Digital Image Analysis

Report Name	Outline Project Specification
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1 Project description

Sir John "Kyffin" Williams was a landscape painter from Wales who's work was predominantly based in Wales and Patagonia. His work, and associated metadata collected by the National Library of Wales, allows for some interesting analysis; particularly that of temporal or geological data for a given painting.

Temporal analysis will be the focus of this project as it allows for a diverse range of techniques; from statistical analysis of RGB values of the paintings to looking at the length and style of paintbrush strokes. The ultimate aim of this being to accurately place the year of a given painting which has no metadata collected.

2 Work to be tackled

2.1 Library and Language Decisions

There are quite a few image processing/computer vision libraries available to use, including:

- AForge.net
- FIJI Is Just ImageJ (FIJI)
- Intergrating Vision Toolkit (IVT)
- Open Source Computer Vision (OpenCV)
- Scillab Image Processing (SIP)
- Vision X Library (VXL)

Some analysis of these libraries needs to be performed before a proper choice is made. This analysis should take into account certain aspects such as cross-platform compatibility, ease of use and install, features available, etc.

2.2 Image Processing and Computer Vision Research

Having never done any digital image processing or computer vision it will be vital to research into the area. For some of the simpler techniques; RGB Statistical Analysis, for example, this is less of an issue.

For the long term viability of the project this needs to be completed before any major work.

I intend to use Hannah and other staff members of the Computer Science Department to aid with this as there is a wealth of knowledge existing there.

2.3 Base System

As with any software project, a strong base will allow for a good overall whole. The base for this system will need to allow the running of different analysis techniques on lists of images and for the output of this to be passed into a machine learning module in a form which allows for the classification of a single image using the given technique.

The difficulty of this will be passing the techniques around in this fashion. C allows method pointers, any Object Orientated language can do this with help from inheritance, etc.

2.4 Techniques

The main focus of this project is on the Techniques to analyse the paintings. So creating these techniques will have to be a large piece of work.

Part of this will be coming up with the ideas for these techniques; there are currently a few ideas for these techniques:

- RGB Statistical Analysis (Mean, Standard Deviation, Range, etc.)
- Histogram Comparison
- Texture Analysis
- Brush stroke Analysis

The more of these techniques there are the better the analysis can be and the more likely the project is to be able to accurately predict the age of a painting.

2.5 Machine Learning

The final required part of this is to be able to "Learn" the age of paintings given the analysis performed upon it, map a function which matches all learned information from this information and be able to infer the age of a new painting.

This part is potentially the most difficult as such systems can be fairly difficult to create. However there may be some libraries which include Machine Learning packages. I will need to explore these libraries and find out if they are suitable for use.

3 Project deliverables

1. Requirements Documentation.
2. Review of Computer Vision Libraries.
3. Review of Programming Language Choice (where applicable).
4. Research into Image Processing and Computer Vision.
5. Design Documentation.
6. Implement system skeleton.
7. Test Documentation
8. Implement unit and system tests.
9. Complete system implementation.
10. Implement Machine Learning module.
11. Design and implement a number of Painting Analysis Techniques.
12. Progress Report.
13. Final Report.

4 Initial bibliography