TITLE

A Thesis
Presented to
The Established Interdisciplinary Committee for Mathematics-Computer Science
Mathematical and Natural Sciences
Reed College

In Partial Fulfillment
of the Requirements for the Degree
Bachelor of Arts

Thomas Ulmer

May 2024

Approved for the Division
(Computer Science)

Dylan McNamee	David Meyer

Acknowledgements

List of Abbreviations

Table of Contents

List of Figures

Abstract

In this thesis I consider the automatic generation of hedcut style portraits using photographs of faces. These renderings mimic those that appear in the Wall Street Journal which are produced by hand with pen and ink. I begin this work by following Kim et al. who render hedcuts by placing stipples so they follow not only the outline of facial features but also isophotes (lines with constant illumination). I apply a variety of image processing techniques to extract facial components and inform stipple placement and size to illustrate tone and depth of the face. I then expand on the work of Kim et al. by introducing an interactive tool that allows for a fully parameterizable version of their approach. Finally I experiment with allowing for areas of negative space and areas of stipple density variation. In this thesis I report on this tool and assess the quality of these methods.

Introduction

Chapter 1

Background

1.1 Representing Images on a Computer

Chapter 2

Extracting Feature Lines

Chapter 3

Stippling

Chapter 4

Algorithmic Assessment

Chapter 5

RGB to CIEL*a*b Color Conversion

Chapter 6

pseudocode

6.1 Lower Envelope Algorithm

Chapter 7

Results

7.1 Level 1 Input Images