LIST OF FIGURES

Figure 1: Proposed Functionality [1.0]
Figure 2: Design Methodology and Implementation Strategy [1.3]
Figure 3: Research and Development Methodology [2.1.1]
Figure 4: Anatomy of Typography [2.1.1]
Figure 5: Main Window Controller Dependencies [3.2]
Figure 6: Tool Window Controller Dependencies [3.2]
Figure 7: UI Tool Window Sequence Diagram [3.2]
Figure 8: Screen Dimension Constraints [4.1]
Figure 9: UI Image Upload Default [4.2]
Figure 10: UI Finder Dialog [4.2]
Figure 11: UI Error Feedback [4.2]
Figure 12: UI Success feedback [4.2]
Figure 13: UI Image processing tools [4.3]
Figure 14: UI Letterform Comparison [4.4]
Figure 15: UI Saving output [4.5]
Figure 16: UI Multi stepped guided output [4.5]
Figure 17: UI Storyboard [4.6]
Figure 18: Image Acquisition [5.1.1]
Figure 19: Image Crop Result [5.1.2]
Figure 20: Original image and desired output from preprocessing [5.2]
Figure 21: Threshold function pseudo code [5.2.2.1]
Figure 22: Threshold function implementation [5.2.2.1]
Figure 23: Neighborhood offset coordinates [5.2.3]
Figure 24: Neighborhood offset Cartesian coordinates [5.2.3]
Figure 25: Spatial Filter iteration 1 [5.2.3]
Figure 26: Spatial Filter iteration 2 [5.2.3]
Figure 27: Simple averaging filter pseudo code [5.2.3.1.1]
Figure 28: Simple averaging filter implementation. [5.2.3.1.1]
Figure 29: Original Image Gray scaled [5.2.3.1.1]
Figure 30: 5 * 5 Simple Averaging Filter [5.2.3.1.1]
Figure 31: Thresholded 30% [5.2.3.1.1]
Figure 32: Weighted averaging filter [5.2.3.1.2]
Figure 33: Weighted Averaging filter pseudo code. [5.2.3.1.2]
Figure 34: Weighted Averaging filter implementation [5.2.3.1.2]
Figure 35: Median Filter Pseudo Code [5.2.3.1.3]
Figure 36: Median Filter Implementation. [5.2.3.1.3]
Figure 37: Original Image Gray scaled [5.2.3.1.3]
Figure 38: 9 * 9 Median Filter [5.2.3.1.3]

Figure 39: Filtered Image Thresholded 40% [5.2.3.1.3]
Figure 40: Min/max Filter Implementation [5.2.3.1.4]
Figure 41: Original Image Gray scaled [5.2.3.1.4]
Figure 42: 11 * 11 Max/Min Filter [5.2.3.1.4]
Figure 43: Max/Min Filter Thresholded 20% [5.2.3.1.4]
Figure 44: Broken lines of an object [5.2.4]
Figure 45: Lines reconnected using combination of a Max Filter and dilation [5.2.4]
Figure 46: The original subject. [5.2.4]
Figure 47: Data removed from subject [5.2.4]
Figure 48: Structuring element overlapping a object in the subject [5.2.4.2]
Figure 49: Dilation Pseudo Code [5.2.4.2]
Figure 50: Dilation Implementation [5.2.4.2]
Figure 51: Dilation subject [5.2.4.2]
Figure 52: Dilation Result 3x3 structuring element [5.2.4.1]
Figure 53: Erosion Pseudo Code [5.2.4.2]
Figure 54: Erosion Implementation [5.2.4.2]
Figure 55: Erosion subject [5.2.4.2]
Figure 56: Erosion Result 3x3 structuring element [5.2.4.2]
Figure 57: Opening Implementation [5.2.4.3]
Figure 58: Opening subject [5.2.4.3]
Figure 59: Opening Result [5.2.4.3]
Figure 60: Erosion [5.2.4.3]
Figure 61: Closing Implementation [5.2.4.3]
Figure 62: Closing subject [5.2.4.3]
Figure 63: Closing Result [5.2.4.3]
Figure 64: Attaining Borders [5.2.4.4]
Figure 65: Image Difference [5.2.4.4]
Figure 66: Difference polarity switched [5.2.4.4]
Figure 67: Switching Polarity Implementation [5.2.4.4]
Figure 68: Comparison of CPU time (in seconds) Consumed by Different Parallel Thinning Algorithms. [5.2.4.5]
Figure 69: Zhang Suen outer loop [5.2.4.5.1]
Figure 70: Zhang Suen sub iteration 1 [5.2.4.5.1]
Figure 71: Zhang Suen sub iteration 2 [5.2.4.5.1]
Figure 72: Thinning input [5.2.4.5.1]
Figure 73: Thinning output [5.2.4.5.1]
Figure 74: Thinning output with new condition [5.2.4.5.1]
Figure 75: Subject [5.2.4.5.1]
Figure 76: Subject thinned with original condition [5.2.4.5.1]
Figure 77: Subject thinned with amended condition [5.2.4.5.1]
Figure 78: Moore Neighborhood [5.3.1.1]

Figure 79: Moore Neighbor Algorithm interpretation. [5.3.1.1]
Figure 80: Working of Moore's Neighbor tracing algorithm. [5.3.1.1]
Figure 81: Moore Neighbor Pseudo Code [5.3.1.1]
Figure 82: Moore Neighbor Implementation [5.3.1.1]
Figure 83: Moore Neighbor Implementation Continued [5.3.1.1]
Figure 84: Moore Neighbor Trace Loop Implementation
Figure 85: Reducing to distinct points.
Figure 86: Starting letterform subject
Figure 87: Thinned subject
Figure 88: Traced result
Figure 89: Thinned subject
Figure 90: Trace Failure Explanation
Figure 91: Projection profile pseudo code
Figure 92: Projection profile Implementation
Figure 93: Result of projection profile
Figure 94: Overlapping lines
Figure 95: Projection profile for analysis
Figure 96: User selecting an area to crop.
Figure 97: The cropped region.
Figure 98: (l-r) Subject Image, Averaging, Median, Min, Max filters
Figure 99: (l-r) Subject Image, Averaging, Median, Min, Max filters thresholded
Figure 100: (l-r) Subject Image, Erosion, Dilation, Opening, Closing
Figure 101: Broken Image.
Figure 102: Dilated Broken Image.
Figure 103: Thinning Evaluation.
Figure 104: Path Generated By PaintCode.
Figure 105: Contour Traced Border
Figure 106: Contour Traced Thinned Image
Figure 107: Projection Profile Line Segmentation
Figure 108: Projection Profile Letterform Analysis
Figure 109: Demonstration UI.

TABLE OF CONTENTS

1. Introduction.
    1.1. Background.
    1.1.1 Initial Research and Literature Review.
    1.1.2 Comparable Systems.
    1.1.3 Relevance.
    1.2 Project Aims and Objectives.
    1.2.1 Aims.
    1.2.2 Objectives.
    1.3 Methodology.
    1.3.1 Analysis and Design.
    1.3.2 System Design.
2. Requirements Engineering.
    2.1 Background Reading and Research.
    2.2 Comparable Products.
3. System Design.
4. Interface Design.
    4.1 Screen Dimension Constraints
    4.2 Image Upload.
    4.3 Image Processing tools
    4.4 Output presentation
    4.5 Saving output.
    4.6 UI Storyboard.
5. Implementation.
    5.1. Image Data Acquisition.
    5.2. Image Processing.
    5.2.1. Image Processing Considerations.
    5.2.2. Point Operations.
    5.2.3. Spatial Filters.
    5.2.4. Morphology.
6. Evaluation.
7. References.
8. Appendix.
    8.1 Source Code.
    8.2 Viva Presentation.