TOWARDS THE DEVELOPMENT OF IMAGE PROCESSING AND ANALYSIS TECHNIQUES TO INFLUENCE CREATION OF STRUCTURED TYPEFACES FROM HANDWRITTEN TEXT IMAGES.

JAMES MITCHELL - 10425907 - Towards the development of Image processing and analysis techniques to influence creation of structured typefaces from handwritten text images.

INTRODUCTION.

Written letters can be used only during the process of writing its self: the moment of production and use are one and the same.

– Fred Smeijers

Smeijers, 1996

Smeijers, 1996 Counterpunch: Making type in the sixteenth century, designing typefaces now. United Kingdom: Chronicle Books.

THE PROCESS OF DESIGNING A TYPEFACE HAS A HIGH BAR FOR ENTRY

TAKING MANY HOURS TO CREATE AND MANY MORE HOURS TO MASTER.

TYPE DEVELOPMENT IS NOT A SKILL AVAILABLE TO ALL

DESPITE ARTISTIC ABILITY OR INTENT.

THIS FACT TAKES THE POTENTIAL FOR COMPLETE PERSONAL AND VISUAL EXPRESSION AWAY FROM EVEN THE MOST CREATIVE USERS.

THE PRIMARY OBJECTIVE

DESIGN AND IMPLEMENT AN APPLICATION THAT WILL LOWER THE BAR FOR THE AVERAGE USER TO CREATE TYPEFACE FONTS FROM IMAGES OF HANDWRITTEN TEXT.

DESIRED FUNCTION.

Original Image Grayscaled

Thresholded 30%

abcdefghij
klmnopqrst
uvwxyz

BACKGROUND

METHODOLOGY

BREAKING DOWN THE PROBLEM.
COLLECTION OF RESOURCES.
RESEARCH, DEVELOPMENT, IMPLEMENTATION.

BREAKING DOWN THE PROBLEM

IMAGE PROCESSING AND ANALYSIS

LETTERFORM COMPOSITION.

GENERATING OUTPUT.

USER INTERFACE DEVELOPMENT.

IMAGE PROCESSING

CREATING THE RIGHT ENVIRONMENT.

AND ANALYSIS

FINDING THE FEATURES

LETTERFORM COMPOSITION

CREATION OF A TEMPLATE. APPLYING ATTRIBUTES.

GENERATING OUTPUT

SVG.
TRUETYPE.
OPENTYPE.

USER INTERFACE DEVELOPMENT.

PROVIDE STATION FOR INPUT.
OPTIONS FOR OUTPUT.

COLLECTION OF RESOURCES

HANDWRITTEN SUBJECTS. RESEARCH MATERIALS.

RESEARCH DEVELOPMENT AND IMPLEMENTATION.

BACKGROUND RESEARCH

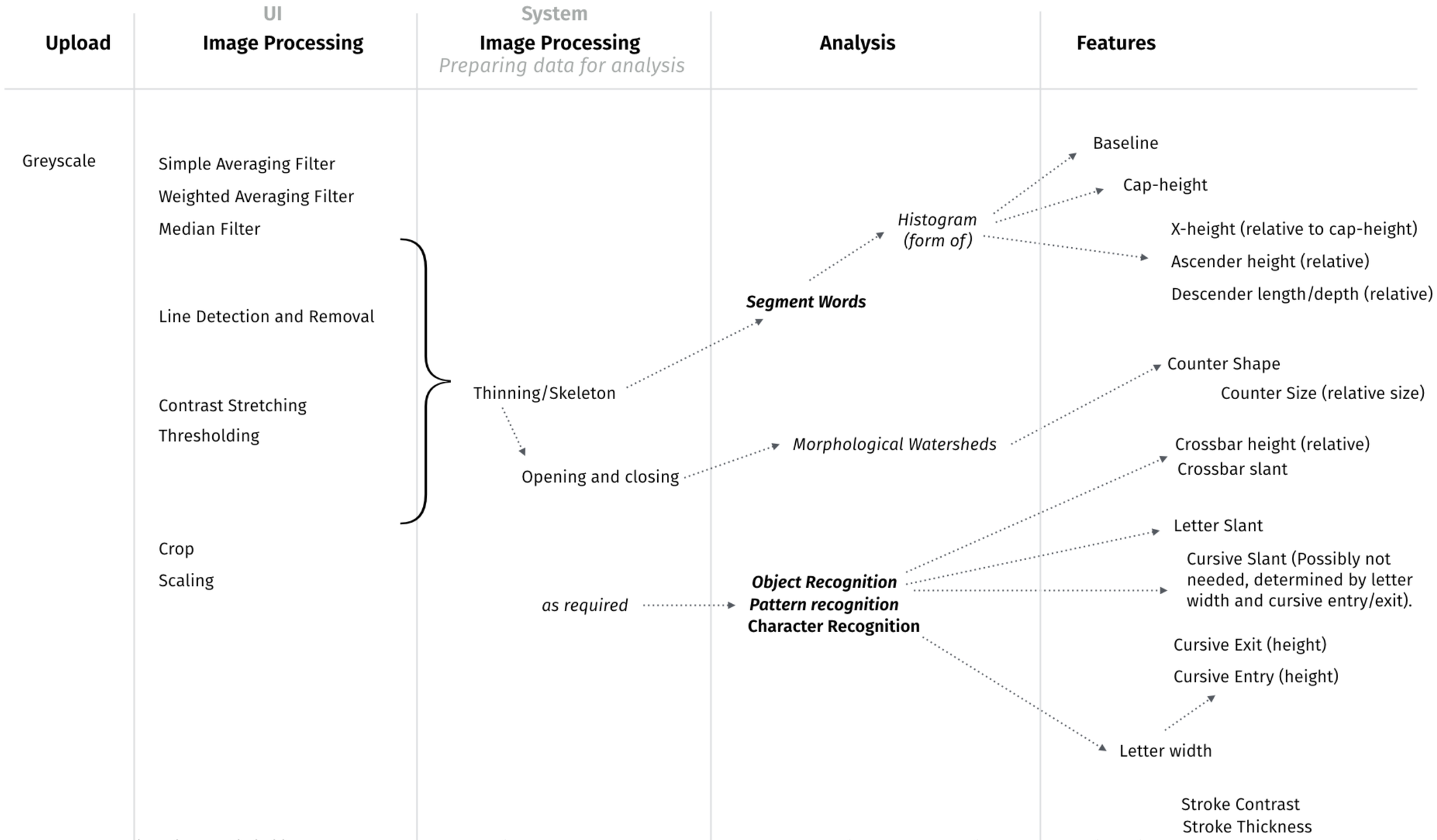
PSEUDO CODE DEVELOPMENT

IMPLEMENTATION.

RESEARCH DEVELOPMENT AND IMPLEMENTATION.

IMAGE PROCESSING AND ANALYSIS.

JAMES MITCHELL - 10425907 - Towards the development of Image processing and analysis techniques to influence creation of structured typefaces from handwritten text images.


UI
System
Upload
Image Processing
Image Processing
Preparing data for analysis
Analysis
Features
Greyscale
Simple Averaging Filter
Weighted Averaging Filter
Median Filter
Line Detection and Removal
Contrast Stretching
Thresholding
Crop
Scaling
Thinning/Skeleton
Segment Words
Histogram
(form of)
Baseline
Cap-height
X-height (relative to cap-height)
Ascender height (relative)
Descender length/depth (relative)
Opening and closing
Morphological Watersheds
Counter Shape
Counter Size (relative size)
Crossbar height (relative)
Crossbar slant
as required
Object Recognition
Pattern recognition
Character Recognition
Letter Slant
Cursive Slant (Possibly not needed, determined by letter width and cursive entry/exit).
Cursive Exit (height)
Cursive Entry (height)
Letter width
Stroke Contrast
Stroke Thickness

RESEARCH DEVELOPMENT AND IMPLEMENTATION.

THRESHOLDING.

JAMES MITCHELL - 10425907 - Towards the development of Image processing and analysis techniques to influence creation of structured typefaces from handwritten text images.

THRESHOLDING.

FINDING THE EQUATION.

$$g(x,y) = T[f(x,y)]$$

$$g(x,y) = \begin{cases} 1 & if \quad f(x,y) > T \\ 0 & if \quad f(x,y) \leq T \end{cases}$$

Gonzalez and Woods, 2002

RESEARCH, DEVELOPMENT AND IMPLEMENTATION

DEVELOPING THE PSEUDO CODE.

```
T = threshold value

for each row y in representation
    for each column x in row

    if pixel(x, y) > T then
        pixel(x, y) greylevel = 1
    else
        pixel(x, y) greylevel = 0
```

RESEARCH, DEVELOPMENT AND IMPLEMENTATION

IMPLEMENTING.

```
- (NSBitmapImageRep *) thresholdWithValue:(int)value
{

    // get the image data
     NSBitmapImageRep *output = [self grayScaleRepresentationOfImage:self.image;
     unsigned char *data = [output bitmapData];

     // ..
}
```

```
    // Iterate over the image.

    for ( int y = 0; y < self.height; y++ )
    {
        for ( int x = 0; x < self.width; x++ )
        {
            int index = x + (y * self.width);

            // ..

        }
    }

    return output;
}
```

```
// apply the threshold
if ( data[index] < value) {
     data[index] = 0;
} else {
     data[index] = 255;
}
```

DEMONSTRATION.

CRITICAL APPRAISAL

JAMES MITCHELL - 10425907 - Towards the development of Image processing and analysis techniques to influence creation of structured typefaces from handwritten text images.

1. DELAY IN ESTABLISHING THE METHODOLOGY FOR RESEARCH AND DEVELOPMENT.

2. THE INCORRECT ORDER OF RESEARCH FOCUS.

2. THE INCORRECT ORDER OF RESEARCH FOCUS.

3. INABILITY TO CORRECTLY ESTABLISH THE PROBLEM PRIOR TO IMPLEMENTATION OF SOME FEATURES.