

# **Abstract**

# Abstract

The field of digital image processing is continually evolving. During the past ten years, there has been significant increase in the level of interest in image morphology, full-colour image processing, image data compression, image recognition and knowledge-based image analysis systems. Many of these image processes include one thing or another that deals with thresholding or edge detection.

Our project deals with finding edges in grayscale images. Edges are known as where a sudden change in brightness occurs, and grayscale images are images that only consist of different levels of the grey colour.

To find these edges a set of edge detection operators are used:-

- Sobel & Prewitt operators
- Robert & The Gradient operators
- Kirsch operator

Each of the above operators consists of two masks, one to calculate the magnitude and the other to calculate the angle. Of course, the type of the masks differ (ie, a “ 2X2 ” mask is used for the Gradient & Robert operators, while a “ 3X3 ” mask is used for the Sobel & Prewitt operators). Some operators work better than other operators on some images, so, we cannot say that this operator is the best or that operator is the worst.

About the operation of our program, a grayscale image will be read and stored into an array. A text user interface will appear so that the user would choose which operator he would want to use. The user will follow the instructions on the screen and at the end, the result (output) will be displayed on the screen using the “XV” program.

# Table of Contents: -

<b>Acknowledgements</b> .....	2
<b>Chapter 1:- Introduction</b> .....	3
1.1 Goal and Objectives .....	4
1.2 Overview of the report .....	5
<b>Chapter 2:- System Overview</b> .....	6
2.1 Requirements .....	7
2.2 System Specifications .....	7
2.2.1 Functional Specifications .....	7
2.2.2 Inputs .....	8
2.2.3 Outputs .....	8
2.2.4 Operators and how they work .....	9
2.2.5 Limitations and Restrictions .....	9
<b>Chapter 3:- Implementation</b> .....	10
3.1 Input & Output .....	11
3.2 Sobel Operator .....	11
3.3 Prewitt Operator .....	11
3.4 Robert Operator .....	12
3.5 Gradient Operator .....	12
3.6 Kirsch Operator .....	13
3.7 How do these operators work/?.....	14
3.7.1 Convolution of the Masks.....	15
3.7.2 Calculating the values of (dx & dy) .....	17
3.7.3 Calculating the Magnitude & Angle.....	19
3.8 XV Program .....	19

<b>Chapter 4:- Testing</b> .....	<b>20</b>
4.1 Verification .....	21
4.2 Validation .....	21
4.3 edge detecting test .....	22
4.4 thresholding test .....	25
4.5 superimposing test.....	25
<b>Chapter 5:- Discussion</b> .....	<b>26</b>
5.1 Summary .....	27
5.2 Critical Appraisal .....	27
5.3 Applications .....	28
5.4 Recommendations .....	28
<b>References</b> .....	<b>29</b>
<b>Appendix</b> .....	<b>31</b>

## List of Illustrators:-

### **Chapter 2:-**

Fig 1:- PGM ASCII Image (page 8)

### **Chapter 3:-**

Fig 2:- Sobel Masks (page 11)

Fig 3:- Prewitt Masks (page 11)

Fig 4:- Robert Masks (page 12)

Fig 5:- Gradient Masks (page 12)

Fig 6:- Kirsch Masks (page 13)

Fig 7:- Original Image pixels example (page 14)

Fig 8,9:- Movement of the [3x3] masks (page 15)

Fig 10,11:- Movement of the [2x2] masks (page 16)

### **Chapter 4:-**

Fig 12:- Eye Retina in PGM format (page 22)

Fig 13:- Dr. Halim (page 22)

Fig 14,15:- Outputs of the Sobel Operator (page 22)

Fig 16,17:- Outputs of the Prewitt Operator (page 23)

Fig 18,19:- Outputs of the Robert Operator (page 23)

Fig 20,21:- Outputs of the Gradient Operator (page 24)

Fig 22,23:- Outputs of the Kirsch Operator (page 24)

Fig 24:- Input image (page 25)

Fig 25:- Threshold outputs (page 25)

Fig 26:- Superimposing test (page 25)