

## Design & Implementation of Digital Image Transformation Algorithms

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### I. GRAYSCALE TRANSFORMATION

Grayscale is a range of shades of gray without apparent color. The darkest possible shade is black, which is the total absence of transmitted or reflected light. The lightest possible shade is white, the total transmission or reflection of light at all visible wavelengths. Intermediate shades of gray are represented by equal brightness levels of the three primary colors (red, green and blue) for transmitted light, or equal amounts of the three primary pigments (cyan, magenta and yellow) for reflected light [1].

In photography and computing, a grayscale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest. Grayscale images are distinct from one-bit bi-tonal black-and-white images, which in the context of computer imaging are images with only the two colors, black, and white. Grayscale images have many shades of gray in between. Grayscale images are also called monochromatic, denoting the presence of only one color.

### ABSTRACT

In computer science, Digital Image Processing or DIP is the use of computer hardware and software to perform image processing and computations on digital images. Generally, digital image processing requires the use of complex algorithms, and hence, can be more sophisticated from a performance perspective at doing simple tasks. Many applications exist for digital image processing, one of which is Digital Image Transformation. Basically, Digital Image Transformation or DIT is an algorithmic and mathematical function that converts one set of digital objects into another set after performing some operations. Some techniques used in DIT are image filtering, brightness, contrast, hue, and saturation adjustment, blending and dilation, histogram equalization, discrete cosine transform, discrete Fourier transform, edge detection, among others. This paper proposes a set of digital image transformation algorithms that deal with converting digital images from one domain to another. The algorithms to be implemented are grayscale transformation, contrast and brightness adjustment, hue and saturation adjustment, histogram equalization, blurring and sharpening adjustment, blending and fading transformation, erosion and dilation transformation, and finally edge detection and extraction. As future work, some of the proposed algorithms are to be investigated with parallel processing paving the way to make their execution time faster and more scalable.

**KEYWORDS:** Algorithms, Digital Image Processing, Digital Image Transformation

### A. Implementation

```
Image img = pictureBox1.Image;
Bitmap bitmap = new Bitmap(img);

// Cycling over all the pixels in the image
for (int i = 0; i < bitmap.Size.Width; i++)
{
    for (int j = 0; j < bitmap.Size.Height; j++)
    {
        Color color = bitmap.GetPixel(i, j); // Retrieves
        the color of a particular pixel
        int R = color.R; // since the image is 8-bit
        Grayscale
        if (intensityTrackbar.Value == 2)
        {
            int upperBound = 271; // 271-16 = 255
            int lowerBound = 0;
            for (int k = 1; k <= 16; k++)
            {
                upperBound = upperBound - 16;
                lowerBound = upperBound - 16;
                if (R <= upperBound && R > lowerBound)
                {
                    R = upperBound;
                }
            }
        }
    }
}
```

# Digital Image Display Algorithms And Implementation

**Christian G. Meyer**



## **Digital Image Display Algorithms And Implementation:**

This book delves into Digital Image Display Algorithms And Implementation. Digital Image Display Algorithms And Implementation is an essential topic that needs to be grasped by everyone, from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Digital Image Display Algorithms And Implementation, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
    - Chapter 1: Introduction to Digital Image Display Algorithms And Implementation
    - Chapter 2: Essential Elements of Digital Image Display Algorithms And Implementation
    - Chapter 3: Digital Image Display Algorithms And Implementation in Everyday Life
    - Chapter 4: Digital Image Display Algorithms And Implementation in Specific Contexts
    - Chapter 5: Conclusion
  2. In chapter 1, this book will provide an overview of Digital Image Display Algorithms And Implementation. This chapter will explore what Digital Image Display Algorithms And Implementation is, why Digital Image Display Algorithms And Implementation is vital, and how to effectively learn about Digital Image Display Algorithms And Implementation.
  3. In chapter 2, this book will delve into the foundational concepts of Digital Image Display Algorithms And Implementation. The second chapter will elucidate the essential principles that need to be understood to grasp Digital Image Display Algorithms And Implementation in its entirety.
  4. In chapter 3, this book will examine the practical applications of Digital Image Display Algorithms And Implementation in daily life. The third chapter will showcase real-world examples of how Digital Image Display Algorithms And Implementation can be effectively utilized in everyday scenarios.
  5. In chapter 4, the author will scrutinize the relevance of Digital Image Display Algorithms And Implementation in specific contexts. The fourth chapter will explore how Digital Image Display Algorithms And Implementation is applied in specialized fields, such as education, business, and technology.
  6. In chapter 5, this book will draw a conclusion about Digital Image Display Algorithms And Implementation. This chapter will summarize the key points that have been discussed throughout the book.
- The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Digital Image Display Algorithms And Implementation.

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