

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

**Matthew S. Brennesholtz, Edward H.
Stupp**



Digital Image Display Algorithms And Implementation:

Digital Image Display Gheorghe Berbecel, 2003-05-07 An essential read for technology developers systems integrators and video graphics interface engineers Digital Image Display will also appeal to researchers and postgraduate students working in image processing and display **BOOK JACKET**

Digital Image Processing Techniques Michael P. Ekstrom, 2012-12-02 Digital Image Processing Techniques is a state of the art review of digital image processing techniques with emphasis on the processing approaches and their associated algorithms A canonical set of image processing problems that represent the class of functions typically required in most image processing applications is presented Each chapter broadly addresses the problem being considered the best techniques for this particular problem and how they work their strengths and limitations and how the techniques are actually implemented as well as their computational aspects Comprised of eight chapters this volume begins with a discussion on processing techniques associated with the following tasks image enhancement restoration detection and estimation reconstruction and analysis along with image data compression and image spectral estimation The second section describes hardware and software systems for digital image processing Aspects of commercially available systems that combine both processing and display functions are considered as are future prospects for their technological and architectural evolution The specifics of system design trade offs are explicitly presented in detail This book will be of interest to students practitioners and researchers in various disciplines including digital signal processing computer science statistical communications theory control systems and applied physics

Digital Image Processing and Analysis Scott E Umbaugh, 2017-11-30 Digital image processing and analysis is a field that continues to experience rapid growth with applications in many facets of our lives Areas such as medicine agriculture manufacturing transportation communication systems and space exploration are just a few of the application areas This book takes an engineering approach to image processing and analysis including more examples and images throughout the text than the previous edition It provides more material for illustrating the concepts along with new PowerPoint slides The application development has been expanded and updated and the related chapter provides step by step tutorial examples for this type of development The new edition also includes supplementary exercises as well as MATLAB based exercises to aid both the reader and student in development of their skills

Digital Image Processing William B. Green, 1989 Examines These Aspects of Computer Based Systems Used to Process Image Data Graphics Design Implementation Maintenance

Remote Sensing Digital Image Analysis John A. Richards, Xiuping Jia, 2006-01-16 Remote Sensing Digital Image Analysis provides the non specialist with an introduction to quantitative evaluation of satellite and aircraft derived remotely retrieved data Each chapter covers the pros and cons of digital remotely sensed data without detailed mathematical treatment of computer based algorithms but in a manner conducive to an understanding of their capabilities and limitations Problems conclude each chapter This fourth edition has been developed to reflect the changes that have occurred in this area over the past

several years Its focus is on those procedures that seem now to have become part of the set of tools regularly used to perform thematic mapping As with previous revisions the fundamental material has been preserved in its original form because of its tutorial value its style has been revised in places and it has been supplemented if newer aspects have emerged in the time since the third edition appeared It still meets however the needs of the senior student and practitioner **IEEE Proceedings of the Southeastcon** ,1982 **Information Display** ,2003 Applications of Digital Image Processing VI Andrew G. Tescher,1983 Projection Displays Matthew S. Brennessoltz,Edward H. Stupp,2008-10-13 Projection is a technology for generating large high resolution images at a price point end users can afford This allows it to be used in a wide variety of large screen markets such as television and cinema In addition there are emerging small screen markets where a pocketable miniaturized projector can display images from mobile information devices such as smart phones or portable media players Fully revised this second edition of Projection Displays provides up to date coverage of the optical and mechanical systems in electronic projection displays It takes into account major new developments in the many technologies needed to manufacture a projector display system It presents a comprehensive review of projector architectures systems components and devices Key new and updated features include new material on light sources for projection displays updated information on the human factors of projection displays including color gamuts resolution and speckle coverage of new image generating systems including LCOS and scanned laser systems up to date information on front and rear projection screens practical examples of projection display applications models for predicting the performance of optical and mechanical systems This book is aimed at practicing engineers and researchers involved in the research development design and manufacture of projection displays It includes key aspects from the many technologies contributing to projection systems such as illumination sources optical design electronics semiconductor design microdisplay systems and mechanical engineering The book will also be of interest to graduate students taking courses in display technology and imaging science as well as students of the many other engineering physics and optics disciplines that lead into the field of projection displays The Society for Information Display SID is an international society which has the aim of encouraging the development of all aspects of the field of information display Complementary to the aims of the society the Wiley SID series is intended to explain the latest developments in information display technology at a professional level The broad scope of the series addresses all facets of information displays from technical aspects through systems and prototypes to standards and ergonomics **Applications of Digital Image Processing X** Andrew G. Tescher,1987 **Image and Graphics** Yu-Jin Zhang,2015-08-03 This book constitutes the refereed conference proceedings of the 8th International Conference on Image and Graphics ICIG 2015 held in Tianjin China in August 2015 The 164 revised full papers and 6 special issue papers were carefully reviewed and selected from 339 submissions The papers focus on various advances of theory techniques and algorithms in the fields of images and graphics Medical Imaging ,2000 **Computer Assisted Radiology and Surgery**

,2004 CARS 2004 H. U. Lemke, Heinz U. Lemke, 2004 Almost 500 paper and poster contributions from more than 30 countries had to be evaluated for CARS 2004 In addition to the traditional CARS themes and topics emphasis has been given to developments such as IHE Surgical Workflow and PACS Operation Room of the Future and Strategic Thinking In special congress sessions partner societies such as SPIE and SCAR have joined these endeavours to assist in achieving progress in these fields While the increased reliance on multi source information is proceeding at a rapid rate it is interesting to note that the basis for the greater part of medical decision making is still medical imaging This may change as genomics and proteomics fulfil more of their potential but it is estimated that more than half of current hospital visits result in imaging studies In that respect it is true that the more things change the more they stay the same Alphonse Karr 1849 and that medical imaging is the cornerstone of the field This focus on medical imaging is evident throughout the CARS conference with sessions dedicated to Medical Imaging MI itself Image Processing and Display IPD Image Guided Radiological Therapy IGRT Image Guided Therapy IGT and separate symposia on Computer Aided Diagnosis based on imaging and both Cardiovascular and Maxillofacial Imaging Still it is up to you the engineers scientists clinicians and related personnel participating in CARS to ensure that innovation in technology and procedures is not developed just for the sake of change but instead to achieve progress and thereby provide better patient care **Image Understanding** ,

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