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EVALUATION OF QUALITY OF COMPUTER STORED DIGITAL IMAGES

Kantamreddy Ravindra[1], Murugu Nachippan[2], Tamilarasan[3]

[1]Graduateship, Associate Membership, Computer Science and Engineering, Indian Institute of Industry Interaction Education and Research, India

[2]Assistant Professor, Indian Institute of Industry Interaction Education and Research, India

[3]Project Coordinator, Indian Institute of Industry Interaction Education and Research, India

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ABSTRACT

The assessment of the quality of digital images stored in computer systems is currently subjective due to the presence of multiple file formats that can be employed for image storage. To ensure the highest level of decision-making effectiveness, it is crucial to make the appropriate choice from the outset. The aim of this study is to examine the methodologies utilised in comparable industries for assessing the quality of an image stored in various file formats, and to investigate their successful application. One of the software components involved in this project involves the creation of a graphics library that enables the seamless conversion between different widely used graphics formats.

Keywords: Evaluation, Quality, Digital images, Graphics formats

1. INTRODUCTION

The author's scholarly curiosity regarding digital image quality and its practical application has prompted an investigation into the realm of graphics files, with a specific focus on evaluating their overall quality. The learning curve associated with this particular task exhibits a greater degree of steepness when compared to previous endeavours. Additionally, it is worth noting that the software component involved in this project represents the author's initial foray into genuine software development. The author has conducted extensive research on various aspects related to image storage principles, including compression and decompression techniques, colour spaces, image displaying methodologies, file format conversion, as well as advanced techniques in this field. The field of digital image processing has witnessed significant advancements in the past century, particularly in the areas of noise reduction, image enhancement, segmentation, and recovery [1]. The field of digital image analysis has undergone significant advancements since the 1970s, with the integration of pattern recognition systems.The development of digital image processing technology is accelerated by the growing demands placed upon it [2]. The utilisation of software and algorithms for the analysis and research of digital images has the potential to enhance the overall quality of the output. The optimisation of the output image is discussed through the examination of various factors such as resolution, colour, noise reduction, object analysis, image cutting, mosaic, and print character [3]. The field of image processing is experiencing significant growth, primarily focused on the manipulation of digital images. This domain is frequently associated with computationally demanding tasks. Processing engines must be equipped with specialised data paths, application-specific operators, efficient data management, and meticulous sequencing and pipelining in order to handle the high pixel count of over seven million pixels per second for typical image sources [4]. One of the primary limitations associated with digital image processing pertains to the considerable amount of computational time and computational power that is demanded by a digital image processing system [5]. Digital image processing plays a crucial role in extracting the most relevant information applicable to a wide range of disciplines, such as remote sensing, medical imaging, non-destructive evaluation, forensic studies, textiles, material science, military operations, the film industry, document processing, graphic arts, and the printing industry [6]. Several filtering techniques have been employed in order to enhance the quality of images, and it has been observed that adaptive filters are particularly effective in the case of images with high levels of noise [7]. Historically, objective approaches for evaluating perceptual image quality have sought to measure the detectability of discrepancies between distorted images and reference images by leveraging different characteristics of the human visual system [8]. Nevertheless, an alternative paradigm for evaluating the quality of a system has been proposed, which relies on the deterioration of structural data and employs a metric known as the Structural Similarity Index. Digital image processing encompasses four fundamental operations: image pre-processing, image segmentation, and feature extraction. The processing operations of satellite imagery can be classified into three distinct categories, namely Image Rectification and Restoration, Enhancement, and Information Extraction. The former pertains to the initial processing of raw image data, encompassing tasks such as rectifying geometric distortions, radiometrically calibrating data, and mitigating noise. The latter pertains to methods aimed at enhancing the visual differentiation among various elements within a given scene [9]. The field of digital image processing has experienced

significant advancements and has found widespread applications in various domains such as remote sensing, medicine, and recognition. The forthcoming trajectory of digital image processing will primarily concentrate on artificial intelligence algorithms and enhancing the logical framework, thereby broadening its range of applications and advancing miniaturisation, intelligence, and convenience [10].The primary objectives of the project involve the identification, understanding, and representation of various industry-specific methodologies for quantitatively assessing image quality in different graphic file formats. The evaluation of the quality of digital images stored in computer systems is currently subjective due to the presence of multiple file formats that can be employed for image storage. To achieve optimal decision-making, it is crucial to make the correct choice on the first attempt. The aim of this project is to investigate the methods used in similar industries to assess the quality of an image saved in various file formats, and to examine how these methods can be effectively applied. One of the software components within this project involves the creation of a graphics library that enables the transformation of diverse and widely used graphics formats.

2. EVALUATION

The Joint Photographic Experts Group created the JPEG JFIF standard for optimal compression and output quality. This format supports lossy compression but prioritises it above lossless. JPEG compression begins with the Discrete Cosine Transform (DCT). This technique converts pixel values into frequency domain. This process produces values with identical information, expressed in frequency and magnitude. The minimum frequency value in the block's top left corner is crucial. JPEG picture encoding involves Discrete Cosine Transformation, entropy encoding, and quantisation. Quantisation attenuates frequencies below a threshold. Entropy encoding converts coefficients in the upper left of each block from absolute to relative values. Zero values can be turned into pairs for run-length encoding. Run-length encoding uses a zig-zag sequence to traverse images instead of horizontally and vertically. This method exploits the frequency coefficient distribution. Run-length encoding is likely for this sequence. This article examines common formats and techniques, the difficulties of creating a uniform format evaluation method, and the difficulties of quantifying the huge number of graphical formats. Due to the wealth of information, the third objective—researching and understanding said forms and techniques—was achieved. The author's exploration has helped identify fresh methods for this endeavour and given him first-hand experience quantifying the huge assortment of graphic representations.

3. CONCLUSIONS

The primary focal points of this text pertain to the investigation of prevalent formats and methodologies, the challenges associated with devising a comprehensive system for evaluating formats based on established techniques, and the complexities involved in quantifying the vast array of graphics formats. The successful attainment of the third objective, which pertains to the research and comprehension of these formats and their associated techniques, can be attributed to the abundance of available information. The author's exploration has facilitated the identification of novel approaches for accomplishing this task, and has provided direct insight into the challenges that arise when endeavouring to measure the vast array of graphical formats.

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