RESEARCH ARTICLE

Image Processing in Android Environment

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ABSTRACT

Image Processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image and the output is any processed image having some operations applied on it. In Android environment we have compressed image, saturated image and cropped image with different mathematical operations and various techniques such as J-peg Lossy Compression technique. Adding text to image and decreasing-increasing brightness and contrast of image also come under processing of images.

Keyword: Android Processing, Image Processing, Image Processing System

INTRODUCTION

Image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image.[1] Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Images are also processed as three-dimensional signals with the third-dimension being time or the z-axis.

Closely related to image processing is computer graphics and computer vision. In computer graphics, images are manually made from physical models of objects, environments, and lighting, instead of being acquired (via imaging devices such as cameras) from natural scenes, as in most animated movies. Computer vision, on the other hand, is often considered high-level image processing out of which machine/computer/software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans).

In modern sciences and technologies, images also gain much broader scopes due to the ever growing importance of scientific visualization (of often large-scale complex scientific/experimental data).

Examples include microarray data in genetic research, or real-time multi-asset portfolio trading in finance. Image Compression is one of important feature of Image processing. Image Compression is a type of data compression applied to digital images, to reduce their cost for storage or transmission. Algorithms may take advantage of visual perception and statistical properties of image data to provide superior results compared to generic compression methods.[2]

The best image quality at a given bit-rate (or compression rate) is the main goal of image compression, however, there are other important properties of image compression schemes:

Scalability: Scalability generally refers to a quality reduction achieved by manipulation of the bitstream or file (without decompression and re-compression). Other names for scalability are progressive coding or embedded bit streams. Despite its contrary nature, scalability also may be found in lossless codec's, usually in form of coarse-to-fine pixel scans. Scalability is especially useful for previewing images while downloading them (e.g., in a web browser) or for providing variable quality access to e.g., databases. There are several types of scalability:

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- **Quality progressive** or layer progressive: The bit stream successively refines the reconstructed image.
- **Resolution progressive**: First encode a lower image resolution; then encode the difference to higher resolutions.[3][4]
- **Component progressive**: First encode grey; then color.
- **Region of interest coding-** Certain parts of the image are encoded with higher quality than others. This may be combined with scalability (encode these parts first, others later).

Meta information- Compressed data may contain information about the image which may be used to categorize, search, or browse images. Such information may include color and texture statistics, small preview images, and author or copyright information.

Processing power- Compression algorithms require different amounts of processing power to encode and decode. Some high compression algorithms require high processing power.

COMPRESSION TECHNIQUES AND USES

Lossless Image compression is used in many applications. For example, it is used in the ZIP file format and in the GNU tool g-zip. It is also often used as a component within lossy data compression technologies (e.g. lossless mid/side joint stereo pre-processing by the LAME MP3 encoder and other lossy audio encoders).

Lossless compression is used in cases where it is important that the original and the decompressed data be identical, or where deviations from the original data could be deleterious. Typical examples are executable programs, text documents, and source code. Some image file formats, like PNG or GIF, use only lossless compression, while others like TIFF and MNG may use either lossless or lossy methods. Lossless audio formats are most often used for archiving or production purposes, while smaller lossy audio files are typically used on portable players and in other cases where storage space is limited or exact replication of the audio is unnecessary.

Lossy Image compression is most commonly used to compress multimedia data (audio, video, and images), especially in applications such as streaming media and internet telephony. By contrast, lossless compression is typically required for text and data files, such as bank records and text articles. In many cases it is advantageous to make a master lossless file which is to be used to produce new compressed files; for example, a multi-megabyte file can be used at full size to produce a full-page advertisement in a glossy magazine, and a 10 kilobyte lossy copy can be made for a small image on a web page.

JPEG LOSSY COMPRESSION: The term "JPEG" is an initialism/acronym for the Joint Photographic Experts Group, which created the standard. The MIME media type for JPEG is image/jpeg, except in older Internet Explorer versions, which provides a MIME type of image/jpeg when uploading JPEG images.[5] JPEG files usually have a filename extension of .jpg or .jpeg.

JPEG compression is used in a number of image file formats. JPEG/gif is the most common image format used by digital cameras and other photographic image capture devices; along with JPEG/JFIF, it is the most common format for storing and transmitting photographic images on the World Wide Web.[6] These format variations are often not distinguished, and are simply called JPEG.

J-PEG COMPRESSION OVER OTHER COMPRESSION

The advantage of lossy methods over lossless methods is that in some cases a lossy method can produce a much smaller compressed file than any lossless method, while still meeting the requirements of the application. Lossy methods are most often used for compressing sound, images or videos. This is because these types of data are intended for human interpretation where the mind can easily "fill in the blanks" or see past very minor errors or inconsistencies – ideally lossy compression is transparent (imperceptible), which can be verified via an ABX test. Data files using lossy compression are smaller in size and thus cost less to store and to transmit over the Internet, a crucial consideration for streaming video services such as Netflix and streaming audio services such as Spotify.

Transparency

When a user acquires a lossily compressed file, (for example, to reduce download time) the retrieved file can be quite different from the

original at the bit level while being indistinguishable to the human ear or eye for most practical purposes. Many compression methods focus on the idiosyncrasies of human physiology, taking into account, for instance, that the human eye can see only certain wavelengths of light. The psychoacoustic model describes how sound can be highly compressed without degrading perceived quality. Flaws caused by lossy compression that are noticeable to the human eye or ear are known as compression artifacts.

Compression ratio

The compression ratio (that is, the size of the compressed file compared to that of the uncompressed file) of lossy video codecs is nearly always far superior to that of the audio and still-image equivalents.

- Video can be compressed immensely (e.g. 100:1) with little visible quality loss
- Audio can often be compressed at 10:1 with imperceptible loss of quality
- Still images are often lossily compressed at 10:1, as with audio, but the quality loss is more noticeable, especially on closer inspection.

PERFORMANCE COMPARISON

Image processing must be done by using precise mathematical operations which can provide optimal results. Image saturation is also important part of Image processing. With the help of RBGA values we change image to greyscale or in different color according to design by adjusting value from(0 to 255).In Android platform, CPU usage, GPU(Graphical Processing Unit) and RAM(Random Access Memory) provide certain criteria on which application can be compared with other applications. To study about different criteria and comparing with other features Android Monitor is used which produces results such as-
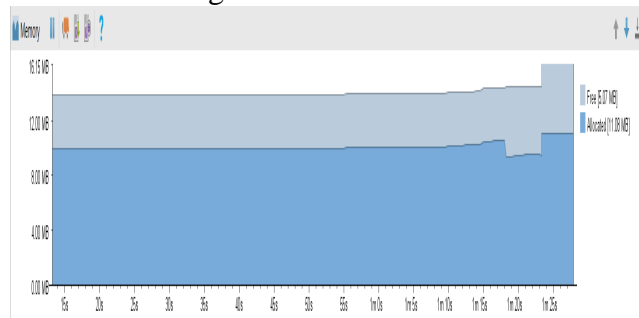
MEMORY Usage:-

Figure-1: Image processing Memory

```
ColorMatrix matrix = new ColorMatrix();
   matrix.setSaturation(0);

   ColorMatrixColorFilter    filter    =    new
ColorMatrixColorFilter(matrix);
   imageview.setColorFilter(filter);
```
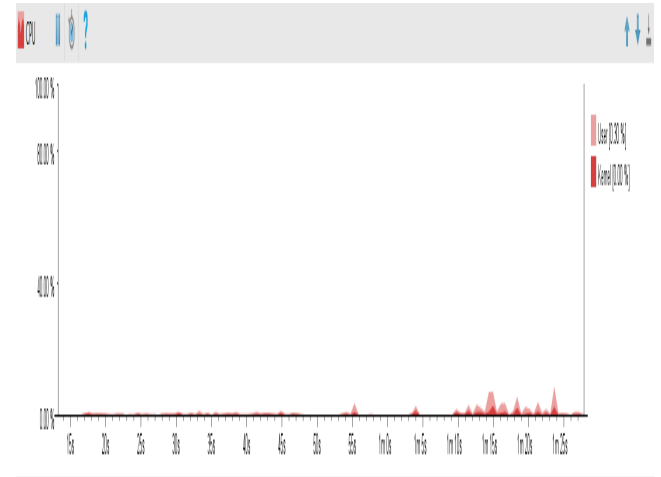**Figure-2: Adding Saturation in Image processing**

CPU Usage:-

Figure-3: Image processing CPU Usage

By using an optimal GUI and optimal mathematical operations and decreasing load on application we can have low Graphical usage which leads to less memory consumption and less CPU usage so Devices that can do not have high processing power or with limitations in CPU one can use image processing features such as:
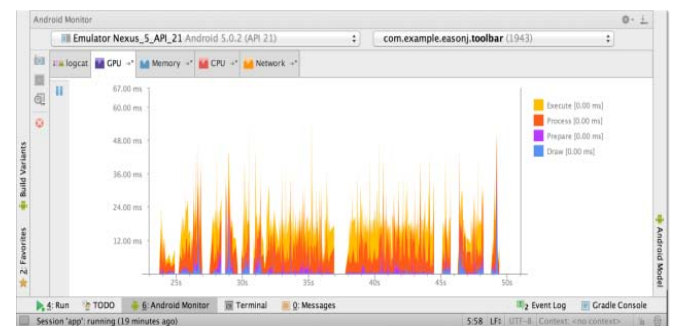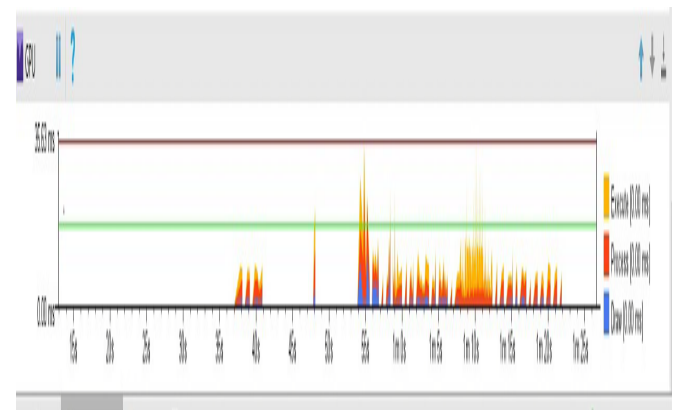

Figure-4: Other Image processing GPU value

Figure-5: Optimized Image Processing GPU value.

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CONCLUSION

The purpose of image processing is divided into 4 groups. They are:

- Visualization - Observe the objects that are not visible.
- Image sharpening and restoration - To create a better image.
- Image retrieval - Seek for the image of interest.
- Measurement of pattern – Measures various objects in an image.

It can be viewed as necessity of using mathematical operations on pixels and using optimized functions which consume less memory, CPU usage, GPU usage in image processing.Use of compressing technique must also be taken care of whether using lossy or lossless compression technology as both has their advantages and disadvantages over each other. We have JPEG lossy technology in our application due to its high performance, Region of Interest coding, Scalability than lossless compression technology and other lossy technology. For saving the quality of image, we have initially converted image in Bitmap format the applied lossy compression technique with 90% size compression and then we have converted bitmap to image. For adding saturation in Image processing we have converted image to bitmap values of R,B,G (Red, Blue, Green) and by adjusting its value color of image can be changed or color of text on image can be changed ,in matrix.setSaturation() function values varies from(0 to 255) .

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