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Context Based Predictor on Lossless and Lossy Compression

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Abstract: *In Android devices, Memory management has become a major concern because it has significant impact on system performance and battery life. Also it is important to efficiently use and manage the internal and external memory space present inside the mobile operating system. So it is essential to make a facility that helps in reducing memory consumption. The proposed Classic Image Compression Algorithm compress the RGB color image using lossless Image Compression Algorithm with the help of predictive coding based on Color Quantization for Android Mobile Devices. Predictive coding is very effective for lossless image compression. Predictive coding estimates a pixel color value based on the adjacent pixels. To enhance the accuracy of the estimation, we propose a new and simple predictive coding that estimates the pixel color value based on the quantized pixel colors of three neighboring pixels. The objective of image compression is to reduce the redundancy of the image and to store or transmit data in an efficient form. Based on this it will reduce the image size while achieving the best image quality with less data loss.*

Keywords: *Color Quantization, Predictive coding, Image Compression, Android devices, Memory Management, Image Representation.*

I. Introduction

Nowadays we have a tendency to square measure facing the increasing use of pictures in several components of our life. 3D systems, satellites, cameras, medical equipments etc. All of those equipments use or turn out image for various functions for victimization these pictures, for competitive examination we have a tendency to would like to transfer the compressed image . we have a tendency to have to save or transmit them, then as a result of the limitation in space and channel information measure we have a tendency to virtually invariably would like compression for decreasing the scale of information that should be save or transmit. There square measure many ways for compression supported the standards and conditions. a number of these criteria square measure compression quantitative relation, compression quality, compression time. Compression is minimizing the scale in bytes of a graphics file while not degrading the quality of the image. The reduction in file size permits a lot of pictures to be keep in a very given quantity of disk or memory area. It conjointly reduces the time needed for pictures to be sent over the web or downloaded from web content.

This paper is disturbed with lossless compression victimization the prophetical writing for RGB color pictures. Prophetical writing is a compression technique used for text and compression. It encodes the difference between the current data transmission derived from past data and actual current data to attain more efficient compression . To improve the compression efficiency of the predictive coding method, a new estimation method is proposed to give higher estimation accuracy. The new method estimates the pixel color value by the average of color values of the neighboring pixels, i.e. the adjacent pixels in the north, northwest, and west directions, with the same quantized color. If all three neighboring pixels have different quantized colors, the estimated value is simply equal to the average of the pixel color values of all three neighboring pixels. It can be shown later that by using the proposed estimation scheme the estimation errors can be reduced significantly leading to an improvement of compression efficiency with MSE, PSNR, Compression Ration and Compression Time.

II. Literature Survey

In this paper, (1) their is style extremely economical image encryption-then-compression (ETC) system, wherever each lossless and lossy compression are thought of. The projected image cryptography theme operated it he prediction error domain is shown to be able to offer a moderately high level of security associated additionally demonstrate that an arithmetic coding-based approach are often exploited to with efficiency compress the encrypted pictures. This paper (2) represents new lossless color compression algorithmic program, primarily based on the hierarchical prediction and context-adaptive arithmetic secret writing. For the lossless compression of associate RGB image, it is 1st de-correlated by a reversible color rework and so Y element is encoded by a standard lossless grayscale compression methodology.

Prophetical secret writing is enticing for compression on a board of ballistic capsule due to its low process complexness, modest memory needs, and the power to accurately management quality on a pixel-by-pixel basis. historically, prophetical compression targeted on the lossless and near-lossless modes of operation, wherever the utmost error are often delimited however the speed of the compressed image is variable (3).

This paper(4) proposes a lossless to lossy compression theme for hyper spectral pictures primarily based on dual-tree Binary Embedded Zero tree ripple (BEZW) algorithmic program. The algorithmic program adapts Karhunen–Loève rework and separate ripple rework to realize 3D number reversible hybrid rework and de-correlate spectral and spatial information.

Associate effective, low complexness methodology for lossy compression of scenic bi-level pictures, known as lossy cut set secret writing, is projected primarily based on a mathematician random field model. It operates by lossless secret writing pixels during a sq. grid of lines, that could be a cut set with relation to a mathematician random field model, and preserves key structural info (5).

During this paper (6), specialize in optimization and sweetening of High potency Video secret writing with respect to skilled applications. In most of the skilled video applications, noise dominates the compression performance. we tend to thus in theory associated much analyze the de-noising performance of an HEVC codec and show that, particularly for low to medium division parameters.

In propose a new methodology (7), known as 3D Image deformation primarily based Depth Video Compression (IW-DVC), for quick and economical compression of depth pictures captured by mobile RGB-D sensors. During this paper (8), the target associated subjective evaluations discovered that the projected compression framework achieved higher sensory activity quality compared to an existing technique wherever up to eight audio objects are thought of. The subjective evaluations additionally confirmed that the projected approach is ready to realize ascendible transmission according to the information measure whereas protective the sensory activity quality of each the individual audio objects and therefore the spatial audio scenes. In that paper (9), The goal is to scale back memory needs whereas increasing speed by avoiding Decompression and area domain operations. In every case, associate effort is created to implement the minimum range of JPEG basic operations. Techniques are given for scaling, previewing, rotating, mirroring, cropping, recompressing, and segmenting JPEG compressed information.

Our goal in this paper (10) is to offer a quick numerical implementation of the simplest ripple packet algorithmic program so as to demonstrate that associate advantage are often gained by constructing a basis custom-made to a target image. Stress during this paper has been placed on developing algorithms that ar computationally economical. We tend to developed a new quick two-dimensional (2-D) convolution-decimation algorithmic program with factorized non severable 2-D filters.

III. Proposed Work

3.1 Color Quantization:

Color quantization is a process of dividing a color space of an image into regions. Each region can be represented by a respective color, normally the centroid of the region. The process can be used to represent a color image by using a number of colors which take fewer bits to represent.

3.2 Predictive Coding:

Let, the output from the color quantization it will give a centroid of the entire region. The predicted color value of each pixel, at a time one, starting from the left column to the right column and from the top row to the bottom row, based on the quantized colors of their adjacent pixels.

3.3 Encoding Process:

The Proposed encoding process of image compression consists of three main tasks:

1) Color Quantization
2) Predictive Coding
1. Encoding process:

In color quantization the number of regions on given image discussed above and the output of color quantization task returns the centroid of each region. In Predictive coding it will calculate the predicate color value of each pixel based on the quantized color of adjacent pixel. In the last task it encodes the residual error with other parameter as number of centroid and the value of centroid.

IV. Proposed System Architecture

In proposed System architecture of Image Compression Algorithm using predictive coding based on Color Quantization for Android Mobile Devices, it will run android application on any mobile device where the android operating system is present. Its takes a Input as Images for application it will take Images from Gallery of Mobile Phones, Image captured from Camera and Images downloaded from WAP or Internet.

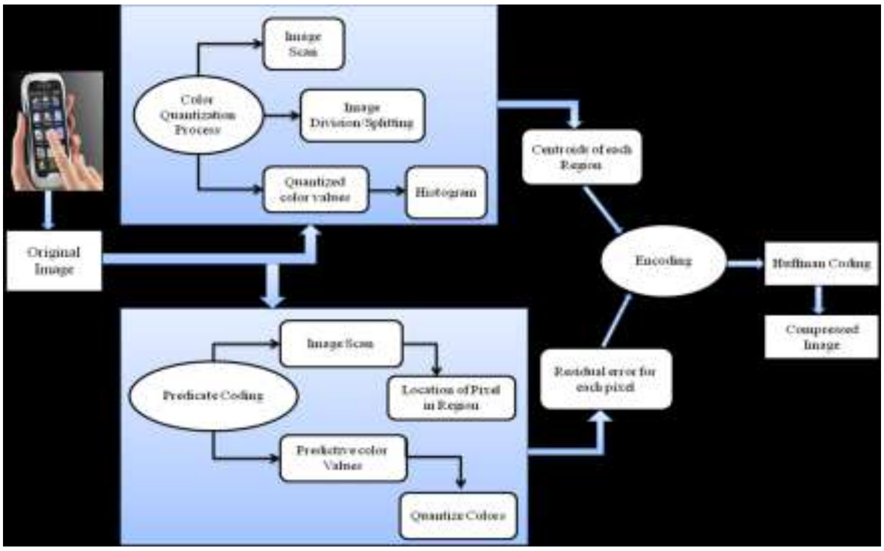

Fig 1. System architecture

Either select single image or multiple Images for Image compression, for Single Image it will show the file size of the Image i.e original image stored in mobile device, and Extension or type of the image for ex. .jpeg or .png. Our objective is to enhance the reduction of memory consumption in android mobile devices with Image Compression Algorithm using predictive coding based on Color Quantization technique.

It will take original image and it stores all the RGB values of images into a Matrix then Color quantization is performed where the image is divided into number of regions and RGB color values are identified. This RGB color values are stored in matrix format called color histogram matrix according to their RGB color axis of intensity values. From this histogram Matrix a centroid for each region is computed. After Color quantization, predictive coding is used to find the predicate value for each color, this predicate value is calculated according to the location of the current pixels value.

V. Algorithm

Image_Compression={Color Quantization, Predicate_color, Encoding }
Step 1.Color_Quantization :
F: M N C
Step 1.1.Where, Ψ = { (ri, gi, bi) | 0 r, g, b 255 } is the RGB color space
(x, y) M N are the co-ordinate of a pixel,
Step 1.2.M and N is the integer set of colors used in the image is
C = { C1,C2, ----Cn }.
There are 256, 256, 256 possible combination of red green and blue components.
Step 1.3.A quantized image may be regarded as mapping defined by:
Q: M * N -> R $\subseteq \Psi$
Where, R= {r1, r2, ……….rk} is a set of representative color used in the quantized image.
It will consider the RGB color image is divided into the number of regions and each region is represented by representative color:
Input: A set I= {(ri,gi,bi) | i=1,2,3…..|I| } ={Input original Image}
Output = {Centroid of the region}

Step 2.Predicate color:

Input_predicate = {Image centroid, Ht_image, Wt_image}
Output_Predicate = {Predicate_color, Residual error}
Step 3.Encoding :
Step 3.1.Input = {Centroid, Residual_error}
Consider, a set of centroid C= { C1, C2, C3,……..Cn}
with the intensity value of a centroid f(ai).
Step 3.2.Output = {It will provide a Compressed Image}
Step 3.3.CR = Compression Ratio = Original Image / Compressed Image
Mt = {1………………n} = Total Memory
Mavi = {1………………….n} = Available Memory
Mocc = {1………………m} = Occupied Memory
Output :{ Image is compressed and Save the more Memory of Android Devices.}
Success: {Reduced the file size of Image & reduced consumption of memory.}
Failure: {The File size of the image is not reduced & more consumption of memory.}

VI. Mathematical Model

Let S be the System such that,
S = {Input, DD, NDD, SI, RI, Image Compression, Sc, CR, Mt, Mavi, Macc, Succ, Failure, Output}
Input = {P1, P2, P3} = {Number of Images from Gallery, Camera & WAP}
P1= {Image Capture from Camera type is .jpeg or .png}
P2= {Image is Downloaded from web in Mobile Devices type is .jpeg or .png}
P3= {Image is already present in a Gallery in jpeg or png}
DD = Deterministic Data
= CI ϵ AI
Where,
CI = Required Images requested by client to compress = {P1, P2, P3}
AI = Available Images in Mobile Device and image is divided into a region.
NDD = Non-Deterministic Data= {P1= ɸ, P2= ɸ, P3= ɸ}
= CI ϵ AI
= Required Images resources are not available.
SI = {Size, Resolution, DPI, Image Type}
= {Single Image Properties from P1, P2, P3,…….}
RI = {SI is divided into number of regions }
= {R1, R2, R3, ……..Rn}
For each region of R1, Let Pixel are x1, x2, x3, x4 and corresponding pixel intensities
{ fR (x1), fG(x1), fB(x1) },
{ fR (x2), fG(x2), fB(x2) },
{ fR (x3), fG(x3), fB(x3) },
{ fR (x4), fG(x4), fB(x4) },
From that select the highest intensity value of region R1 for each component RGB say
{ fR (x3), fG(x3), fB(x3) }

VII. Experimental Results

The Classic Image Compression Application for android Mobile devices is tested on 200 images of type .jpeg and .png using predictive coding based on color quantization. Application is tested on different images varying the image size from 50kb to 5Mb. During Testing, image type is properly checked to avoid false results and failure of the system. Image must be in .jpeg or .png format only. For detailed analysis and to check the performance of the image, various performance parameters have been computed. The performance parameters include Mean Square Error (MSE), Peak Signal to Noise Ratio (PSNR), Compression Ratio and Compression Time. These parameters are computed by Classic Image compression Application on Android Mobile Devices. Test Images for Classic Image Compression Application By observing the results and analyzing it, we can determine how efficient an application is working and its performance with respect to other existing image compression tool.

A. Computational Complexity:
- Compression ratio and saving percentage=
- O(M)/O(N)=O(S)
- M= Before compression

- N= After compression
- S= Final compressed size

Test compressed images

Sunset

Mountain

Nature

Gold Hill

VIII. Future Scope

Application of shape image compression is additionally extended to the field of mobile communications. The simplicity and regularity of the tactic makes it appropriate to be enforced on programmable logic devices, an excellent improvement on the encoding/ decoding time will be achieved with the use of real Digital Signal Processor. this kind of compression are often applied in Medical Imaging, wherever doctors would like to focus on image details, and in police work Systems, once making an attempt to urge a transparent image of the interloper.

IX. Conclusion

We proposed Android classic Image Compression Application. In proposed system first scan the RGB color image to get all the color values of Image and it get stored in color matrix then compute centroid of the region using color quantization process. We then compute residual error of the neighboring pixels values using predictive coding method. We used the centroid of the each regions and residual error values for encoding, Encoding process is done using patch the given coding to get bits of stream for image pixels values as compressed image. We tested an application on different set of images. The application is also efficient since it works to reduce the memory consumption for android mobile devices. By using this Classic Image Compression Application, a compressed image is displayed on mobile screen, obtained a good quality image with minimum data loss. It takes minimum bandwidth to transfer image on the network. We conclude that, this application gives good results with high compression ratio, less compression time and maintain good quality of image than other existing image compression Application.

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