British Journal of Mathematics & Computer Science
9(1): 35-39, 2015, Article no.BJMCS.2015.185
ISSN: 2231-0851

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The Formation of Graphical Images Using Resampling Pixel Addressing Mode and Its Effect on 12 X 12 Block Memory

Makanjuola Daniel[1*]

[1]*Department of Computer Science, Salem University, Lokoja, Kogi State, Nigeria.*

Article Information

DOI: 10.9734/BJMCS/2015/15103
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Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=1142&id=6&aid=9235

Short Research Article

Received: 06 November 2014
Accepted: 06 March 2015
Published: 13 May 2015

Abstract

This paper is inclined to address the issue of pixel semantic expression of different region of interest. From the textual point of view, the number of pixels that are read from the region of interest in every graphical display is principally control by the pixel addressing features. Pixel Addressing is controlled by two parameters; Pixel Addressing Mode and Pixel Addressing Value [1,2]. This paper significantly displays knowledge of how fractional part of pixels (based on the chosen mode of pixel addressing) in the regions of interest is returned, and the effects of such discount on the image produced in terms of graphics and colour artifacts. The mode of Pixel Addressing can be decimate (0), averaging (1), binning (2), or resampling (3). The eventual image production in ROI (in terms of graphics and colour artifacts) is significantly determined by the mode of pixel addressing and the settings of the block memory.

Keywords: Pixel addressing; graphical Images; pixels.

1 Introduction

1.1 Region of Interest (ROI)

In the most general sense, a region of interest, as its name suggests, is a part of the image for which the observer of the image shows interest. Of course, the interest shown by the observer in viewing the image is

**Corresponding author: danielmakanjuola@salemuniversity.edu.ng;*

determined not only by the image itself, but also by the observer's own sensitivity. For a given image, different people could find different regions of interest. However, it can be said, in most cases, regions of interest generally have visually and structurally distinctive features than the rest of the image [3].

1.2 Detecting Region of Interest

Automatic detection of regions of interest in images is one of the most critical problems in computer vision. For a human observer, detecting a perceptually important region in an image is a natural task which is done instantaneously but for a machine it is far more difficult, as the machine lacks cultural knowledge and references to identify the content of the scene. One of the causes for this difficulty is the subjective nature of the region of interest. Some structural characteristics can be used to detect the region of interest of an image without making hypotheses about the semantic content of the picture. As established by Caron et al. [3], the detection of the ROI consists of finding a region of the image which appears different from the background with respect to low-level features such as contrast, colour, region, size and shape, distribution of contours or texture pattern.

1.3 Related Works

Different methods have been proposed to detect regions of interest in an image. Some are based on models of low-level human vision, such as the method propsed by Osberger and Maeder [4] which detects perceptually important regions on the image by building *important maps* based on various visual characteristics. The method proposed by Itti et al. [5] is based on multiscale centre-surround contrast and the method presented by Syeda-Mahmood [6] uses segmentation in homogenous colour regions. Other methods are based on different structural characteristics of the image without explicit reference to the human vision. The method proposed by Di Gesu et al. [7] uses symmetry transforms, Stentiford [8] uses dissimilarities in local neighborhoods, Kadir and Brady [9] used a local measure of entropy to detect salient features in an image. Wang et al. [10] used a wavelet transform and Carlottoand Stein [11] used a fractal model.

1.4 Pixels Addressing

The parameters of pixel addressing control the number of pixels that are read from the Region of Interest (ROI). Pixel Addressing is controlled by two parameters [12]. These parameters are:

i. The pixel addressing mode
ii. The pixel addressing value

The modes of pixel addressing can be decimate (0), averaging (1), binning (2) or resampling (3).

The difference in the modes of pixel addressing is in their pattern of image display. For instance, all pixels that are illuminated (active) whenever an image display system is switched on, but not all the active pixels are used to display images on the screen. The fraction of pixels that are eventually used to return images on the screen is in accordance to their categories in the pixel addressing mode. Actually, the mode of pixel addressing as described is directly related to their value i.e When the mode is decimate, the corresponding value is "0", when it is averaging, the value is (1), binning (2) and so on.

However, it is pertinent to say that the fact that Scaling algorithm is on re-sampling mode does not mean it cannot activate a value of 2, it only means that the highest value it can accommodate is not more than "3".

With a Pixel Addressing value of 1, the Pixel Addressing mode has no effect and all pixels in the region of interest (ROI) will be returned. For Pixel Addressing values greater than 1, the number of pixels will be reduced by the square of the value [1]. For example, a Pixel Addressing value of 2 will result in ¼ of the pixels.

1.5 The Formation of Graphical Images in Re-sampling Pixel Addressing

The number of pixels is reduced by the square of the value [1]. Therefore, with a Pixel Addressing value of 1, the number of pixels that will be returned in the region of interest (ROI) will be determined by $(1/n^2)$ where n is the pixel addressing value and it can either be 0, 1, 2, or 3. The number of pixels that is returned in the region of interest (ROI) is $1/n^2$. With a Pixel Addressing value of 1, the number of pixels will be $(1/[\mathbf{1}]^2) = 1$. This suggests that, with pixel addressing value of 1, all pixels in the region of interest (ROI) will be returned. Thus, resampling has no effect.

Imagine a resampling pixel addressing mode with a designated value of 3 within a pixrect (6 x 6) block memory. In line with the study undertaken by Donald and Pauline [1], the number of pixels that will be returned in the region of interest can be calculated as follows;

Mode of Pixel Addressing: Resampling
Pixel Addressing Value:3
Types of memory: *Pixrect*

Thus, the number of pixels that will be returned in the region of interest will be;

$1/n^2 = 1/(3)^2 = 1/9$
1/9 of (6 x 6 = 36) => 1/9 of 36 = 4
Meaning a reduction into 2 x 2 memory
However, a 12 x 12 Block memory will therefore return
$1/n^2$ of (12 x 12) => $1/(3)^2$ = 1/9 of 144 = 16

Meaning that out of the initial size of 12 x 12 memory, only 4 x 4 block memory would eventually be used to display image.

At this level of reduction, details in the scene may be lost, color artifact may be introduced and the resolution will be poorly affected.

However, with a pixel addressing mode of 2 or more, resampling convert the block of 10-bit pixels to one 30-bit RGB pixel by averaging the red, green and blue channels [2]. Setting the video format to YUV422 mode will result in the best image quality while resampling. Resampling will create images with the highest quality and the least artifacts.

1.6 The Influence of Pixel Addressing on image produced by different Cameras

Pixel Addressing will reduce the amount of data coming from the camera. However, only the Decimate mode will permit an increase in the frame rate. Averaging, Binning and Resampling modes will have the same frame rate as if the Pixel Addressing value was 1 (no decimation). Pixel Addressing works in the same fashion with color or monochrome sensors. For example, the pixel addressing for a camera and its parameters are shown in Tables 1 and 2.

Table 1. Controls

Mode	Auto	Mannual	One-time- auto	Off	CiD
All cameras	No	Yes	No	Yes	Yes

Studies have shown that the averaging mode will average pixels with the similar colour within the block resulting in a 2 x 2 Bayer pattern [12]. This allows details in the blocks to be detected and reduces the effect of colour artifacts. In the same line of progression, the binning mode will sum pixels with similar colour within the block reducing the block to a 2 x 2 Bayer pattern. Unlike binning with CD sensors, this

summation occurs after the image is digitized. Hence, no increased in sensitivity will be noticed but a dark image will appear brighter.

Table 2. Parameters

Camera	Parameter	Unit	Type	Min	Max	Default	Step/size	Comments
PL – A741	Mode	None	Absolute	0	0	0	1	0: Decimate
	Value	None	Absolute	1	2	1	1	
PL – A742	Mode	None	Absolute	0	3	0	1	0: Decimate, 1: Average, 2:Bin, 3: Resample
	Value	None	Absolute	1	2	1	1	
PL – A770	Mode	None	Absolute	0	3	0	1	0: Decimate, 1: Average, 2: Bin, 3: Resample
	Value	None	Absolute	1	4	1	1	Pixel addressing value of 3 is not supported!
PL – A780	Mode	None	Absolute	0	3	0	1	0: Decimate, 1: Average, 2: Bin, 3: Resample
	Value	None	Absolute	1	6	1	1	Pixel addressing value of 5 is not supported!

2 Further Research

The arrangement of data coded in the raster memory has a direct influence on the graphical image production of an image. There are three categories by which data could be coded in raster memory of any digital devices; They are Pixmap, Bitmap and Pixrect. Studying how these arrangements influence image resolution, processing time and colour artifacts would be a significant contribution to computer graphics. Furthermore, it could be interesting to know how the usage of either concave or convex lens/screen directly influence the image processing style of pixels on different categories of pixel mode (decimate, averaging, binning and resampling).

3 Conclusion

This research work is navigated towards expressing pixel semantic expression, with special consideration of how pixel addressing modes and their corresponding values significantly influence the graphical production in terms of brightness, resolution and colour artifacts. As established by Donald Hearn [1], the mode of pixel addressing can be decimate (0), averaging (1), binning (2), or resampling (3). Each category of pixel addressing mode has a significant influence on the eventual image production. More than other categories, this paper emphasized intensely the formation of graphical images in Resampling Pixel Addressing Mode and its effect on 12 x 12 block memory.

Acknowledgements

I want to use this medium to express my profound gratitude to the Editorial Board of British Journal of Applied Mathematics and Computer Science for putting this manuscript on a global platform thereby making it resourceful for potential readers and researchers who may be interested in this line of research.

Competing Interests

Author has declared that no competing interests exist.

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