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THE ENHANCEMENT OF IMAGE QUALITY IN VISUAL IMAGE PROCESSING BY USING PIXEL BASED DIGITAL FILTERS

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Abstract

Digital image processing makes it possible to use the most sophisticated methods, so it can provide both more complex performance in simple tasks and the implementation of impossible methods. Digital cameras usually have a special hardware for image processing (specially added to the circuits or other chips) to convert the original data into a standard image file format in the form of a standard image file changes. The Digital filters are used to blur and sharpen visual based digital images. These filters can be done in the space sphere through the frequency field by covering specially designed cores or certain frequency bands. The images are usually stacked before the Fourier is transferred and the overlay filter images show the results of different layer techniques. In this paper, an innovation filter model was proposed interms of color pixels in the images. The proposed model has a high-pass filter shows extra edges when zero is compared to the repeat edge. The visual transformations make the basic changes of the film, including scaling, rotation, exchange, reflection and cultivation.

Keywords:

Digital Image Processing, Digital Camera, Digital Filters, Visual, Frequency Bands, Filter Model, Color Pixel

1. INTRODUCTION

The effective form of a certain type of graphic construction depends on the choice of elements and their arrangement. Improper selection of elements, poverty or excessive variety of characters of pictorial means reduces the information content of charts [1]. In graphic messaging, as in any other, semantic and aesthetic components can be distinguished. When they are displayed on the screen, of course, semantic accuracy must be ensured, which determines the error-free reading of the information [2]. The aesthetics of illustrations deserve very close attention, because it affects the speed of reading and creates a positive emotional background, which contributes to the successful perception and integration of information [3]. This is especially important when the quality of home-made charts is still not high [4].

PCS presentation is the most important part of the images, so special attention should be paid to their implementation. Scientific research has proven that the accuracy and speed of reading these symbols from the screen depends on the visual conditions of their style and observation [5]. The first factor to consider is the location of the image field on the screen. Screen dimensions can be determined by adjusting the optics to provide uniform acceptable resolution across the entire screen area without distortion around the edges [6]. Labels, texts and other important information should be placed in the "safe" image area, the boundaries of which are 5-10% of the corresponding linear size from the edges of the screen [7]. Therefore, the most important text should be placed in the center of the screen. Second, in the preparation of category titles, introductory and explanatory titles, the experience of broadcast television should be taken into account, and the orderly and consistent arrangement of the text of the splash should be sought [8].

At the same time, hyphenation of words in credits is very undesirable. It is possible to use direct and reverse contrast, that is - dark PCS on a light background, and vice versa for the second [9]. In good lighting conditions, it is better to use direct contrast, and in poor lighting conditions, it is better to use inverse contrast [10-11]. The change of contrasts during the demonstration should not be frequent, which tires the eye, but the judicious use of this technique will contribute to the development of some dynamism of the presentation, breaking its monotony [12-13]. When using color symbols, it is necessary to take into account their combination [14]. However, in any case, the background of the inscription should not be a saturated bright color [15]. Psychologists have experimentally established the existence of "edge effects," in which letters at the ends of a string (or even single letters) are recognized faster and more accurately than letters within the string and the string is read faster as it is isolated [16]. This suggests that text covering multiple lines should be increased in letter height, and short monographs should be created in a common font used throughout the presentation style [17-18].

A dynamic image is a collection of still images taken in sequence. Therefore, the previous discussion on the composition of analog and digital still images applies to dynamic images [19]. Dynamic images obtained in digital format contain matrices selected by the technologist, but, as a rule, these are matrices with dimensions of 64x64 or 128x128 [20]. Although these matrices can compromise image resolution, they require significantly less memory and RAM than 256x256 matrices. Dynamic images are used to assess the rate of RFP accumulation and/or excretion from organs and tissues [21]. Some procedures, such as a three-phase bone scan and gastrointestinal bleeding, require only a visual examination by a physician to make a diagnostic decision. Other tests, such as nephrograms, gastric emptying, and hepatobiliary ejection fraction studies, require quantitative evaluation as part of the physician's diagnosis [22]. This section discusses several common dynamic image processing techniques used in clinical practice. These techniques are not necessarily unique to dynamic imaging, and some have applications for physiologically gated images.

2. LITERATURE REVIEW

Scan images can be partially or fully compressed to obtain a single image. An alternative method involves compressing the dynamic image into fewer frames. Regardless of the method used, the main advantage of image layering is cosmetic in nature [1]. For example, a series of images with a limited number of selections can be stacked to visualize an organ or tissue of interest. Obviously, further processing of images of visualization of organs and tissues will be facilitated by the technologist, which will help the doctor in the visual interpretation of research results [4].

The technologist can use a light pen or mouse to draw the ROI. However, there are some computer programs that automatically select contour analysis. Low-level research can be a problem for technologists because organs and tissues are difficult to understand [5]. Sufficient ROI isolation may be required to be abstracted or compressed by the technologist until organ or tissue boundaries can be readily distinguished [6]. For some studies, the ROI remains the same throughout the study (eg, nephrogram), while in other studies, the ROI may vary in size, shape, and location (e.g., gastric emptying) [10]. In quantitative studies, it is necessary to correct for the background. Once calculated, the ROI is determined for each frame, and the background is subtracted from each image, typically plotting the data over time on the X-axis and the count on the Y-axis [12].

3. PROPOSED MODEL

Digital images are composed of a matrix selected by the technician. Some common matrices used in radiology are 64x64, 128x128 and 256x256. In a 64x64 matrix, the computer screen is divided into 64 cells horizontally and 64 cells vertically. Each square resulting from this division is called a pixel. Each pixel can contain a certain amount of data. In a 64x64 matrix, the computer screen has a total of 4096 pixels, a 128x128 matrix gives 16384 pixels, and a 256x256 matrix gives 65536 pixels. Images with a higher pixel count look more like the original analog data.

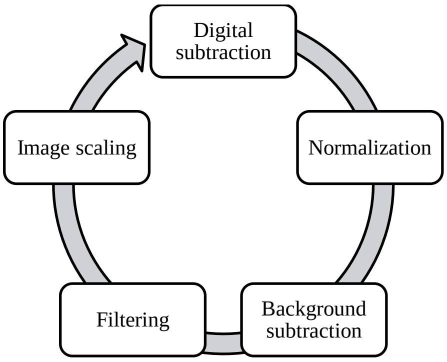

Fig.1. Proposed model

However, the computer must store and process more data, which requires more hard disk space and more random-access memory. Most static images are acquired by a radiologist for visual inspection, so they usually do not require significant statistical or numerical analysis. Several common static imaging techniques are commonly used for clinical purposes. These techniques are not unique to static image processing and can be used in some applications for dynamic, physiologically gated. The proposed model has the following modules to filter the visual images shown in Fig.1.

3.1 DIGITAL SUBTRACTION AND NORMALIZATION

A common problem in radiology is the prevention of ongoing surgery from obscuring or obscuring abnormal areas of tracer accumulation. Many of these difficulties have been overcome by the use of technology. However, better methods are needed to extract relevant information from a flat image. One of these methods is digital subtraction. Digital subtraction involves subtracting one image from another. Some radiopharmaceuticals are localized in both normal and abnormal tissue, making it difficult for the physician to interpret correctly. A second radiopharmaceutical is administered only to healthy tissue to distinguish between normal and abnormal tissue. A second image of the distribution of the radiopharmaceutical is subtracted from the first image, leaving only the image of the abnormal tissue. The patient must remain motionless between the first and second injection. When the technologist subtracts the high-quality second image from the low-quality first image, enough values are removed from the abnormal tissue to appear “normal.”

Images should be normalized to avoid false negative results. Normalization is a mathematical process that matches sparse patterns between two images. To normalize the image, the technologist must isolate a small point of interest adjacent to the tissue considered normal. The number of figures in the area in the Fig.1 (with the lowest number) is divided into graphs in the same area in the second (with the highest number). This gives a multiplication factor, counting all the pixels that make up the first image. In Fig.7, the “normal zone” is, by calculation, the top left pixel. Dividing this number in the “normal area” by the corresponding pixel in the second image yields a multiplication factor of 20. All pixels in the first image are multiplied by a factor of 20. Finally, the second Fig.is subtracted from the number in the first figure

3.2 BACKGROUND SUBTRACTION

There are many unwanted factors in radiological images: background, Compton scattering and noise. These factors are unusual in radiology in relation to the localization of radiopharmaceuticals within an organ or tissue. Such abnormal values (numbers) contribute significantly to image distortion. Background Samples collected from overlapping and overlapping sources. Compton scattering occurs when a photon deviates from its path. If the photon is deflected away from the gamma camera, or the electronics have lost enough energy to be distinguished by the camera, this is not so important. However, sometimes the photon is deflected toward the camera and its energy loss is great enough for the camera to detect it as scattering. Under these conditions, Compton scattering can be recorded by the camera, originating from sources other than the regions of interest. Noise is a random fluctuation in an electronic system. Under normal circumstances, noise does not contribute to unwanted emissions to the same degree as background and Compton scattering. However, noise such as background and Compton scattering can degrade image quality. This can be particularly problematic for studies where quantitative analysis plays a key role in the final interpretation of the study.

Background problems, Compton scattering, and noise can be reduced using a process called background subtraction. Typically, the technician draws a region of interest (ROI) suitable for background subtraction, but in some cases, the region of interest is computer generated. Regardless of the method, the technologist is responsible for the correct location of the ROI background. The background of regions with a large number of regions can capture many parameters from the organ or tissue in the region of interest. On the other hand, the background of regions with too few regions will remove too few parameters from the image. Both errors lead to misinterpretation of the study. Background subtraction is determined by adding the number of samples to the background ROI and dividing by the number of pixels that contain the background ROI. The resulting number is then subtracted from each pixel in the organ or tissue. For example, suppose the background ROI has 45 pixels and 630 samples.

Average background: 630 counts / 45 pixels = 14 counts / pixels

3.3 FILTERING

The purpose of anti-aliasing is to reduce noise and improve the visual quality of the image. Anti-aliasing is often referred to as filtering. Two types of filters are useful in radiation medicine: spatial and temporal. Spatial filters are used for both static and dynamic images, while temporal filters are used only for dynamic images. A very simple method of anti-aliasing uses a 3x3 pixel squares (nine in total) and determines the value of each pixel. The pixel values in the square are averaged, and this value is assigned to the center pixel.

At the discretion of the technician, the same operation can be repeated on the entire computer screen or on a specific area. Similar operations can be performed on 5x5 or 7x7 squares. A similar but more complex process involves building a filter kernel by weighting the pixel values around the center pixel. Each pixel is multiplied by the corresponding weighted values. Next, the values of the filter kernel are summed. Finally, the sum of the filter kernel values is divided by the sum of the weighted values, and the value is assigned to the center pixel. The disadvantage is that with anti-aliasing, even if the image is clearly visible, the image may be blurry and there may be a loss in image resolution. A final application of the filter kernel involves weighting the center of the pixel with a positive value and the peripheral pixels with negative values. This weighting method maximizes the amount of contrast between adjacent pixels and is used to increase the likelihood of detecting organ or tissue boundaries.

3.4 IMAGE SCALING

When viewing digital images for visual inspection, the technologist must select the correct image size. Image scaling can be done in black and white with intermediate shades of gray or in color. A simple gray scale is a scale consisting of two shades of gray, white and black. In this case, if the pixel value exceeds the user specified value, a black dot will appear on the screen; if the value is low, it will be white (or transparent in the case of X-ray images). This scale can be reversed as per the user's preference.

The most commonly used scale is 16, 32 or 64 shades of gray. In these cases, pixels with the most complete information appear as dark shadows (black). Pixels with less information appear as light shadows (transparent). All other pixels appear in grayscale based on the information they contain. The relationship between the number of points and shades of gray can be determined as linear, logarithmic or exponential. Choosing the right shade of gray is important. If too many shades of gray are selected, the image may appear washed out. If it is too small, the image may appear too dark. Color format can be used to scale the image, where the process is equivalent to grayscale manipulation. However, instead of displaying the data in grayscale, the data is displayed in different colors depending on the amount of information in the pixel. While color images may appeal to beginners and are more descriptive for public relations purposes, color images add little to image description. Therefore, many doctors still prefer to view grayscale images

4. RESULTS AND DISCUSSION

The proposed pixel based digital filter model (PBDFM) was compared with the existing DWT and bilateral filter (DWTBF), Real-Time Data Acquisition and Processing System (RDAPS), Intelligent Image Enhancement System (IIES) and the segmentation based visual processing algorithm (SVPA)

4.1 ACCUMULATION / ADDITION OF IMAGE

Filming and padding are interchangeable terms that refer to the same process. This article uses the term image stacking. Image compositing is the process of summing the values of multiple images. Although there may be situations where stacked images are the case, this is more the exception than the rule. Because image stacking is rarely used for quantitative purposes, image stacking is not worth normalizing. This was shown in Table.1.

Table.1. Comparison of accumulation of images

Images	DWTBF	RDAPS	IIES	SVPA	PBDFM
100	68.16	55.94	66.69	81.72	92.40
200	69.21	56.95	67.83	82.64	91.97
300	69.92	57.88	68.94	83.97	93.21
400	70.86	58.86	70.07	85.03	93.34
500	71.74	59.83	71.19	86.15	93.74
600	72.62	60.80	72.32	87.28	94.15
700	73.50	61.77	73.44	88.40	94.55

4.2 TEMPORAL FILTERING

The purpose of filtering is to reduce noise and improve the visual quality of the image. Spatial filtering, often called anti-aliasing, is used for static images. However, since dynamic images are static images arranged in a sequence, it is better to apply spatial filters to dynamic images as well. Various types of filters, time filter, are used for dynamic studies. Pixels in continuous dynamic analysis frames are unlikely to experience large fluctuations in the accumulated samples. However, small changes in a frame from the previous frame can lead to "flickering". Temporal filters successfully reduce flicker while reducing statistically significant fluctuations in the data. These filters use a weighted averaging technique, in which a pixel is assigned a weighted average of identical pixels from the previous and subsequent frames. This was shown in below Table.2.

Table.2. Comparison of temporal filtering

Images	DWTBF	RDAPS	IIES	SVPA	PBDFM
100	71.22	58.88	69.64	84.84	93.32
200	72.10	59.85	70.77	85.97	93.73
300	73.09	60.83	71.76	87.03	94.13
400	74.08	61.80	72.76	88.10	94.53
500	75.01	62.77	73.82	89.19	94.93
600	75.97	63.75	74.85	90.28	95.34
700	76.93	64.72	75.89	91.36	95.74

4.3 OPERATING TIME CURVES

Quantitative use of dynamic images to estimate the accumulation rate and/or RFP efflux rate from organs or tissues ultimately correlates with the activity-time curve. Activity-time curves are used to show how the counts of an area of interest change over time. Clinicians may be interested in sample collection and elimination rate (e.g., nephrogram), ejection fraction (eg, hepatobiliary ejection fraction, gastric emptying), or change over time (e.g., radioisotope ventriculography). Regardless of procedure, activity time curves begin with an ROI around an organ or tissue. This was shown in below table 3

Table.3. Comparison of operating time curves

Images	DWTBF	RDAPS	IIES	SVPA	PBDFM
100	65.35	52.95	63.91	78.11	90.27
200	65.68	54.45	64.50	79.98	91.31
300	67.02	55.56	65.48	80.81	91.44
400	67.69	56.93	66.20	82.33	92.18
500	68.52	58.23	66.98	83.68	92.76
600	69.36	59.54	67.77	85.03	93.35
700	70.20	60.84	68.55	86.38	93.94

4.4 SPECIFICATION IMAGING

Image profiling is a simple process used to measure various parameters in a static image. To profile the image, the technician opens the corresponding application on the computer and positions the line on the computer screen. The computer looks at the pixels indicated by the line and plots the number of samples in the pixels. A profile picture has many uses. For standard myocardial perfusion studies, a profile is taken through the infarct to help determine the size of the infarct orifice. During examination of the sacroiliac region, the profile is used to assess the uniformity of bone resorption of the sacroiliac joint agent in the image. Finally, image profiles can be used as a control to analyze camera variability. This was shown in Table.4.

Table.4. Comparison of specification imaging

Images	DWTBF	RDAPS	IIES	SVPA	PBDFM
100	68.52	58.24	66.99	83.68	92.76
200	69.36	59.54	67.77	85.03	93.35
300	70.19	60.85	68.56	86.38	93.93
400	71.03	62.15	69.34	87.73	94.52
500	71.86	63.46	70.13	89.08	95.10
600	72.70	64.76	70.91	90.43	95.69
700	73.53	66.07	71.70	91.78	96.27

4.5 STANDARD IMAGE PROCESSING

Still images converted directly to film in real time are presented in analog format. These data can have infinite values and can produce images that accurately reflect the distribution of radionuclides in organs and tissues. While these images are of the highest quality if captured correctly, real-time data collection provides only one opportunity to acquire data. Due to human error or other errors, image acquisition may need to be redone, and in some cases entire selections may need to be redone. Images transferred to a computer for storage or enhancement is presented in digital format. This was shown in Table.5.

Table.5. Comparison of standard image processing

Images	DWTBF	RDAPS	IIES	SVPA	PBDFM
100	72.22	60.18	65.54	81.23	93.08
200	73.52	61.18	66.24	82.31	93.24
300	74.82	62.18	66.94	83.39	93.40
400	76.12	63.18	67.64	84.47	93.56
500	77.42	64.18	68.34	85.55	93.72
600	78.72	65.18	69.04	86.63	93.88
700	80.02	66.18	69.74	87.71	94.04

This is done electronically through an analog-to-digital converter. In older cameras, this conversion occurred through series of resistor networks that contained the signal strengths of several photo-amplifier tubes and produced a digital signal proportional to the incident radiation power. Regardless of the method used to digitize images, digital output provides unique value to processed analog data. The result is storable and processable images. However, these images are only approximations of the original analog data

5. CONCLUSION

Many practices that apply to static rendering can also be applied to dynamic rendering. Unity occurs because dynamic images are a series of static images. However, the number of dynamic processes does not have static equivalents. Some manipulations of static and dynamic images are size-independent. Many procedures are aimed at improving the image of the image. However, the lack of quantitative results does not make the process any less important. It goes to show that a picture is worth a thousand words. Additionally, high-quality, computer-assisted diagnostic imaging, with proper interpretation, can go a long way toward improving a person's quality of life. As a result, the time curve can be compared visually and numerically with the norms established for each specific study. In almost all cases, the rate of accumulation or excretion, as well as the overall shape of the curve from the normal study, is used as a comparison to determine the final interpretation of the study results.

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