◈ 원 저 ◈

GOD모델과 S-curve모델을 적용한 임상용 모니터 영상출력인자 분석

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Clinical application of factor analysis GOD monitor video output and S-curve model

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Abstract

임상용 모니터의 출력값 중 가장 큰 영향을 주는 것이 휘도이다. 최근 컬러 모니터의 임상용 사용으로 인해 출력값의 보정은 매우 중요하게 관리되고 있다. 색보정 변위의 특성화가 휘도와 동일한 인자로 영향을 주는지 분석하기 위해 사용된 특성화 보정 모델은 GOG모델과 S-curve모델 이다. 두 개의 모델을 통해 모니터의 휘도는 장치의 출력과 직접적인 관계가 있다는 것을 증명하고 동일한 출력에 입력값을 가질 수 있도록 구성하고자 한다. 동일한 출력을 디스플레이 할 경우 동일한 출력값을 얻어야 한다. 그러나 모니터에 따라 서로 다른 출력값을 산출한다. 컬러모니터의 경우는 출력의 안정성에 휘도뿐만 아니라, 색감(R,G,B) 변화가 큰 역할을 수행한다. 본 연구에서는 분석인자 중 대조도에 영향을 주는 인자를 역추적하여 특성화 보정 S-curve모델을 LCD에 적용하였다. 이는 GOG모델을 적용한 CRT와 동일한 결과를 얻었다. 따라서 인자는 CIEXYZ의 결과값과 동일한 인자를 구할 수 있다.

Key works : GOD, S-CURVE, CIEXYZ, CONTRAST

Ⅰ. INTRODUCTION

Clinical monitoring of the hospital has the most amount in the medical information system and allows a lot of information in medical care. Therefore, clinical monitoring quality control is very important. Most are operated in accordance with the Quality Assurance (QA) Guideline for Medical Imaging Display System. Is the most important part of the management of the display brightness, the brightness measurement areas decides mostly the brightness response and uniformity of assessment. Brightness of the monitor areas is directly related to the output of the device. If the display to obtain the same output to the same input value, in accordance with the monitor output to different output values. For a color display, as well as the stability of the output brightness, the change in color (R, G, B) plays a big role. Therefore, it is necessary to reduce color calibration system is a change in color.[1]

Recent clinical monitoring is using the most color monitors. Therefore, this calibration is necessary because the color reproduction range according to affect the overall brightness of the display. This is possible through a characterization. Characterization of the output value can be calculated by adjusting the input value, there is an advantage capable of improving the results. The purpose of this study was the like to help improve the image with the characterization and analysis of the output parameter by applying representative GOG model and the model of the S-curve calibration process.

Ⅱ. MATERIAL AND METHOD

The display device is represented by a different color according to the kind method for driving, which can give a direct effect on the brightness. .Suppose that same transfer to monitor the input signal. This particular program is implemented in the device is output to a monitor unless the drive is expressed differently. Therefore, when such input signal is the same for all original images are different, but the quality of the output image to be output. It defines the relationship between the output value of each unit of the input (RGB) in order to complement this, and over the relation between the standard color and the definition is needed a process of correcting the output characteristics of different devices.[2],[3] In this study, it is called characterization. Thus, to derive the relationship between the standard color from (CIEXYZ) stimulation is characterized by the input RGB values and the output of the display device. CRT (Cathode Ray Tube) monitor video output (RGB) representative GOD (Gain-Offset-Gamma) model of the correction model is a characteristic of the digital input values and the brightness applied to the CRT composed of information such as the expression below. [4],[5]

R is if the $[k_{g,red}(\frac{d_{red}}{2^N-1})+k_{o,red}]>0$,

R = $[k_{g,red}(\frac{d_{red}}{2^N-1})+k_{o,red}]^{red_\gamma}$,

$[k_{g,red}(\frac{d_{red}}{2^N-1})+k_{o,red}]^{red_\gamma}<0$ is R=0

G is if the $[k_{g,green}(\frac{d_{green}}{2^N-1})+k_{o,green}]>0$,

G = $[k_{g,green}(\frac{d_{green}}{2^N-1})+k_{o,green}]^{green_\gamma}$,

$[k_{g,green}(\frac{d_{green}}{2^N-1})+k_{o,green}]<0$ is G=0

B is if the $[k_{g,blue}(\frac{d_{blue}}{2^N-1})+k_{o,blue}]>0$,

B= $[k_{g,blue}(\frac{d_{blue}}{2^N-1})+k_{o,blue}]^{blue_\gamma}$,

$[k_{g,blue}(\frac{d_{blue}}{2^N-1})+k_{o,blue}]<0$ is B=0

d : Value of the input digital
k_g : Gain
k_o : Offset
γ : Gamma
N : Bits of the input digital value of the display device
2^{N-1} : Value of the input digital(maximum)

Each of the above calculated the R, G, and B values when the input applied to the following equation: R, G, and B to find out about the CIEXYZ values.

$$\begin{matrix} X_{p_{ixel}} \\ Y_{p_{ixel}} \\ Z_{p_{ixel}} \end{matrix} = \begin{vmatrix} X_{r,\max} & X_{g,\max} & X_{b,\max} \\ Y_{r,\max} & Y_{g,\max} & Y_{g,\max} \\ Z_{b,\max} & Z_{b,\max} & Z_{b,\max} \end{vmatrix} \begin{vmatrix} R \\ G \\ B \end{vmatrix}$$

$X_{\max}, Y_{\max} Z_{\max}$: CIEXYZ value of the output light of a digital input for each channel

Obtaining the input R, G, B to find any output value is represented by the inverse matrix.

$$\begin{vmatrix} R \\ G \\ B \end{vmatrix} = \begin{vmatrix} X_{r,\max} & X_{g,\max} & X_{b,\max} \\ Y_{r,\max} & Y_{g,\max} & Y_{g,\max} \\ Z_{b,\max} & Z_{b,\max} & Z_{b,\max} \end{vmatrix}^{-1} \begin{vmatrix} X \\ Y \\ Z \end{vmatrix}$$

LCD (Liquid Crystal Display) monitor video output (RGB) model of representative S-curve model- calibration model is a characteristic of the digital input values and the brightness is applied to the LCD is made with the same contents as the expression below. [6]

First it is represented by each of the following formula to obtain RGB expression.

$$R = A_{rr} \cdot f_R(d_r) + A_{rg} \cdot f'_G(d_g) + A_{rb} \cdot f'_B(d_b)$$
$$G = A_{gr} \cdot f'_R(d_r) + A_{gg} \cdot f_G(d_g) + A_{gb} \cdot f'_B(d_b)$$
$$B = A_{br} \cdot f_R(d_r) + A_{bg} \cdot f'_G(d_g) + A_{bb} \cdot f_B(d_b)$$
$$f(x) = \frac{x^\alpha}{x^\beta + C}$$
$$f'(x) = \frac{(\alpha-\beta)x^{\alpha+\beta-1} + a \cdot C \cdot x^{\alpha-1}}{(x^\beta + C)^2}$$

f'(x) : first - order derivative of f(x)
d : Value of the input digital
C: Contrast Values

$$C = \frac{L_O - L_B}{L_B}$$
$$L_o = average\,white\,value$$
$$L_B = average\,black\,value$$

By applying the following formula obtained above to obtain the RGB value of the CIEXYZ

$$\begin{matrix} X_{p_{ixel}} \\ Y_{p_{ixel}} \\ Z_{p_{ixel}} \end{matrix} = \begin{vmatrix} X_{r,\max} & X_{g,\max} & X_{b,\max} \\ Y_{r,\max} & Y_{g,\max} & Y_{g,\max} \\ Z_{b,\max} & Z_{b,\max} & Z_{b,\max} \end{vmatrix} \begin{vmatrix} R \\ G \\ B \end{vmatrix}$$

Obtaining the input R, G, B to find any output value is represented by the inverse matrix.

$$\begin{vmatrix} R \\ G \\ B \end{vmatrix} = \begin{vmatrix} X_{r,\max} & X_{g,\max} & X_{b,\max} \\ Y_{r,\max} & Y_{g,\max} & Y_{g,\max} \\ Z_{b,\max} & Z_{b,\max} & Z_{b,\max} \end{vmatrix}^{-1} \begin{vmatrix} X \\ Y \\ Z \end{vmatrix}$$

$X_{\max}, Y_{\max} Z_{\max}$: CIEXYZ value of the output light of a digital input for each channel

Ⅲ. RESULT

Clinical management brightness and color calibration for quality control monitor is very important. Clinical management brightness and color calibration for quality control monitor is very important. Clinical management brightness and color calibration for quality control monitor is very important. RGB calibration and CIEXYZ of light output, given the largest digital value of each channel input from the input estimated correction model of GOD and the S-curve model model in order to correct the output value in this study, but not the same, it could derives to similar results. To analyze this, R, G, B and derived from a standard color calibration characterizing the brightness of the value was set in the same manner. Model to get the same output value without changing the CIEXYZ value of $X_{\max}, Y_{\max} Z_{\max}$ input it has the same brightness element satisfies the following characteristic change.

$$\begin{matrix} X_{p_{ixel}} \\ Y_{p_{ixel}} \\ Z_{p_{ixel}} \end{matrix} = \begin{vmatrix} X_{r,\max} & X_{g,\max} & X_{b,\max} \\ Y_{r,\max} & Y_{g,\max} & Y_{g,\max} \\ Z_{b,\max} & Z_{b,\max} & Z_{b,\max} \end{vmatrix} \begin{vmatrix} R \\ G \\ B \end{vmatrix}$$

is

$$\begin{vmatrix} R \\ G \\ B \end{vmatrix} = \begin{vmatrix} X_{r,\max} & X_{g,\max} & X_{b,\max} \\ Y_{r,\max} & Y_{g,\max} & Y_{g,\max} \\ Z_{b,\max} & Z_{b,\max} & Z_{b,\max} \end{vmatrix}^{-1} \begin{vmatrix} X \\ Y \\ Z \end{vmatrix}$$

Therefore, this factor is involved in the output value can be adjusted according to the change of the normal value of each channel that affects the brightness factor.

Ⅳ. CONCLUSION

Although clinical monitoring of a various models to maintain the same brightness variation is proposed, it is close to the by suggesting rule to implement the color space of the CIE XYZ. That is similar to that of the brightness of color. These points can be combined using a tristimulus value.

CRT, the LCD monitor of the characterization factor model can be deduced the same result also applies to any characterization this same. Although the response function of the standard observer that a change in the model of the variation factor which can be applied to printing of a simple model. Characterization value to maintain the same output value may be applied by inferring to a value within the accepted range, the color correction may also be applied to the factors affecting in brightness.

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