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POWER-CONSTRAINED CONTRAST IMPROVEMENT ALGORITHM MULTI SCALE RETINEX FOR OLED DISPLAY

Y SAI KRISHNA REDDY — Department of Electronics and Communication Engineering, Narayana Engineering College, Nellore, Andhra Pradesh, India.

KANTE MURALI — Department of Electronics and Communication Engineering, Narayana Engineering College, Nellore, Andhra Pradesh, India.

ABSTRACT

This project presents a power-constrained contrastimprovement algorithmic program for organic semiconductor diode displaybased on multiscale retinex. Basically, MSR, that isthe key element of the planned algorithmic program, consists of powerlog operation and subbands gain c First,we have a control tendency todecompose input image to MSRs of varied sub-bands,and figure an accurate gain for each MSR. Second, we have a tendency to apply acoarse-to-fine power management mechanism, that re-validates theMSRs and gain. This step iterates untill the desired power savingis accurately accomplished. Incase of video sequences, the distinctionlevels of adjacent pictures are determined systematically usingtemporal coherence thus on to avoid unsteady artifacts. Finally,we have a tendency to gift several improvement skills for processing.Experimental results show that the planned algorithmic program providedesired visual quality than existing methods, and a desirable power-saving magnitude relation while not unsteady artifacts, even for videosequences

KEYWORDS : Power consumption, contrast enhancement ,multi-scale retinex.

I. INTRODUCTION

Modern show panels are classified as emissive and non-emissive displays. Cathode-ray tube Plasma board and additionally the Organic light-weightemitting diode square measure representative emissive displaysthat do not want external light sources, this will be the most desired one for the future generation.Whereas the thin-filmjunction transistor liquid shows (TFT-LCD) is also a non-emissive.In general, the first one is having many blessings over the second one, since associate degree emissive displaycan close up individual pixels[1] [2], it will specific complete darknessand win a high distinction quantitative relation. Second, emissive showsconsume less power than non-emissive ones as a result of every component tin associate degree emissive display will be severally driven and also thepower consumption of the elementis proportional to its magnitude. Non-emissive displays need to activate theirbacklight despite component intensity.Thus, the OLED is thought to be the foremost promising candidate for the next-generation showwhich can replace the TFT-LCD displays presently dominating the business market. So large-size OLED panels might shortly be adopted in a very wider vary of devices like highdefinition TV (HDTV) and radical video .Note that show modules consume most of the facility indigital media devices . Therefore techniques to attenuate powerconsumption within the show square measureinevitably needed. Severalimage process techniques for power saving in show panels are projected, on the far side circuit-level power savings.Lee et al. projected a power-constrained contrastenhancement algorithmic rule (PCCE) for emissive displays basedon bar graph deed (HE) [1], [2]They implemented an power-consumption model for OLED displays and enforcedan objective operate that consists of the HE terms and therefore thepower terms. By reducing the target operate primarily based mostly on the bell-shaped optimizationtheory; they tried to simultaneouslyachieve distinction improvement and power savings.

II.SUB-BANDDECOMPOSEDMULTI-SCALERETINEX

MSR is that the one which is an extended SSR with multiple kernel windows of varied sizes. MSR output be a weighted total of many totally different SSR output.The MSR output for onespectral component can be formally represented as

$$R^{MSR}(x,y) = \sum_{n=1}^{N} w_n . R_n(x,y) \qquad (1)$$

Where

$$R_n(x,y) = logI(x,y) - \log\left(F_n(x,y) * I(x,y)\right) \qquad (2)$$

Here R_n *(x,y)* ,denotes a retinex output related to the n-the scale for an input image *I(x,y)*.Note that gain wn isdetermined so that it will satisfy the condition $\sum w_n = 1$ of The image"*"in Eq. (2) this is equivalent to the convolution operationand Nis the quantity of scales. F_n *(x,y)*gives a surroundfunction and is given by

$$F_n(x,y) = K_n e^{(x^2+y^2)}/\sigma_n^2 (3)$$

Where is set so that $F_n(x,y)$ will satisfy $\sum\sum F_n(x,y) = 1$. σ_n^2 denotes the variance of the Gaussiankernel at then-the sub-band. Under the condition $\sigma_n > \sigma_{n-1}$ every SSR, we will derive consecutive frequency sub-bands.Note that a less is appropriate for enhancing fine details,whereas a more is suitable for improving notation. Thus, itis vital to choose an appropriate value of anin the MSR.Supported on this principle, Jang et al. proposed an enhanced SD-MSRthat associated with an modified logarithmic function, and also sub-banddecomposition, area varied sub-band gain, and an automaticgain/offset changes [3] (see Fig. 1). The modified log (mlog)is outlinedas

$$mlog(I(x,y)) = \begin{cases} w_L \log(I(x,y)+1) & I(x,y) \le \tau \\ -w_H \log(D - I(x,y)) + logD) & I(x,y) > \tau \end{cases} \qquad (4)$$

Where τ could be a user-defined threshold and D denotes a picturedynamic range. As an example, D is 256 for an 8-bit image

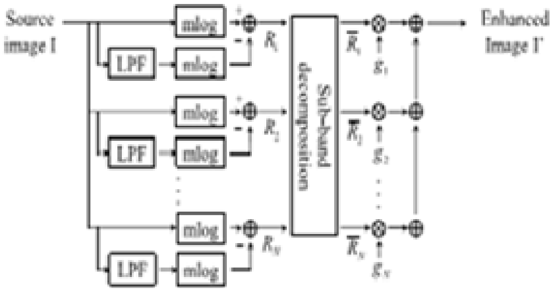

Fig 1: Block diagram of the conventional SD-MSR [2]

w_LAnd w_L defines weighting parameters according toandare defined as

$$w_L = \frac{\frac{\bar{\tau}}{D-1}\log D}{\log(\tau+1)}, w_L = \frac{(1-\frac{\tau}{D-1})\log D}{\log(D-1)} \quad (5)$$

as a result, the mlog function of Eq. (4) improves the contrasts of dark regions also bright regions. During this time, we are able to improve image details both in highlights and shadows. Another added advantage of SD-MSR is that we can decompose the changedretinex outputs into non-overlapping spectral regions. The subsequent equation accomplishes this sub-band decomposition:

$$\bar{R}_1 = R_1 n = 1$$

$$\bar{R}_n = R_n - R_{n-1} \qquad 2 \le n < N \qquad (6)$$

As nincreases, Rn corresponds to the low frequencyregion n more and more. Here,Rn is computed by replacing the log of Eq. (2) With the mlogof Eq. (4) Next, the space varyingsub-band gain at then-the sub-band is defined as

$$g_n(x,y) = \left(\frac{1}{NR_n(x,y)+\varepsilon_g}\right)^{1-\frac{\sigma_n}{\sigma max+\varepsilon\sigma}} \qquad (7)$$

Where

$$\sigma_{max} = \max_{n\epsilon[1,2,3\ldots N]} \sigma_n$$

$$NR_n(x,y) = \frac{|\bar{R}_n(x,y)|}{\bar{R}_{n_{max}}} (8)$$

In a high spectral band of tiny, they create the gain difference between pixels larger, particularly for the pixels with low $NR_n(x,y)$. This can be due to the spectral band has large high-frequency elements representing image details. Meanwhile, the lower that we observed gain changes between pixels in a high spectral region of huge n to keep up the characteristics of a natural scene. Thus, using Eq. (7), the ultimate increased imagelis output as follows

$$I' = \sum_{n=1}^{N} g_n \widetilde{R_n} (9)$$

III. THE PROPOSED ALGORITHM

We propose a power governable distinction enhancement algorithm for OLED show primarily based on SD-MSR. Fig.2describe the projected formula that consists of threestages. the primary stage coarsely reduces the facility of Associate in Nursing inputimage nearer to the target powerwith distinction improvement, and the second stage finely controls the image power suchthat it's terribly near the target power. If the input could be a video sequence, the ultimate stage adjusts the facility of every image so that it islike those of its neighbors by considering the temporal coherence of the input video sequence. The projected formula is differentiated from previousmethods in the following3 aspects. First, we tend to controlthe target power level mechanically. Second, we tend to avoid theflickering development by keeping the facility levels of adjacentimages constant for video sequences. Third, we tend to come through time period process of the projected formula ona all-purpose graphics process unit (GPU) even for full HD video sequences

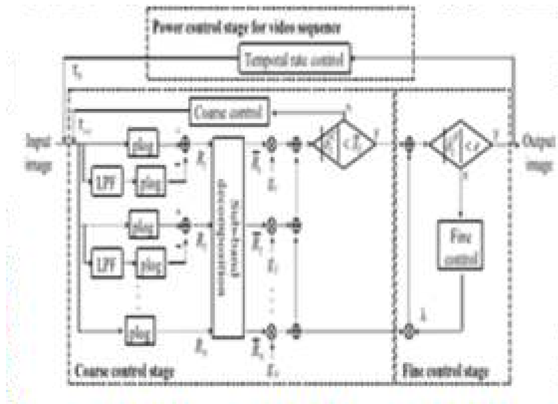

Fig 2: Block diagram of the proposed algorithm

Image nearer to the target power with distinction improvement and the second stage finely controls the image power suchthat it's terribly near the target power. If the input may be a videosequence, the ultimate stage adjusts the ability of every image sothat it's the same as those of its neighbors by considering the temporal coherence of the input video sequence.The projected algorithmic program is differentiated from previous methods within the following 3 aspects. First, we have a tendency to controlthe target power level mechanically. Second, we have a tendency to avoid theflickering development by keeping the ability levels of adjacent images constant for video sequences. Third, we have a tendency to bring home the bacon real-time process of the projected algorithmic program on a generalpurpose graphics process unit (GPU) even for full HD video sequences.

A. Power Modeling in OLED Display

Before presenting an in depth clarification of the projected algorithmic program, we want to model power for associate OLED show. Dong et al. conferred a pel-based power model that estimates the ability consumption of OLED modules supported the red green-blue (RGB) specification of every pixel [4]. the ability consumption of associate OLED show with K pixels, i.e., P is

$$Y_P = \sum_{i=1}^{K} Y_i^{\gamma} \qquad (11)$$

Where γ is a parameter for gamma correction for a given display device

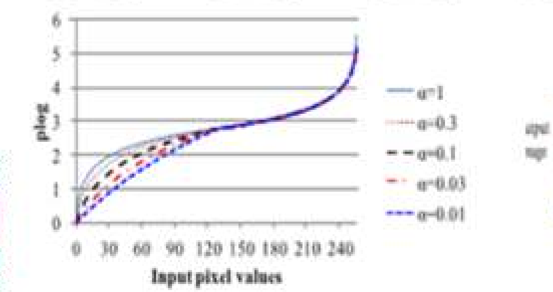

Fig 3: The plog function according to α values. Here, τ is 128.

B. The Proposed Algorithm

This section details the proposed algorithm.1) Coarse Control Stage: The mlog of conventional SD-MSR plays a role in enhancing the contrasts of highlights and shadow regions. In other words, contrast in the dark region becomes high by increasing the intensity level of the pixels in the region, and contrast in the bright region also becomes high by decreasing the intensity level of the pixels in the region. However, the increase of the intensity values in the shadow region results in the increase in power consumption for the OLED display. So, for low power consumption as well as contrast enhancement, even in the shadow region, we redefine a so-called power-constrained log (plog) from them log of Eq. (4) as follows

$$plog(I(x,y)) = \begin{cases} \frac{\tau logDlog(\alpha I(x,y)+1)}{(D-1)\log(\alpha\tau+1)} I(x,y) \le \tau \\ mlog(I(x,y)) I(x,y) > \tau \end{cases} \quad (12)$$

Therefore, the plog of Eq. (12) has the impact of dominant in raise of power consumption whereas partially lowering the contrast within the dark region. From Eq. (7) and MSRs computed byplog, i.e., {Rn}, we will derive the subsequent output image

$$\tilde{R}_t = \sum_{n=1}^{N} g_n \hat{R}_n \quad (13)$$

On the other hand, basin YP on Eq. (11), the power reduction quantitative relation ratio of an input image and its output image is outlined as follows

$$p_t = 1 - \frac{YP(\hat{\hat{R}}_t)}{YP(I)} \quad (14)$$

In this paper, $\bar{R}_n$ can be computed with Eq. (15) as in [6].

$$f(X) = X^N = \frac{X-m}{M-m}(L-1) + l \quad (15)$$

Let δ_t denote the difference between p_t and P as in Eq. (16)

$$\delta_t = P - p_t \quad (16)$$

Eq. (17) because such a condition indicates an excess of power reduction over P.

$$\tau_{t+1} = \tau_t + \frac{(D-\tau_t)}{2} \quad (17)$$

we increase τ relatively small as in Eq. (18) because δCt weakly over runs P

$$\tau_{t+1} = \tau_t + \frac{(D-\tau_t)}{4} \quad (18)$$

So we approach P by decreasing τ relatively small as in Eq. (19).

$$\tau_{t+1} = \tau_t + \frac{\tau_t}{4} \quad (19)$$

IV. SIMULATION RESULTS

The performance of the proposed algorithm can be evaluated by choosing the two images from Kodak Lossless True Color ImageSuite1 (capsandbeach) and a high dynamic range (HDR) testimagememorial. Also, we employed six common intermediateformat (CIF) video sequences container(500 frames),football(90 frames), Paris(300 frames), foreman (300 frames), bus(500 frames).

V. CONCLUSION

This project showsSD-MSR-based image process method fordesired powermanagement inOLED displays. . Finally, we tend to given a power management theme for a constant power decreased ratio in video sequences by victimization temporal coherence in video sequences. Planned algorithm results showed that the planned rule gives us higher visual quality than existing methods, and a consistent power-saving magnitude relation while not the flickering effects even for video sequences. Specifically, the proposed algorithm provides at most twelve months and we get 13% edge preserving ratio on an average compared to existing methods.(i.e., PCCE [7]).

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