Estimating Frame Algorithm and System Architecture for LED Screen

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***Abstract*—** In this paper, we propose a frame prediction algorithm to eliminate the flicks and blank under the environment of the refresh rate of 240 Hz in the full color LED Screen. It is well known that the LED Display System has both Blank and Ghost Noise problems. Blank symptoms can be improved by displaying the Video Frame repeatedly in the field of LED display. However it turns out to be inefficient and cannot resolve the Ghost Noise phenomenon for LEDs that have more than 250 μ in their response time as well.

For this reason, we have focused on how to configure the optimized data video, Flicks and Ghost noise problem in the LED Screen. We develop the LED Screen Picture Control System operating on the LED chip based on the characteristics of hardware devices and then implement a Convert Board to use the VDU (Video Distribute unit) device of the conventional LED Screen designed for a DVI Interface. Finally we compare the existing system with improved one to show the performance excellence.

***Keywords*—Led display, Led system, 240hz, Ghost noise , Flicker, Led response time.**

1. INTRODUCTION

Recently, the demand for the LED (Light Emitting Diode) has explosively increased in the multimedia display industry due to inherent characteristics of the LED, such as better viewing angles, contrast ratio, high response time, and brightness than existing LCD. The contents used as input sources in existing LED system are mostly encoded by National Television System Committee method (NTSC) / Phase Alternation Line (PAL) / Sequentiel Couleur Avec Memoire (SECAM) [1,4]. However, the encoding methods cause often various problems such as ghost noise, and flicker phenomenon. Thus, in order to improve the quality of the LED screen, many researches are currently being conducted in a number of different institutions. [1-9]

The problem of ghost noise and blank can be improved by adjusting refresh rate in order that more than the numbers of incoming frame [3]. Namely, the method is handling the frequency of the incoming frames.

However, the method requires increasing the resolution of the LED screen, also, the ghost noise is still occurred in case of that dynamic image such as sports, advertise.

This paper proposes a novel LED representation algorithm. The algorithm estimates frame as more suitable rate.

In this paper, for the prediction Frame to the synchronization algorithm the original of 60 Hz to 240 Hz LED Screen system, Frame data LED Systems are the offers in applying it. (In this paper proposes a novel LED representation algorithm that generates)

The improvement can be found in applying LED Screen of displaying multimedia Data occurs not only at screen flicker phenomenon but at the Ghost Noise (ghosting over the existing methods.)

We suggest that evaluation of the system that receives data from the DVI to 60hz (Figure1) System environment to 240hz conversion was implemented to perform FPGA Control Board, 60hz input unit to the video source, while the output LED Screen afterimage instantly, flicker In terms of symptoms instantly compared with traditional methods to configure the Frame of a pixel of color change in the comparison process was performed., the validity and effectiveness of the proposed system was confirmed using these results.

The remainder of this paper is organized as follows. Section 2 explains the video output of the LED display and existing problems. Section 3 discusses existing research that addresses issues of overall system configuration. It offers an introduction to a course of action. Section 4 evaluates the proposed system using the results of the experiment environment. Section 5 draws conclusions and discusses future challenges.

2. RELATED WORK

At a 60Hz refresh rate vibrations will be visible on the screen. Artifacts will occur when images are dragged. Within a Frame, Flicker and artifacts are solved by extending the frequency [2,3]. A recent issue of the 240 Hz LED TV backlight Scanning was is the LED backlight of the LCD panel [5]. This method increases the number of blinking frequencies for 240 Hz Frame-based processing of images. Chapter 240 indicates that the effect of watching this.

The bit transmission size is used to extend the high definition and related fields in the last full color LED Screen LED Display's high-definition.

For example by increasing the bit Size Color Data transmission range of the color representation of a typical 8 ~ 10 bit in the data transmission represents a 16bit process of technology transfer.

High-speed data processing is a way to achieve high-definition. However, this does not resolve flicker or Ghost Noise.

In the recent video to be received, a 60 Hz/sec Frame frequency is extended to 240 Hz/sec in order to operate from the same LED Screen Video Frame; it will be received until the next frame. It is expressed repeatedly using the Present Frame Copy method.

Let us look at the way Video Data was expressed for LED System before considering the Present Frame Copy description.

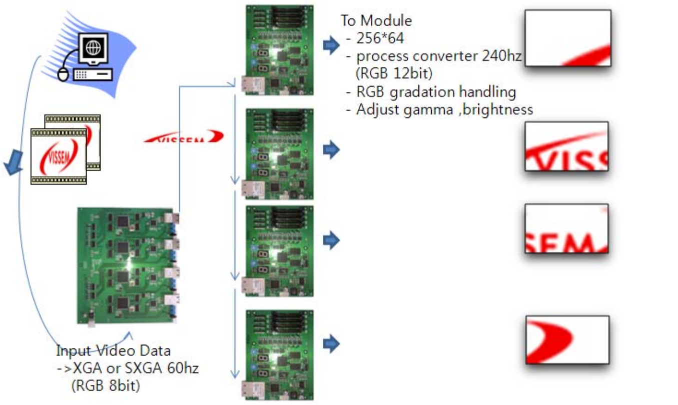

Figure1: For the current PC-based high-action block diagram of LED Screen

Figure1 depicts the LED Display System configuration [4].

Figure1 shows a 16x16 pixel Module LED Screen manifestation of the image, as shown in XGZ of the PC or SXGZ 60hz output signal of the input video data, after the color LCD and LED's capability to express the difference between the RGB or YUV signals and gradation handling of contrast, bright performs.

Then, to improve the flicker phenomenon (Figure2), since the frame rate synchronization of data is expressed.

The synchronization method uses the latest industry LED Screen Video Frame. It expresses the most commonly used method in industry. The conversion process is a double processing technique.

In the Video Frame, which expresses the 16x16pixel Module to configure the LED Screen (shown in Figure 2), the default is to be expressed, when one of Frame Data is received from the Sub-Controller inside the Video Distribute Unit (VDU), is completed when written to RAM.

At this point, while writing to RAM, if you try to Read data to express Frame Data in the LED Module, the port is occupied lby the Write. The attempt is ignored, as a result of the data expression timing, blanks are displayed; then problems occur, with images flashing.

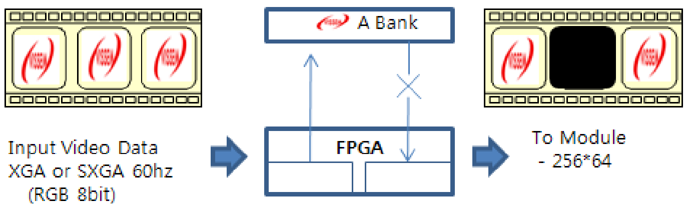

Figure2: port when the ship crashes occupied

Read Write operating on a bus at an occupied port causes a crash.

We write operations simultaneously as a different approach to Bank Memory writes to the same block to solve these problems, using the dual port memory, or more generally to RAM on the same Frequency timing Read (Figure 3).

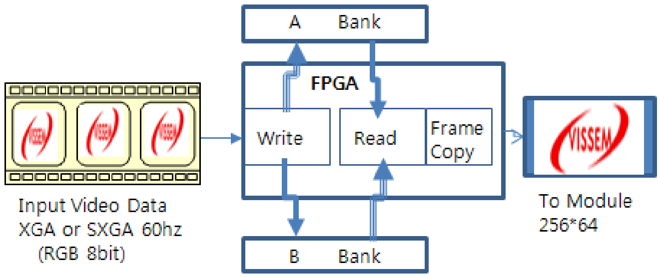

Figure3: method for avoid memory access conflicts

An approach of memory BANK for conflict prevention

Figure3 shows removal of the flicker occurred in the 60 Hz; the Frame processing frequency is extended.

Increasing the frequency, the difference between 60 Hz of the input and 240 Hz of the expressed output, the moment the Frame becomes White. There is a Click Timing the availability four times.

In the same manner, in order to prevent conflicts in the resolution of concurrent access to Click Timing memory, Read and write, respectively, at the intersection of Bank A and Bank B, and the remaining three one single access Click Timing Read the previous one in the old Bank Frame ,then Frame Copy is a method to Read back.

That is, Frame Copy is an approach to re-transmit the Frame three times, until it receives a virtual Present Frame and that of the Frame.

The flicker that appears on the screen is improved by increasing the refresh rate.

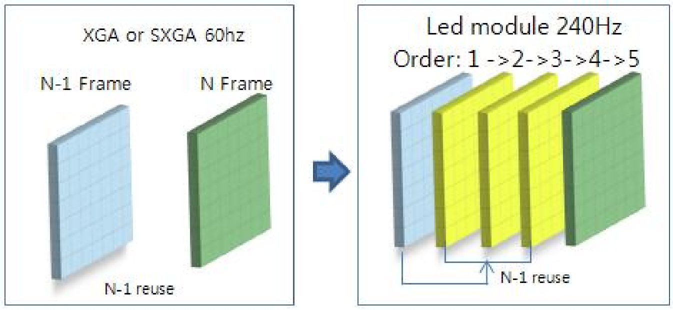

Figure 4: Present Frame Copy Method.

A block diagram of Figure 3 is expressed in the same frame in Figure 4. The algorithm repeats the same algorithm as for the frame flicker phenomenon, so the cycle improves. However, this only suits the LED Screen's LED Screen images to improve the size. The faster dynamic ghost noise becomes, the more serious are the visual symptoms.

Handling the virtual frame using the above method is not efficient for LED's that have no limit in their response speed.

3. PROPOSED SYSTEM

The proposed system failed to resolve the problem of the LED Screen showing the existing Frame repeatedly. Thus, the proposed system's aim is to remove the issue of the Ghost Noise phenomena efficiently at the high point of the dynamic data expression occurring. It is designed to validate the display.

The proposed system has features that make the change in the color values of pixel for the Frame much smoother using a response speed of the LED efficiently.

The basic idea of the frame prediction algorithm proposed in this paper is to fill the frame of the virtual display between an empty space and the source Frame to resolve the phenomenon such as flicker (Figure 5).

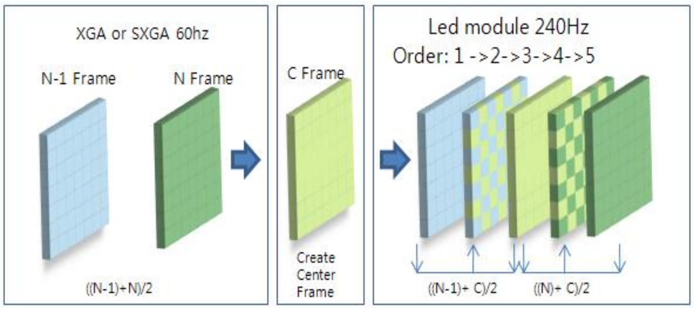

Figure5: Frame prediction algorithm frame prediction algorithm

The RGB values of each pixel are determined by the pixel formula (1) to produce the center frame first. The frame prediction algorithm is based on the inputs of the current N Frame (the next Frame a complete N Write) and the current N-1 (Old Frame) frame that has already been completed.

Pixel Data=((N-1)+N)/2 formula (1)

This operation is only invoked for the change of color levels (2), not the unconditional Frame operation.

$$Y = 2^{out\ bit} * (x/2^{source\ bit})^{gamma\ value} \quad (2)$$

At this point, changing the color is not the change of values, but the change between Y color values from the formula (3) shown above and the change of output Table in the Y axis by the gamma correction step.

If you receive Data as YUV, to express that again to the LED module under RGB, use the method to convert data values:

$$R = Y + 0.956U + 0.621V$$
$$G = Y + 0.272U + 0.647V$$
$$B = Y + 1.1061U + 1.703V \quad (3)$$

The color values per pixel of this calculation are stored in the FPGA internal memory temporarily. It is then used as the Center for prediction.

The resolution, in the case of exceeding the Frame Data Size that is acceptable within the FPGA size, the hardware configuration, is to add memory, but the algorithm itself does not change.

Figure 6 shows the block diagram for the prediction Frame.

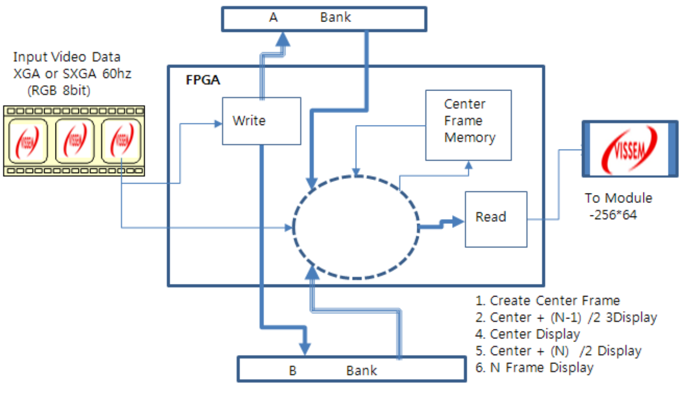

Figure 6: Figure 3 is based on applying the algorithm to predict the frame blocks

The block applied to the frame prediction algorithm based on Figure 3.

Figure 4 is needed to change the traditional method used for Click Timing.

The timing of the 3 to reuse the old frame is used to create the Center Frame and operations, between the timing of the four single clicks obtained due to frequency difference.

Frame prediction algorithm flowchart over the FPGA

When the first Write attempts to create a City Center Frame, the data of the Old Bank and the Frame data, which the Bank completed, will operate the Center Frame by configuration (Figure 7).

So the Frame data is stored in memory connected to the outside to express the definition and in memory within the FPGA.

After the N-1 Frame is displayed, the Frame data operates with the old frame creates the Frame through that operation. Then this is expressed to display the first prediction frame. The second prediction frame expresses the existing Center Frame that was made before. In the third display, the results of the operation between the N Center frame and N frame are entered now. The last (fourth) displays the N-body time Frame itself.

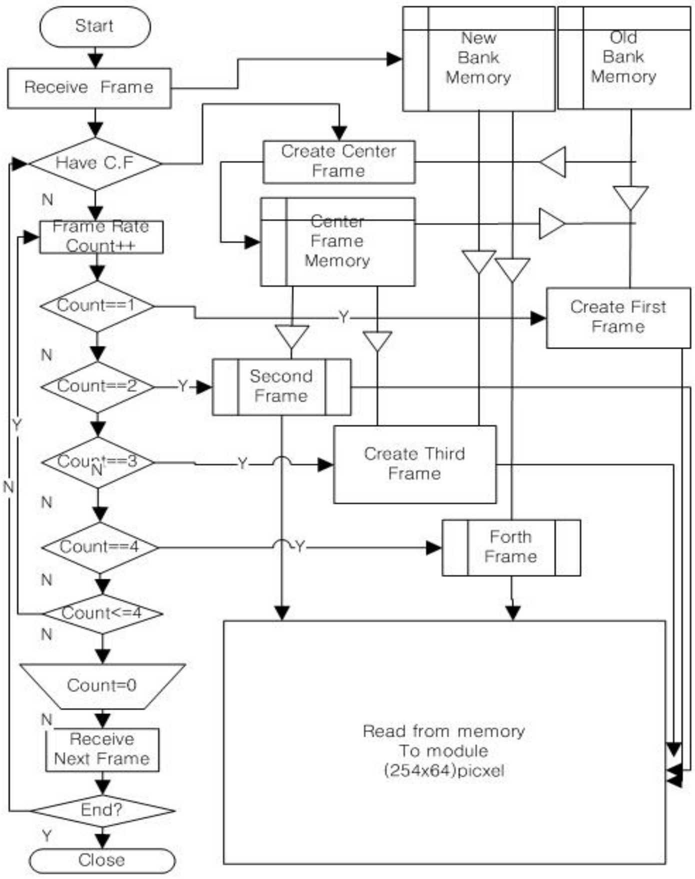

Figure 7: FPGA over the frame prediction algorithm flowchart

The basic approach also relied on the PC unnecessarily to express the Full color and to break away. This paper proposes, for full color display, an Embedded LED Screen Control system, such as applying Figure 5, not a PC-driven vision.

A conversion board was developed to convert the output device to the format to the DVI video and to use VDU equipment of a conventional LED Screen designed to receive input to the DVI Interface.

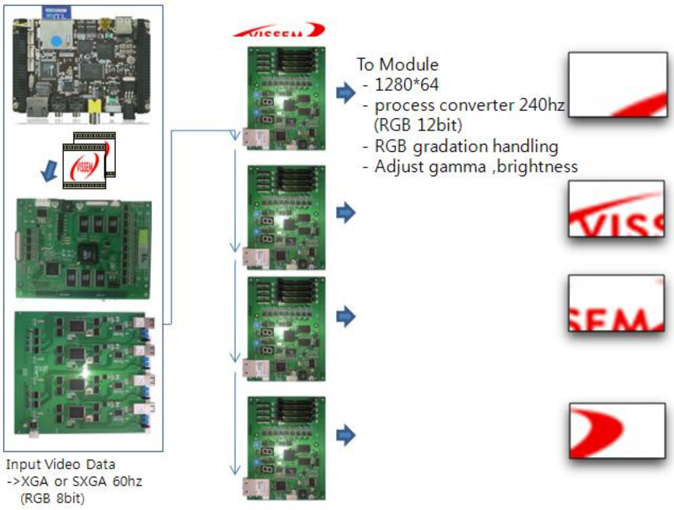

Figure 8. Embedded application system of configuration

Finally, the entire work has the following System Configuration, as depicted in the block diagram (Figure 6).

4. SYSTEM EVALUATION

A LED Screen with a resolution of 384x288, consisting of modules for 96mm SMD and PC was used for LED Screen Display in our assessment of the proposed system. It is based on the Windows XP program to play video files. It has been developed based on the Direct Show v9.0c.

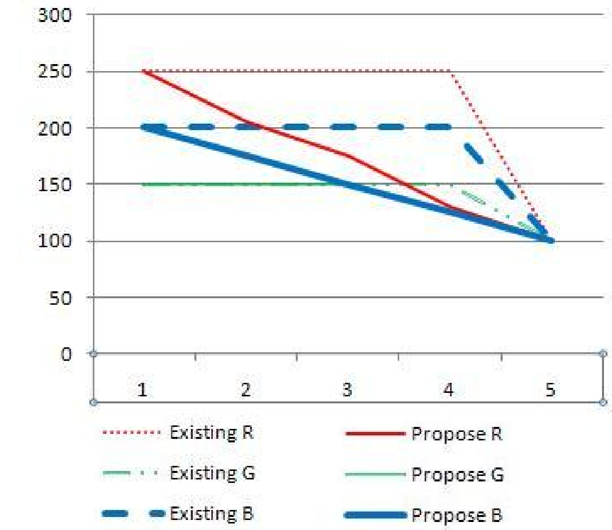

Figure 9. Existing and Propose system compares the RGB Changes

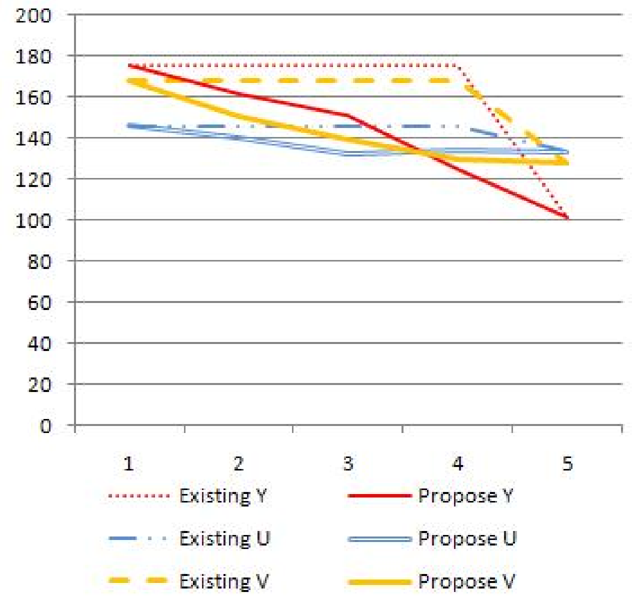

Figure 10. Existing and Propose system compares the YUV changes

In addition, Each FPGA chip responsible for the end of LED Screen image data was implemented using Cyclone tm II. This is a benefit of ALTERA's Low-Cost.

Figure 9 compares the system before and after applying the algorithm proposed in this paper, to represent the changing color of any pixel color RGB data, the pixels of the same Picture Frame configuration. You can see the smooth change between N Frame and N-1 Frame.

Figure 10 captures the value of the YUV data color changes of any pixel color of the pixels Frame configured.

The frame data can be smoothly changed by the frame prediction algorithm as shown in Figure 10,11 and TABLE 1. Luminance also changes with Frame RGB pixel color changes in the output. Thus, the ghosting and flicker expressed in high-speed video data of the existing full color Screen image processing of the same System can be improved.

Figure 11. Frame generation process (a~e)

Pixel Data		N-1	1	2	3	N
Existing System	R	**250**	250	250	250	**100**
	G	**150**	150	150	150	**100**
	B	**200**	200	200	200	**100**
	Y	**175.45**	175.45	175.45	175.45	**101.9**
	U	**145.95**	145.95	145.95	145.95	**133.4**
	V	**168.35**	168.35	168.35	168.35	**128**
Propose system	R	**250**	205	175	130	**100**
	G	**150**	150	150	125	**100**
	B	**200**	175	150	125	**100**
	Y	**175.45**	161.435	151.275	124.66	**101.9**
	U	**145.95**	140.285	132.4	134.01	**133.4**
	V	**168.35**	150.37	138.975	130.195	**128**

TABLE 1. Frame reuse and 240hz frame prediction in the process of

color change in comparison

5. CONCLUSION

The LED Screen is required where the Big Size and representation of high brightness is needed relatively to LCD. The LED is required in such settings as the exterior of the building, sports stadiums, rooftops and roads. This also requires the representation of dynamic Video files.

The LED Screen has flicker and ghosting when expressing files designed using the NTSC / PAL / SECAM approaches. Therefore image quality degrades compared to LCD that is familiar to our eyes.

The LED Screen increases the refresh rate to resolve this problem. However, this method alone cannot remove Ghost Noise (artifacts). Frame injection was used to predict the phenomenon to solve this problem in the experiment. Using Frame Copy rather than existing methods, the proposed algorithm can be very effective in improving the ghost Noise phenomenon and flicker.

The implementation of the system proposed in this paper, ameliorates the flicker phenomenon. It improves performance; the existing value of the refresh rate is four times better than the existing method in vibrant screens; with no ghosting or drag phenomenon, you can see a clearer picture. However, since the input allows a frequency limit of a 30 MHz Refresh rate, the 240 Hz frame prediction algorithm remained the same before and after the frame is made; the pixel colors have the average value only.

In the current environment, with a growing demand for LED, the algorithm is expected to offer a good solution to ghosting problems for large screens on toning down vibrant images and flicker.

There are several future research projects. It is necessary to forecast more accurate images to the frame by improving the ability of the LCD and LED color representation of the gamma-adjusted tables. In addition, increasing the frequency of the input to an accepted limit of 30 MHz will require further testing and verification.

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