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"A Review paper on implementation of hardware control unit of LEDTV Display using Nanotechnology"

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***Abstract*: Light emitting diodes (LEDs) are used for various applications such as signboards, emotional lighting systems, building lightings, and façades. LEDs are non-toxic, mercury-free, consume low power and provide long lifetime. These advantages make LEDs very attractive lighting devices used for various lighting systems from emotional lighting systems to very large lighting systems used in and on buildings. The LED based display control unit play important role in this using nanotechnology.**

Index Term- Nanotechnology, LED display control unit, LED Display

I. INTRODUCTION

Light emitting diodes (LEDs) are used for various applications such as signboards, emotional lighting systems, building lightings.Various types of LED control systems have proposed. Especially, studies on large screen display systems are being conducted. Large-screen signboard LED controllers can be classified into two types: hard-wired systems that use application-specific integrated circuit and those that use general purpose programmable processors (GPP) such as ATMEL's ARM processor.

In generally, a hard-wired system provides superior performance to the GPP-based system. However, hard-wired controllers are typically designed and optimized for a specific application; thus, they lack application flexibility. Compared to this, systems based on the GPP have excellent flexibility.

However, if processors with low operation capability are used due to cost constraints, they have a fairly long instruction cycle. So, GPP-based systems operate more slowly than hardwired systems, or they suffer from unnecessarily high cost. As the number of LED applications increase, the necessity for an LED controller with high performance and flexibility is also increasing. It is well known that an application specific instruction-set processor (ASIP) can provide the flexibility of a GPP and the high performance of a hard-wired system. Similarly, using ASIP in the design of the LED controller is expected to provide the advantages of both the GPP and the hard-wired system. For example, because the hard-wired system is usually designed for only one specific application, the system's hardware must be revised when the system is updated for a new application. In this case, adapting the ASIP-based LED controller for use in

the new application requires software revision only, and minimum hardware revision even if necessary. Thus, the benefits of using ASIP will be low cost and short time-to-market, compared to other two design approaches for LED controllers. In short, the ASIP, as a particular application-specific processor, has various advantages depending on the characteristics and purpose of the application.

Full Colour LED display system is a system that able to display multicolour images whether animated or static using arrays of RGB LEDs. LED or Light Emitting Diode are an innovative electronic device that function as it name states to emit light. LEDs are mainly use in display system because it is abundant with advantages. One of it is that LEDs has proven to be an efficient lighting system as it uses less power than any other traditional lighting device. In addition to that, LEDs also has higher luminous intensity (brightness) and longer lifespan than other lighting device making it is more cost efficient than other lighting device. RGB LED is LEDs that has produce three colour, which are Red, Blue, and Green.

The rapid development of LEDs technology has makes it very useful in today display system. There are many types of LED displays but it can be classified into two categories which is indoor LED screens and outdoor LED screens. The different types were use at different place either way the main purpose of it is to display real time information, advertisement and others. In cases for big advertisement board the LEDs panel used can have small pixel density per meter square as it is enough to produce crude image that can be seen as by human eye as perfect images from far away . However for indoor application a small size display the LEDs panel need to be closes to each other to increase the pixel density in order to produce a high definition (HD) image.

A light emitting diode is a semiconductor light source that emits light when activated. It is basically a PN-junction diode. LEDs “lights up” when a sufficient voltage is applied, this makes the electrons are able to recombine with holes within the LED, this movement of electrons then produce photon which is the light that can be seen. This is called electroluminescence effect, the colour of the light is determine by the energy of the photon released, to control this energy the band gap of the semiconductor is manipulate.

The LEDs are traditionally often used as indicator lamps on electronic devices, then they were packaged to form seven segment displays. Further research nowadays enables LEDs to be used in environmental and task lighting replacing incandescent light sources. LEDs have many advantages over traditional light sources such as longer lifetime, low energy consumption, smaller sizes, faster switching, and better physical robustness . LEDs also has proved to be brighter than other lighting devices and does not produce ultra violet

light that attracts insects making it ideal for indoor and outdoor used. The LEDs are more efficient lighting device. using a simplifies logical functions

'Structure and principle technique of the LED display

It is relatively simple to drive more LED individually. However, as the number of LED increases, the amount of resources needed to operate these LED is growing at an unsustainable level. As such, LEDs are often organized in matrices to make effective use of resources

Structure of display element

The largest share of LED display structures are designed to minimize the complexity of printed circuit PCB and save space. The structure proposed in our paper, figure 1 facilitates their implementation and their management. In a matrix, the LEDs are arranged in rows and columns.

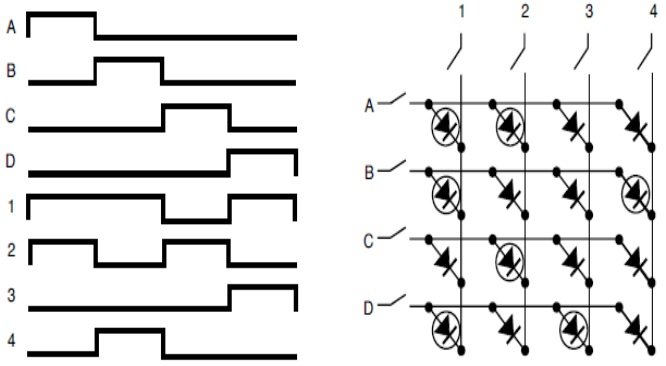

Figure-1 Structure and multiplexing of LED Matrix

The principle is that each LED can be turned on by specifying its location in terms of rows (i) and columns (j), Pixel P(i,j) fig.2. The LED on the top left is addressed by P (A, 1), the line i=A and column j=1. This addressing method also indicates the passage of the electric current. The current flow of the A to 1 (forward bias) to turn on the pixel P(A,1), if all switches are closed to each port A to D and 1 to 4, then all LED will be light.

II. LITERATURE REVIEW

Carrying out literature review is very significant in any research project as it clearly establishes the need of the work and the background development. It generates related queries regarding improvements in the study already done and allows unsolved problems to emerge and thus clearly define all boundaries regarding the development of the research project. Plenty of literature has been reviewed in connection with the LED hardware control unit using ARM processor, Application-Specific Integrated Circuit (ASIC). LED display controller can be classified to hard wired system using Application-Specific Integrated Circuit (ASIC) and general purpose programmable processor using Microcontroller unit (MCU).

In the year 2016 Chandani Maurya et.al published a paper on IJIRCCE that the Notice boards are common in the different institutions and are used daily. The notices are normally printed on the papers and then it displayed. The proposed system can announce a notice by just typing on the computer. If there is no notice, along with temperature and humidity, time

will be displayed. Here, ZigBee module is used for wireless communication. At receiver side, LED matrix board will display a notice which is controlled by microcontroller. GPS module is interfaced with microcontroller to display real time. At transmitter side, computer is used where ZigBee module is interfaced via USB to serial converter. An application is developed to write a notice. When anything is written on that window, it displayed immediately on the board. With the help of this application, notices can be transmitted from any computer if needed.

In the year 2014 K.Mateur published a paper on JACT that the very important objective of the digital designer when using discrete gates for implement a Boolean function is to keep the number of used gates to a minimum and win a memory space without lost the original information. In this sense, the Simplification is very important and could be achieved by a purely algebraic process, but it can be tedious when it arrived to a very large number of variables. In this paper we describe an automat solution based on finite state machine (FSM) for simplify and practically optimize the complex logical functions. This method is programmed and tested on a display system which is based on light emitting diodes (LED) matrix and programmable platform with Field Programmable Gate Array (FPGA). The module is implemented in Spartan 3E family XC3S500E FPGA board.

In the year 2013 Xiaohong Ni et.al published a paper on TELKOMNIKA, a design of LED display control system based on ARM and FPGA is proposed, according to module structure characteristics of the RGB three colors LED display and the dynamic scanning display of the LED display which is achieved by FPGA technology, this system uses ARM chip S3C2240 as the control core. with the help of the programmable logic device auxiliary, it completed the data storage and update, display refresh, animation, cycle display; and achieved communication through Ethernet and PC; the system supports text's and picture's display of full color LED screen which is separated in 256 grayscale, and a remote data transmission.

In the year 2012 G. Mallikarjun et.al published a paper on IOSR Journal of Electronics and Communication Engineering state that the paper introduces the system design and implementation of a true-color light emitting diode (LED) display system. The improvement of LED (Light Emitting Diode) technology, the LED display system for video has attracted public attention. True color is a method of representing and storing graphical image information in an RGB color space such that a very large number of colors, shades, and hues can be displayed in an image, such as in high quality photographic images or complex graphics. We used the STM32F207MicroController for controlling the LED display system as it has advantages of processing fast video frame. The Digital video is extracted and is

converted from video signal to the LED display signal by circuit implementation. The driving circuit receives LED display signals after conversion, and assigns them to LED pixel, and drive the LED screen to display in real time.

In the year 2011 Yongxian Song et.al published a paper on JCE that the paper introduces display design process about hardware and software based on AT89C52 single chip microcomputer. We use a simple external circuit to control the display screen, which size is 32 × 192. The display screen also can display the size of the six 32 × 32 dot matrix Chinese characters by a dynamic scan mode, and can be divided into two small display screen, which can display twenty-four Chinese characters whose size is 16×16. We can modify the code to change the content of the display, subtitles can achieve scrolling function and the scroll speed can be adjusted according to requirements, subtitles can also achieve pause function. The Chinese character code stored in external data memory, the capacity of data memory is expanded according to the requirements of Chinese characters we want to show. This display screen has advantages of small volume, few hardware and simple circuit structure.

III. PROBLEM IDENTIFICATION

LED Display controller is very important part of the LED TV Display unit. In previous work different control techniques are used to control the LED Display Unit (LDU). It needs to have high efficiency in term of mechanism and exchange of information like images and video between the controller and driver. From research, it has been discovered that previous studies shows that LED display controller hardware unit classified.

IV. EXISTING WORK

In previous work it is purposely a good LED display unit controller is needed to ensures that images and videos to be displayed onto the screen. The display controller needs to have high efficiency in term of mechanism and exchange of information like images and video between the controller and driver. From research, it has been discovered that previous studies shows that LED display controller can be classified to hardwire contol unit using Application-Specific Integrated Circuit and general purpose programmable processor using Microcontroller unit(MCU).

V. LIMITATION OF EXISTING WORK

- These types of controller can be very complex and expensive depending on the type of hardware control unit and controller system used. Design using hard wired system Application-Specific Integrated Circuit does solve the high efficiency demand. However when designing system using it there many setback that need to be considered.
- One of them is that hardware control unit usually has a fixed architecture and further improvement of the system are almost impossible as the chip that has been designed

can only perform at certain level of performance as specified before manufacture.

- Application-Specific Integrated Circuit is costly and can produce complexity in term of time synchronization among the chip.
- If the hardware control unit functioning in cascade mode that required data bandwidth overhead.

VI. PROPOSED METHODOLOGY

The main objective is to port the previous work of LED display system on ARM processor and Application-Specific Integrated Circuit to function on Nanotechnology. This is to make the system to become more compact and easy to be moved around. This implementation will also use low power consumption as compared to previous. The current available LED display controller hardware contol unit has many useful characteristic such serial input, this enable the use of less input/output pin of the FPGA. The current system LED display hardware control unit is also able to cascade with each other to obtain higher resolution. The proposed methodology of the project is to improve the design and fix the problem using nanotechnology.

VII. EXPECTED OUTCOME

The implementation of hardware control unit of LED TV display unit using nanotechnology by this we concluded that use of nanotechnology will reduce the size, power and increase the efficiency, speed of the hardware control unit of the LED TV Display system. This draws to conclusion that the system able to read data from SDRAM and the display it to the LED panel.

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