Design and Implemntation of Vga on FRC – FPGA using VHDL

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***Abstract*: In proposed system, introduce real time Full VGA display @ 60HZ Frame rate conversion implemented on FPGA technology. By using the Frame rate conversion a programming design and implement VGA Controller on FPGA, VHDL is used to describe and program the gates and counters in FPGA blocks in order to construct an internal logic circuit in FPGA. The main purpose of this project is to design and implement VGA Controller on FPGA at real time based frame rate conversion. The realized function of the movement and rotation of blocks, randomly generating next blocks. The successful transplant provides a template for the development of other visual control systems in the FPGA. It introduce real time Full VGA display @ 60HZ Frame rate conversion implemented on FPGA .**

Keywords : VGA ,FRC ,FPGA,VHDL

I.INTRODUCTION

VGA interface, as a standard interface has already been applications widely.VGA have to be working in a certain display mode anytime, and there are two kinds of these modes: character display mode and graphics display mode. A high-resolution and refreshing rate, we take the standard VGA graphics display mode .Field-Programmable Gate Arrays are digital integrated circuits that contain configurable blocks of logic along with configurable interconnects between these blocks. Specifically, an FPGA contains programmable logic components called logic elements and a hierarchy of reconfigurable interconnect that allows the less to be physically connected. The combinational functions, or merely simple logic gates like AND, XOR. In most FPGAS, the logic blocks also include memory elements, which may be simple flip-flops or more complete blocks of memory VGA is a video display standard. It provides a simple method to connect a system with a monitor for showing information or images[4]. As a standard display interface, VGA has been widely used. There is more and more need in displaying the result of the process in real time as the fast development of embedded system, especially the development of high speed image processing. Apart from that, display will be replacing paper for future.

Words of wisdom; seeing is believing and picture telling thousand words, display can give correct information about something. Display is used when people present something. Pictures or texts at display catch more attention than verbal voice when people are doing presentation. When people do that kind of presentation, there must be some device involved in control the display[2]. Verilog Hardware Description Language is a popular and standard hardware description language which is now extensively used by engineers and scientists on digital hardware designs. VHDL offers many useful features for digital hardware design, that is, VHDL is a general-purpose hardware description language that is easy to learn and easy to use. It is similar in syntax to the C programming language. VHDL allows different levels of abstraction to mix in the same model .Thus, a hardware model can be defined in terms of switches, gates, RTL, or behavioural code. Also, most popular logic synthesis tools support VHDL. This makes it the language of choice for designers' .The purpose of this project to design a VGA Controller using VHDL and implement it on FPGA. FRAME RATE UP CONVERSION refers the technique that produces higher frame video from the one with a lower frame rate through the process of generating new frames and inserting them into original video .FRC is essential for reducing the motion blur and film judder and it is very challenging work to implement the complete FRC system on FPGA with real –time .In this paper we describe a real time FPGA implementation of VGA @60 HZ FRC system [7].

II. FIELD-PROGRAMMABLE GATE ARRAYS

FPGAs are a semiconductor device containing programmable logic components called "logic blocks", and programmable interconnects. Logic blocks can be programmed to perform the function of basic logic gates such as AND, and XOR, or more complex combinational functions such as decoders or simple mathematical functions. FPGAs are also known as reconfigurable devices. These reconfigurable FPGAs are generally favored in prototype building because the device does not need to be thrown away every time a change is made. This allows one piece of hardware to perform several different functions. Of course, those functions cannot be performed at the same time. Besides that, FPGAs are standard parts, they are not designed for any particular function but are programmed by the customer for a particular purpose. FPGAs have compensating advantages, largely due to the fact that they are standard parts. There is no wait from completing the design to obtaining a working chip. The design can be programmed into the FPGA and tested immediately. Apart from that, FPGAs are excellent prototyping vehicles. When the FPGA is used in the final design, the jump from prototype to product is much smaller

and easier to negotiate. Also, the same FPGA can be used in several different designs, reducing inventory costs.

III. VGA CONTROLLER

Video Graphics Array is mostly used for computer monitors, with a high-definition resolution video standard. It has the ability the ability to transmit a sharp detailed image. VGA uses separate wires to transmit the three color component signals, vertical and horizontal synchronization signals. Red, green and blue are three signals that send color information to VGA monitor. There are four main components in VGA controller which are VGA interface signals, VGA interface definition, VGA control signal, VGA timing Control and VGA monitor.

IV.VERY HIGH SPEED INTEGRATED CIRCUIT HARDWARE HESCRIPTION LANGUAGE

VHSIC was a 1980s U.S. government program to develop Very-High-Speed Integrated Circuits. The United States Department of Defense launched the VHSIC project in 1980 as a joint tri-service (Army/Navy/Air Force) project. The project led to advances in integrated circuit materials, lithography, packaging, testing, and algorithms, and created numerous computer-aided design tools. A well-known part of the project's contribution is the VHDL hardware-design language. The program also redirected the military's interest in GaAs ICs back toward the commercial mainstream of CMOS circuits. VHDL is commonly used as a design-entry language for field-programmable gate arrays and application-specific integrated circuits in electronic design automation of digital circuits

V. FRAME RATE CONVERSION

Many surveillance and monitoring videos are captured using static cameras with relatively low frame rate .the low frame rate of the videos is economics both in term of the monitoring equipment and storage requirement .other factor may influence the necessity of keeping a low frame rate ,such as limited transmission bandwidth for a remote surveillance solution .storage space may be an issue for remote surveillance solution storage space may be an issue for high definition resolution video capture however this poses a challenge in terms for the manual inspection of such video feeds ,since low frame rate videos frequently consist of non smooth motion are facts .This can lead to increased strain for the viewer. Therefore a key challenge toward improving the user experience lies in successfully obtaining a smoother video by increasing the frame rate viewer. Therefore a key challenge toward improving the user experience lies in successfully obtaining a smoother video by increasing the frame rate.

VI. METHODOLOGY

In this project the most required things will be VGA, FRC, FPGA.VGA stands for “Video Graphics Array”. It is the standard monitor or display interface used in most PCs. Therefore, if a monitor is VGA-compatible, it should work with most new computers. The VGA standard was originally developed by IBM in 1987 and allowed for a display resolution of 640x480 pixels. The VGA supports both All Points Addressable graphics modes, and alphanumeric text modes. There are two kinds of VGA interface signals to display. One is data signal, and the other one is control signal. There are three data signals red, green and blue and two control signals horizontal synchronization and vertical synchronization signals. There are different frequencies the horizontal synchronization signal and vertical synchronization signal for the changeable output resolution .Thus, if someone wants to implement any application on any higher graphics arrays, the try could be given on the VGA first. So, we did the same thing by implementing the application on the VGA. Now, if we talk of FPGA then we us FPGA of SpartanE3 family. For this we used Xilinx software in which you can specify your design by three ways i.e. schematic entry, very high speed integrated circuit hardware description language .In our case we have used the, to specify the design. It is possible to make use of even both the HDL languages together. Also, it is possible to implement the required application by just using the HDL languages but then this will make your code very lengthy and will also increase the complexity. Due to which it will reduce the easiness to understand the code and it will also put burden of the memory associated with the FPGA. Now, we know that the memories associated with the FPGA will have sufficient memory space for small information’s like limited number of characters and some image requiring very small memory to be displayed on screen, but would be insufficient to display an animated characters or images. For this kind of situation we will require some additional processor that can reduce the length of code and other information while developing some real-time applications.

VII.RESULTS AND CONCLUSION

A. VGA TIMING COMPONENT

After implementing the VGA Timing Component to the FPGA, the designed output, the puzzles, was seen on the screen as following Fig 1

At first, there are 640 pixels in one line. The result on the screen cannot fill the entire screen. It is normal that every screen requires different number of pixels to be displayed in one line. So the design should be modified as required. After changing the code, the system manages to output 648 pixels in one line and the result seems good enough for this part. The VGA Timing Component is the basis of this project. It can be used to do a lot of things. It can help provide the timing for all the 8 color pictures on the VGA screen. Normally, this component does not need to change to meet the requirement of other component in the project because it talks to the screen directly.

B.THE FINAL SYSTEM RESULT

The final system is run on the ISIM simulator by using Xilinx ISE tool. I designed a VIDEO GAME in VGA monitor by using SPARTAN 3E FPGA kit . The Simulation output of the corresponding design is completed successfully

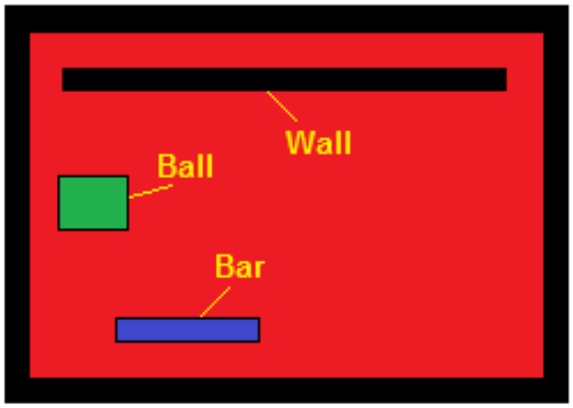

Fig 1 Output Image

C. CONCLUSION

Field programmable gate array is great invention to be used in developing in a VGA controller by using VHDL on FPGA. In this paper , the proposed system is to designed for the video game in FPGA on chip memory by the help of predefined image and to write a VGA controller program in VHDL and implement it on SPARTAN 3E FPGA KIT.

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