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REVIEW ARTICLE

Review of Digital System Access Remotely for FPGA Lab

Miss.Anjali S.Wasu , Prof. Kulkarni V.S,

1. PG Student ,Electronics & Telecomunication Department SKNCOE, Vadgaon Bk. Pune, India

2. Asst. Professor ,Electronics & Telecomunication Department SKNCOE, Vadgaon Bk. Pune, India

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Corresponding Author

Miss.Anjali S.Wasu

Abstract

This paper presents an innovative technique which provides the user a virtual platform via Internet where he can access laboratory equipments and hardware appliances which is the part of Digital System Lab environment [1].

It consists of a PLD/FPGA Board interfaced with a PC via customized hardware; this is called an e-Lab. The custom hardware uses low cost data acquisition components. A Graphical User Interface (GUI) has been designed for communication between the local PC terminal and the remote e-Lab system. This allows the user to take over the entire control of the system. GUI that is used to interface with the PLD/FPGA development board via custom control data acquisition hardware. It interfaces with the hardware, takes measurements and controls hardware, and it analyses data Students at the local PC can access the Lab PC via internet using Microsoft's 'Remote Desktop Connection' facility. The student will access the lab PC "virtually" using Microsoft Remote Desktop Connection as if he were sitting in front of the PC and is able to perform file transfers. The prototype uses a Web Cam to provide a view of the FPGA system operation for the remote users.[1][2]

INTRODUCTION

In engineering education, to introduce the FPGA e-lab system in both its construction and its importance is the basic objective of this paper. To allow the Lerner to have access to experiments with less restriction on time and location, Remote lab provide remote access to experiments. Remote experimentation facilities enhance the development of skills in the use of real system and instrumentation and it is necessary for the student to have learned laboratory content information equally from both type of lab, hand-on as well remote lab. To conduct the live experiments from any location, obtaining time saving and reduction of cost as there is no need of transportation of any instruments (FPGA/PLD).For the courses related to digital system low cost remote laboratory is describe in this paper [3].

It offers relax a time constraint which is a cost effective way of opening a Laboratory for 24 hours for students locally in a Laboratory. Also, It enhances sharing of knowledge, expertise and experience. In the majority of existing solutions, remote users can change system parameters, execute experiments, observe results in text or graphical view, and download the experimental results. In addition to these capabilities, some remote laboratories also include a booking system, which helps the remote users to organize their time and activities. An experimental unit, called e-Lab, is prototyped and tested for variety of design examples. It ensures the remote student's about correctness of the system operation and enhances confidence through the visual access of the experimental result.[1][2]

II.PRAPOSED METHODOLOGY

For effective use by student the FPGA e-lab system consist of hardware and "Laboratory Protocol". In this project the student normally has to perform some stages:

- Project Description
- Design entry through schematic capture or Hardware Description Language
- Functional simulation of the design.
- Design synthesis.
- Design implementation, and post place and route simulation.
- FPGA hardware reconfiguration
- Design verified: testing and debugging.[1][2]

Stages 1 to 5 do not require hardware access, for that software tools are available online freely from Xilinx and other vendors. So student can perform this 5 stages before entering FPGA e lab. For stages 6 and 7 student have to access the FPGA e-lab environment to program the FPGA development board, to verify their designs, modification if needed and for retest. Fig 1 shows the graphical diagram of the system. The system composed of lab PC that can be remotely accessed using 'Windows Remote Desktop'; a Matlab GUI and Microcontroller for data acquisition hardware, FPGA development board, webcam and custom control hardware.

This system is remotely access instrument and user friendly. Fig 3 shows the graphical overview of the system. The student will fully access the lab PC with the help of Windows Remote Desktop which contains the no of components. The data acquisition hardware (AT mega 16-Atmel) and Matlab GUI have been developed to establish an interfacing between computer and FPGA board. Via the Matlab GUI the ON/OFF power, general purpose pull/push button switches on the starter kit can be controlled. The webcam gives the view of FPGA board by remote side. . It also includes cell phone and via headset it is connected to the system. Call is to be made to active the cellular phone unit and as the call is answered, in response the two digit password would be entered by the user to access the system to control devices, then DTMF decoded by the dedicated decoder MT- 8870. As the caller press the specific password, it results in turning ON and OFF the FPGA kit and PC .

This gives the confidence to student that GUI responses the system is true. Visual access of the LCD display of the FPGA board can also be given by the webcam.

III RESULT AND DISCUSSION

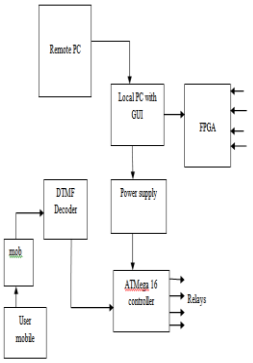

Figure.3: Graphical diagram of proposed system.

Fig 2:Spartan kit

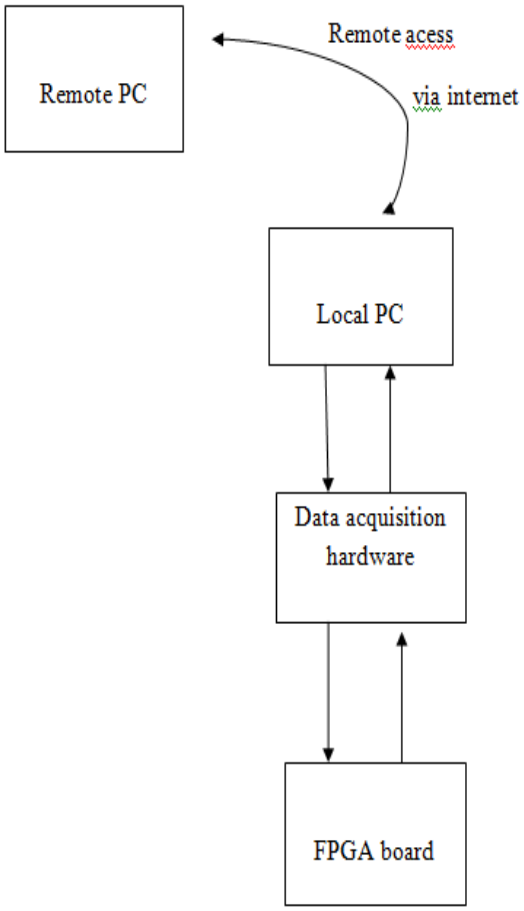

Figure 1: Fundamental Block Diagram of the PLD/FPGA e-Lab

This section includes simulation, implementation process and result of different experiments. To verify the design process some of the experiments were tested.

Design and implementation of OR gate:

a) RTL VIEW :Figure 4shows RTL schematic of OR gate
b) GUI Schematic: Figure 5 shows Graphic User Interfacing Schematic Using MATLAB for operation of switches.

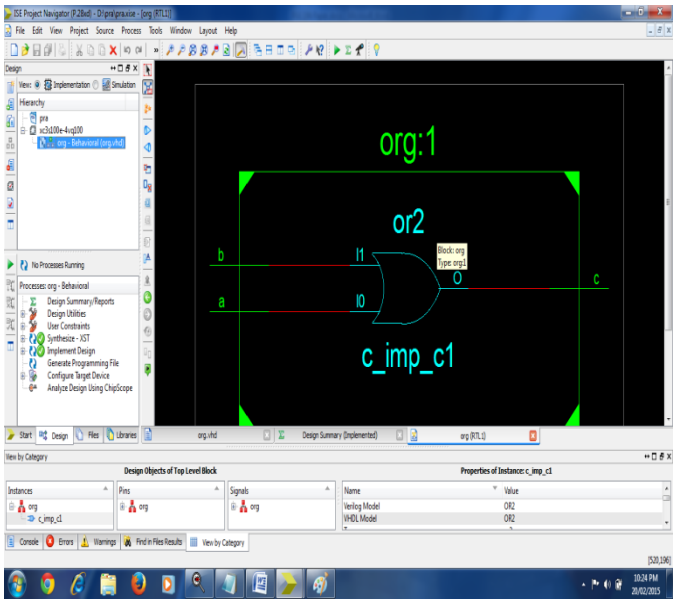

Figure 4: RTL schematic

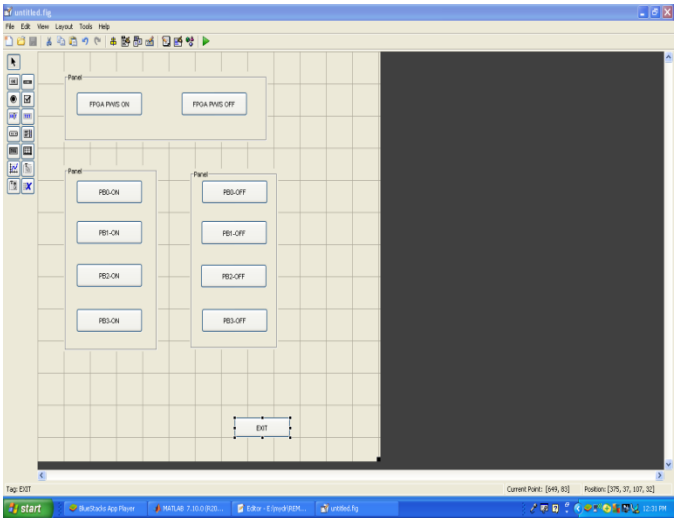

Figure 5: GUI Schematic Using MATLAB

IV CONCLUSION AND FUTURE SCOPE

A remote e-lab is in the demand now days. The research work in this paper presented a low cost remote e-laboratory. It can be used for any course related to digital circuits and systems. Locally developed hardware and software used for the system which makes it low cost. The system has been extensively tested from different locations. Our future objective is to be able to bring several educational institutions together for collaboration. We can then create a Remote Access Laboratory (RAL) network that the institutions can shared their laboratories and facilities. Further impact of the method is that the collaboration and joint efforts could get to a level to outreach to disadvantaged institutions where the students wouldn't normally have access to quality lab equipment.

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