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Efficient Automatic Food Ordering System using FPGA and ZigBee

Anshul Kothari, Priyanka Sharma

Department of Electronics & Communication Engineering, SKIT, M & G, Jaipur, India
Email: priyanka.vlsi@gmail.com

Abstract*— *This paper presents a new concept of automatic food ordering system using low power FPGA board. Proposed design contains one transmitter section and one receiver section. At the transmitter section, menu of food items is listed on the touch screen module located on the customer table. It is driven by Nexsys4 DDR FPGA board along with Zigbee module and keypad. A display module interfaced with another FPGA board and Zigbee receiver module is housed on the top of table of supervisor of the restaurant. To improve signal to noise ratio, we have used wireless system. Increasing need of reducing human efforts in this era and low power constraint in designing were the motivational challenges behind this proposed design.

Keywords*— *FPGA, Zigbee, wireless, low power, touch screen, Nexsys4 DDR.

I. INTRODUCTION

In almost all restaurants, we order food using its menu card in which all the available items are listed. There are many techniques of automatic food ordering system such as waiter paging system, touch screen ordering system, touch pad projection system and interactive user interface system [1].Another approach was to use android technology and wireless user interface to order the food [2].Recently, IOT based automatic food ordering system was designed [3].In this technique, all items are displayed on mobile screen through application and RFID module is used to order the food. In this paper, we have used FSM models to develop an application using EDA tools. The algorithm has been prepared keeping in mind the authenticity of concerned order. Every customer is required to enter three bit binary code using FPGA board to place respective order.

Proposed algorithm has been implemented using Xilinx Vivado 2017.4 tool. It is simulated, elaborated, synthesized and implemented using this tool. Thereafter, hardware implementation would be accomplished by generating the bit stream to program the FPGA board (Nexsys 4 DDR). The suggested design has critical path delay of 4.563ns and maximum clock frequency of 415MHz.It will save time & human efforts because it is automatic rather than manual.

BASIC PRINCIPAL OF OPERATION

In proposed design, we have used FPGA board (Nexsys 4 DDR) to automate the ordering system. The idea behind this design is that there is a touch screen panel on the top of the customer table. On the screen, there are eight items listed with corresponding serial numbers. These serial numbers are modeled with the help of this flow of processes, output is selected corresponding to various input combinations (which are referred as different food items listed in a sequence on the top of customer table. After synthesizing this VHDL code prepared using the above algorithm, we have implemented the design and RTL design is achieved as given below in figure 1.

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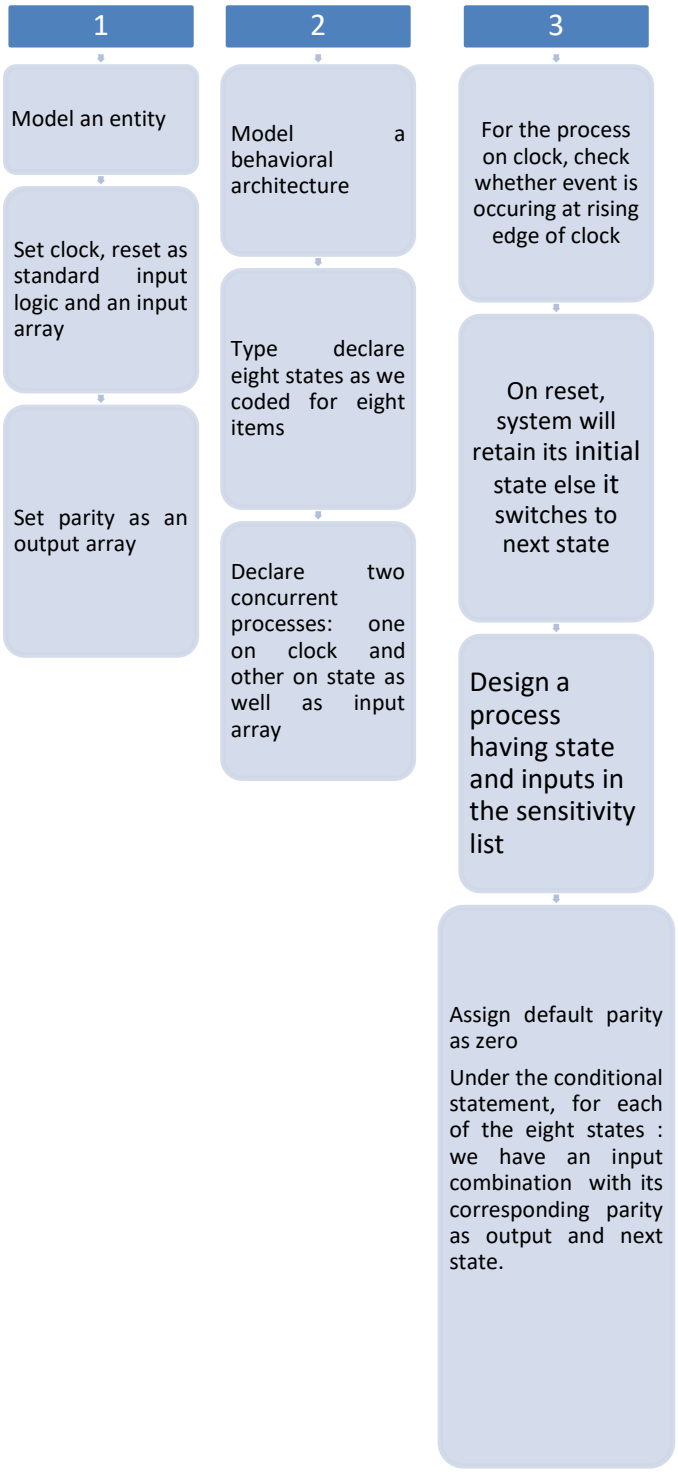
II. METHODOLOGY



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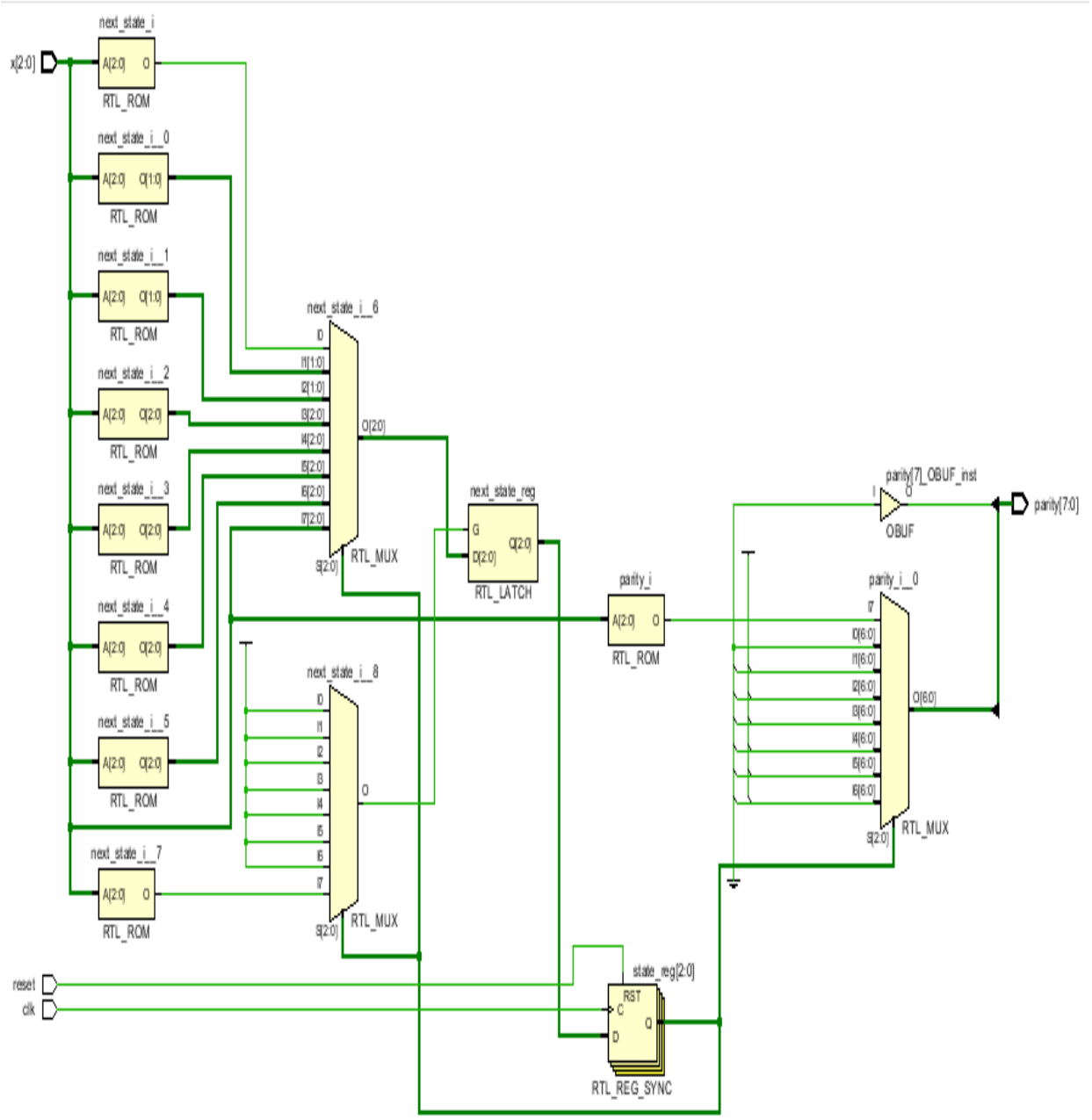

Fig 1: RTL Design of FPGA based interface

III. ANALYSIS OF PROPOSED CIRCUIT

We have analyzed the circuit for the given points:

1. Total On-chip Power: 0.144W

2. Thermal Margin: 59.3°C (12.9W)

3. Confidence Level: High

Table 1: Power utilization by various modules during run time

Modules	Utilization (%)
LUT	1
FF	1
IO	6
BUFG	3

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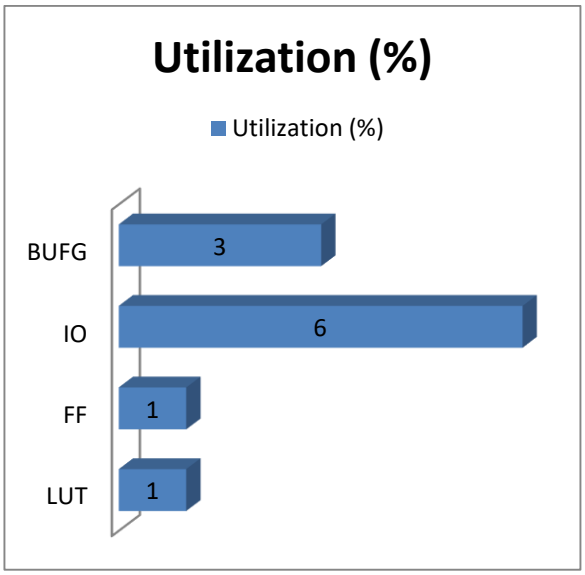

Fig 2: Bar graph showing utilization of power

In this project, we will mount a touch screen on the top of customer table and in that screen; all the available food items are displayed.

This screen is interfaced with the FPGA board and zigbee module. We get output from FPGA output pin and at this pin zigbee module is connected. With the help of this zigbee module, signal corresponding to the user input is received at receiver module (where zigbee end point is connected). This enables the controller connected at supervisor end to display the food item that customer has ordered. Hence, manual work of waiter is replaced using automation technology. In this technology, main innovative element is FPGA board usage, which helped us in programming ease.

This technology will prove very useful for VLSI developers to enhance their scope of programming for solving more social problems in this context.

IV. CONCLUSION AND FUTURE WORK

Our proposed work uses FSM model to program the FPGA. If we further add image processing through FPGA board to get the orders with more authenticity. To proceed in this direction, we will add camera with FPGA board. This work will be accomplished by high level synthesis using vivado HLS.

REFERENCES

[1] YongChai Tan, KienLoong Lee, ZhiChao Khor, KaeVin Goh, KhimLeng Tan and BentFei Lew, "Automated Food Ordering System with Interactive User Interface approach," 2010 IEEE Conference on Robotics, Automation and Mechatronics, Singapore, 2010, pp. 482-485.

[2] Patel Krishna M., Patel Palak P. , Raj Nirali R., Patel Lalit A, "Automated Food Ordering System", Recent trends in Electrical and Electronics & Communication Engineering (RTEECE 17th – 18th April 2015),International Journal of Engineering Research and Development (IJERD) ISSN: 2278-067X.

[3] Meghana Nandre, Divya Patil, Kalyani Patil, J.R. Suryvanshi, "IOT based Restaurant Automation System", International Journal for Research in Applied Science & Engineering Technology (IJRASET), ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887, Volume 6 Issue X, Oct 2018.

[4] Priyanka Sharma et al ."High Performance Sense Amplifier based Flip Flop Design using GDI Technique". International Journal of Advanced Engineering, Management and Science(ISSN: 2454-1311),vol 3, no. 4, 2017, pp.350-354 Infogain Publication, doi:10.24001/ijaems.3.4.11

[5] Priyanka Sharma et al ."Design of High Performance and Energy Efficient Explicit Pulsed Sense Amplifier Based Flip-Flop". International Journal of Advanced Engineering,

[6] Research and Science (ISSN: 2349-6495(P) | 2456-1908(O)), [Vol-4, Issue-4, Apr- 2017] pp.: 159-164, https://dx.doi.org/10.22161/ijaers.4.4.22

[7] Varsha Chavan, Priya Jadhav,Snehal Korade,Priyanka Teli, "Implementing Customizable Online Food Ordering System Using Web Based Application", International Journal of Innovative Science, Engineering Technology(IJISET) 2015.

[8] Mayur D. Jakhete, Piyush C. Mankar," Implementation of Smart Restaurant with e-menu Card," International Journal of Computer Applications 2015 of Smart Restaurant with e-menu Card, "International Journal of Computer Applications 2015

[9] Kirti Bhandge, Tejas Shinde, Dheeraj Ingale, Neeraj Solanki, Reshma Totare,"A Proposed System for Touchpad Based Food Ordering System Using Android Application", International Journal of Advanced Research in Computer Science Technology (IJARCST 2015).

[10] Resham Shinde, Priyanka Thakare, Neha Dhomne, Sushmita Sarkar, "Design and Implementation of Digital dining in Restaurants using Android", International Journal of Advance Research in Computer Science and Management Studies 2014.

[11] Ashutosh Bhargave, Niranjan Jadhav, Apurva Joshi, Prachi Oke, S. R Lahane,"Digital Ordering System for Restaurant Using Android", International Journal of Scientific and Research Publications 2013.