Lab 4: ROM-based GameAccess Control on FPGA User Manual

ECE 5440

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1 System description

The system utilizes eight toggle switches, six seven segment displays,four buttons, and four LEDs to allow for an FPGA based mental binary math game. The two leftmost seven segment displays display the time remaining in the game once the timer runs out. The two middle seven segment displays display the sum of the player's number and the random number generator's number when the game is being played. At the end of the game, the two middle seven segment displays display the score. The second rightmost seven segment display displays the random number generator's number, while the rightmost seven segment display displays the player's inputted number. In addition, there are four status LEDS. The two leftmost LEDs on the board light up depending on if the sum equals F in hexadecimal. If the sum equals F in hexadecimal, the LED second from the left lights up. Otherwise, the leftmost LED lights up. The two rightmost LEDs on the board change depending on if the players are logged in or out. If the players are logged in, the LED second from the right will light up. If the players are logged out, the rightmost LED will light up.

To play the FPGA based mental binary math game, the player first needs to log in by entering the password 5097. To enter in the password, use the password toggle swiches to enter each digit. To save each digit, hit the password button after inputting each digit. After inputting all four digits properly, the logged in LED will light up. After logging in, the player hits the password button again to start the game. The timer will then count down from 99 seconds. The player then hits the random number generation button to load in a random number. Next the player tries to guess the binary number that when added to the random number generator's number, equals F in hexadecimal and hits the player load button after inputting the number. The numbers the random number generator produced, the player inputted, and the sum of the two players numbers are outputted. If the sum of the two players numbers equals F in hexadecimal, the matching LED lights up. Otherwise, the non-matching LED lights up. If the matching LED lights up, the player scores a point. The score is recorded manually. At the end of the game, the score of the player will be displayed. To start a new round, press the password button. The player can log out at the end of the game by pressing the player load button. The player can also reset their password by pressing the random number generation button at this time. To reset the password, press the random number generation button once. Then, enter the first password digit on the password slide switches and hit the password button. Repeat the process of entering in the password digits on the slide switches and hitting the password button for the next three digits to reset the password.

2 Board picture

Figure 1 below shows an image of the FPGA board along with the switches and displays used:

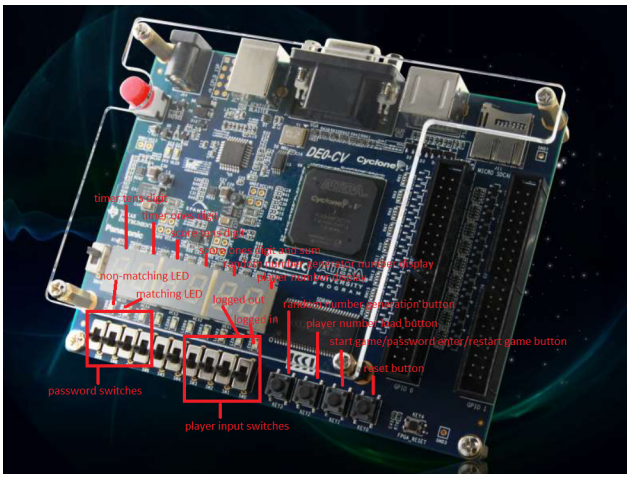

Figure 1: FPGA board picture

3 How to play a successful round

To play a successful round, have the player log in using the password 5097 as described in the system description section above and the log in section below. Then, have the player hit the random number generator button to display a random number on the random number generator seven segment display. Then, let the player input a number using their toggle switches and hit their load button. The player should input a number such that when added to the random number generator's number, the sum equals F in hexadecimal. When the sum seven segment display shows F, the round is successful. In that case the automatic scoring system will give the player a point.

4 How to play an unsuccessful round

To play an unsuccessful round, have the player log in using the password 5097 as described in the system description section above and the log in section below. Then, have the player hit the random number generator button to display a random number on the random number generator seven segment display. Then, let the player input a number using their toggle switches and hit their load button. The player should input a number such that when added to the random number generator's number, the sum does not equal F in hexadecimal. When the sum seven segment display does not show F, the round is unsuccessful. In that case the automatic scoring system will not give the player a point.

5 How to log in

To log in, the player needs to input the password 5097 using the password toggle switches. To input the password, input each digit individually and press the password button after entering the digit. This will load the digit into thr FPGA. The player may then proceed to enter the other digits in the same way. After entering in all four digits correctly, the player will be logged in.

6 How to log out

To log out, the player needs to press the player one load button after ending a game. The player will then be logged out.

7 How to reset the password

To reset the password, press the random number generation button once after ending the game. Then, enter the first password digit on the password slide switches and hit the password button. Repeat the process of entering in the password digits on the slide switches and hitting the password button for the next three digits to reset the password.