

**CS223**

**CELLULAR AUTOMATA**

**SECTION-6**

**ELİF ÖZER**

**21602495**

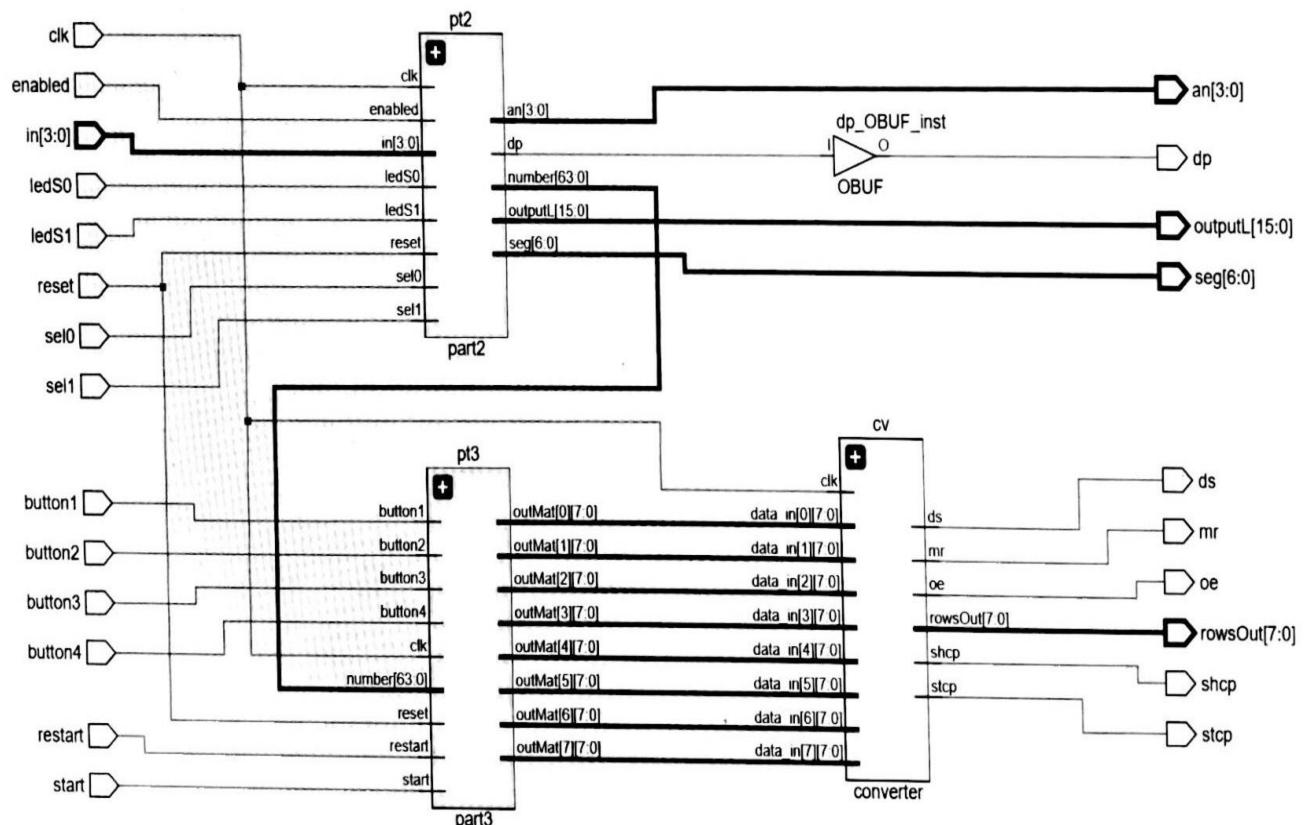
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## Introduction

This project is a game that uses 4 buttons to change the leds on the beti-board 8x8 LED matrix output. Leds on the 8x8 LED matrix output is provided by the number which is output of the part2. When user start the game, leds will be on depending on the Bilkent University student ID.

I was unable to implement the score output on the 7 segment. In addition, I was unable to blink the score since I could not take the score.

## Block Diagram



## **Detailed Description:**

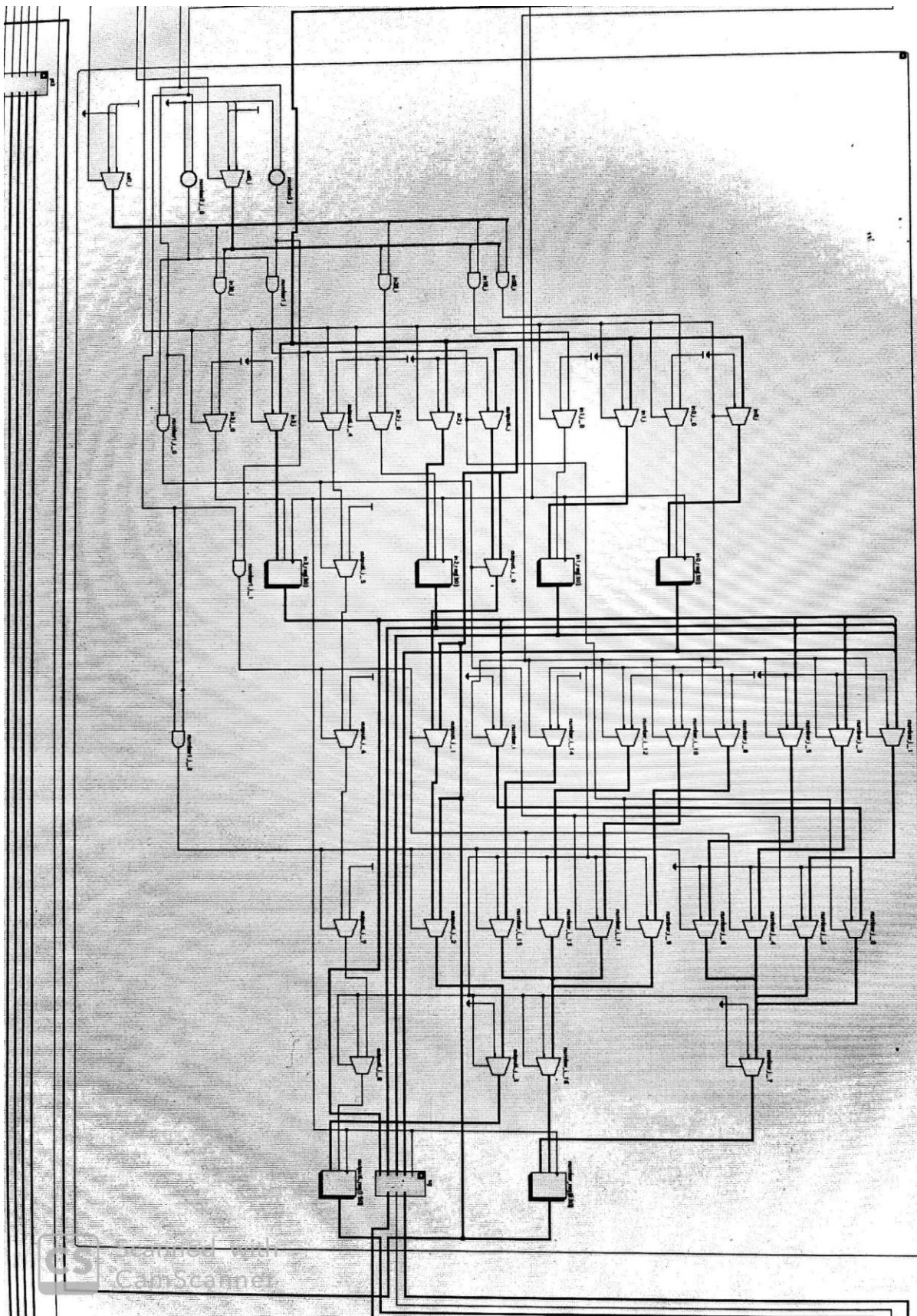
### **Part1 and Part2:**

I implement part1 of the project which uses 4 switches to get the inputs from 0 to 15( in HEX digit form) in the part2 instead of writing 2 different modules. Thus, I write codes that implements part1 in my part2 module.

As part1 required, I use 4 switches to take inputs from the user. User will determine the value by arranging these 4 switches.

In the part2 module, I wrote a module that stores value 0 to  $2^{64}-1$ , and I integrated part1 in this module and I have taken the values from 7 segment modules four times In order to show the 64bits value in the seven segment, I have used 2 switches that are sel1 and sel0. sel1 and sel0 determines where the value is shown in the 7 segment. I showed stored values on the leds by using 2 switches that are ledS1 and ledS0 which determine where leds will be ON in the FPGA.

To start the game, I used a switch in the FPGA that is “start”.



**Part3:**

To implement the game, I draw a FSM to determine the states. When user turn on the switch that is used for start, game will start and leds will be “ON” on the beti-board 8x8 LED matrix according to output of part2.

Game will depend on the rules that is coming from the Bilkent Student ID. I have 8 rules and I control these rules with the buttons. I have 4 buttons: button1,button2, button3 and button4 controlling 2'b00, 2'b01, 2'b10 and 2'b11 respectively. Buttons are acted as a state that changes the leds on the matrix according to rules and controlled numbers.

Part3 has a output names “outMat” which is the input of converter module that display leds of “outMat” on the beti-board 8x8 LED matrix. OutMat will changes the leds according to rules determined in the states.

### **Converter Module:**

Converter module converts our data into the 8x8 LED matrix on the beti-board.

This module takes the outMat output of the part2 module as an input and convert it to the matrix. Since converter module is provided to us, it is like a black box as it is seen in the design.

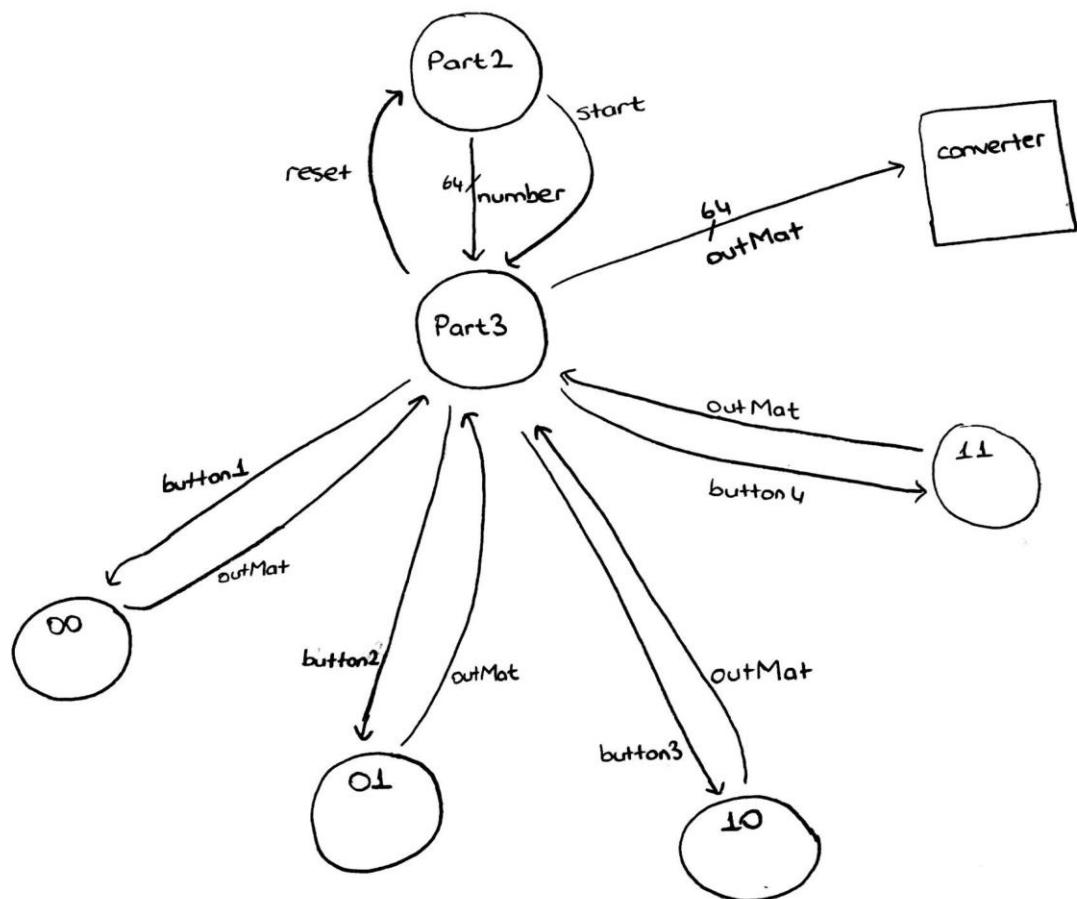
### **gameTop Module**

GameTop module puts all modules together which enables playing game. It takes other modules’ inputs and outputs as parameter. This module calls part2, part3 and converter modules. In short, this module just piece together of the project’s parts .

### **SevSeg\_4digit**

This module is provided to us to show values on the seven segment at Basys.

### **FSM for the project**



I was unable to implement the display score part because I could not increment the score on the seven segment at FPGA. Although I have tried to test my design by writing testbench for debugging, I could not find what I miss in this part. Since I could not implement displaying score on the FPGA, I was also enable blinking the result ont FPGA.

## Conclusion:

To play this game I have used 5 modules that are part2,part3, converter, SevSeg\_4digit and gameTop.

Although it is not necessary, I did not implement part1 in different module.I have integrated it in the part2 module.

In part2 module, I put the values into 7 segment module by using switches and I have saved values to the 7 segment into memory and I showed it on LEDs on Basys board.

In part3, I implemented this game with a logic by using SevSeg\_4digit and converter module.

## References and Appendix

I have used the elaborated design of the vivado as a reference. I found my mistakes by tracing the design and I have reached my final design of the project.

