Hw2

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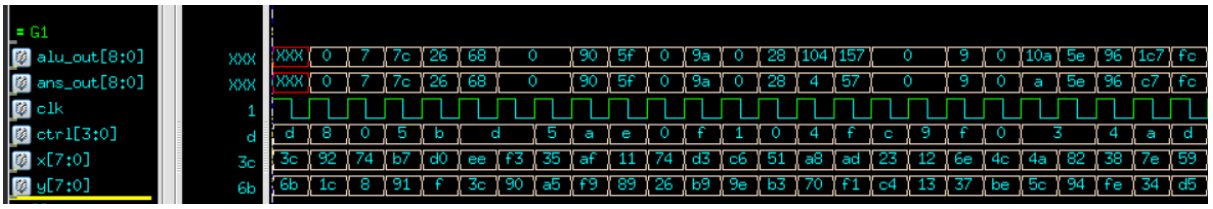
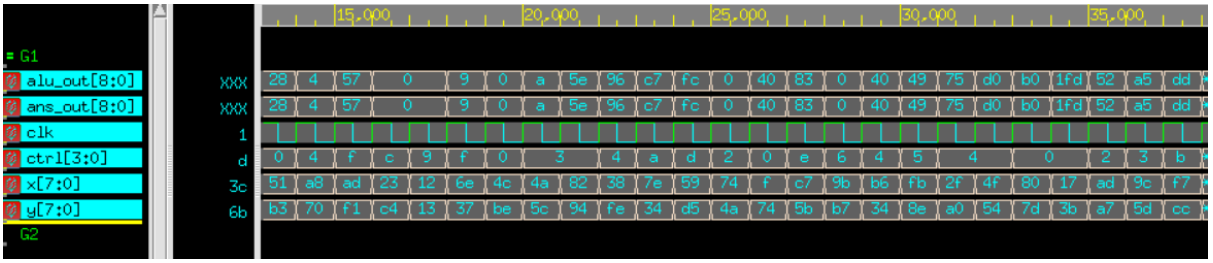
1 - ALU

alu_assign waveform:



alu_always waveform:

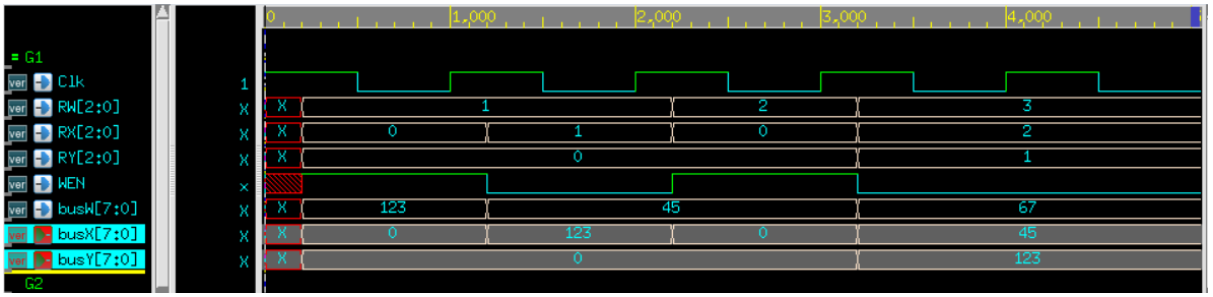


verify:

I write a python program to simulate the behavior of ALU. Then random generate 64 sets of data as in.pattern and calculate the corresponding answer to check my alu_assign and alu_always design.

2 - Register File

waveform:



verify:

I assign some values in tb as below and check by human evaluation.

```
#(`CYCLE*0.2)
busW = 8'd123;  WEN = 1'b1;  RW = 3'd1;  RX = 3'd0; RY  = 3'd0;
#(`CYCLE*0.8)
#(`CYCLE*0.2)
busW = 8'd45;  WEN = 1'b0;  RW = 3'd1;  RX = 3'd1;  RY = 3'd0;
#(`CYCLE*0.3)
if( busX == 123 && busY == 0) $display( "    .... passed." );
else begin
    $display( "    .... failed");
end
#(`HCYCLE)

#(`CYCLE*0.2)
busW = 8'd45;  WEN = 1'b1;  RW = 3'd2;  RX = 3'd0;  RY = 3'd0;
#(`CYCLE*0.8)
#(`CYCLE*0.2)
busW = 8'd67;  WEN = 1'b0;  RW = 3'd3;  RX = 3'd2;  RY = 3'd1;
#(`CYCLE*0.3)
if( busY == 123 && busX == 45) $display( "    .... passed." );
else begin
    $display( "    .... failed");
end
#(`HCYCLE)
```

3 - Found

I found that the verification part is very hard to guarantee the correctness. For the ALU, I verified the design via another python program. In the beginning, I found some error, and I didn't know if there was a bug in my Python program or in my design.

Since the function of the register file is pretty simple, I just checked the output for a few input cases. But when the design becomes more complicated, I think it is really hard to check all the possible cases and we need to find some good verification technique!