Computer Organization HomeWork

2017-3-19

Register File

main.v

```
module registerfile(
    Q1,Q2.DI,clk,reset written,AD,A1,A2
);
    output [31:0] Q1,Q2;
    input [31:0] DI;
    input clk,reset,written;
    input [4:0] AD,A1,A2;
    wire [31:0] decoderout,regen;
    wire [31:0] q[31:0];

    decoder dec_0(decoderout,AD);
    assign regen[0] = decoderout[0]& written;
    assign regen[1] = decoderout[1]& written;
    //
    assign regen[31] = decoderout[31]& written;

    regesiter reg_0(q[0],DI,clk,reset,regen[0]);
```

```
    regesiter reg_1(q[1],DI,clk,reset,regen[1]);
    //
    regesiter reg_31(q[31],DI,clk,reset,regen[31]);

    mux_32 mux_1(Q1,q,A1);
    mux_32 mux_2(Q2,q,A2);
endmodule

module dff(q,data,clk,reset,en)
    output q;
    input data,clk,reset,en;
    reg q;

    always@(posedge clk)
        begin
            if(reset)       q<=0;
            else        if(en)  q<=data;
            else    q<=q;
        end
endmodule

module register(
    q,data,clk,reset,en
);
    output [31:0] q;
    input [31:0]data;
    input clk,reset,en;
```

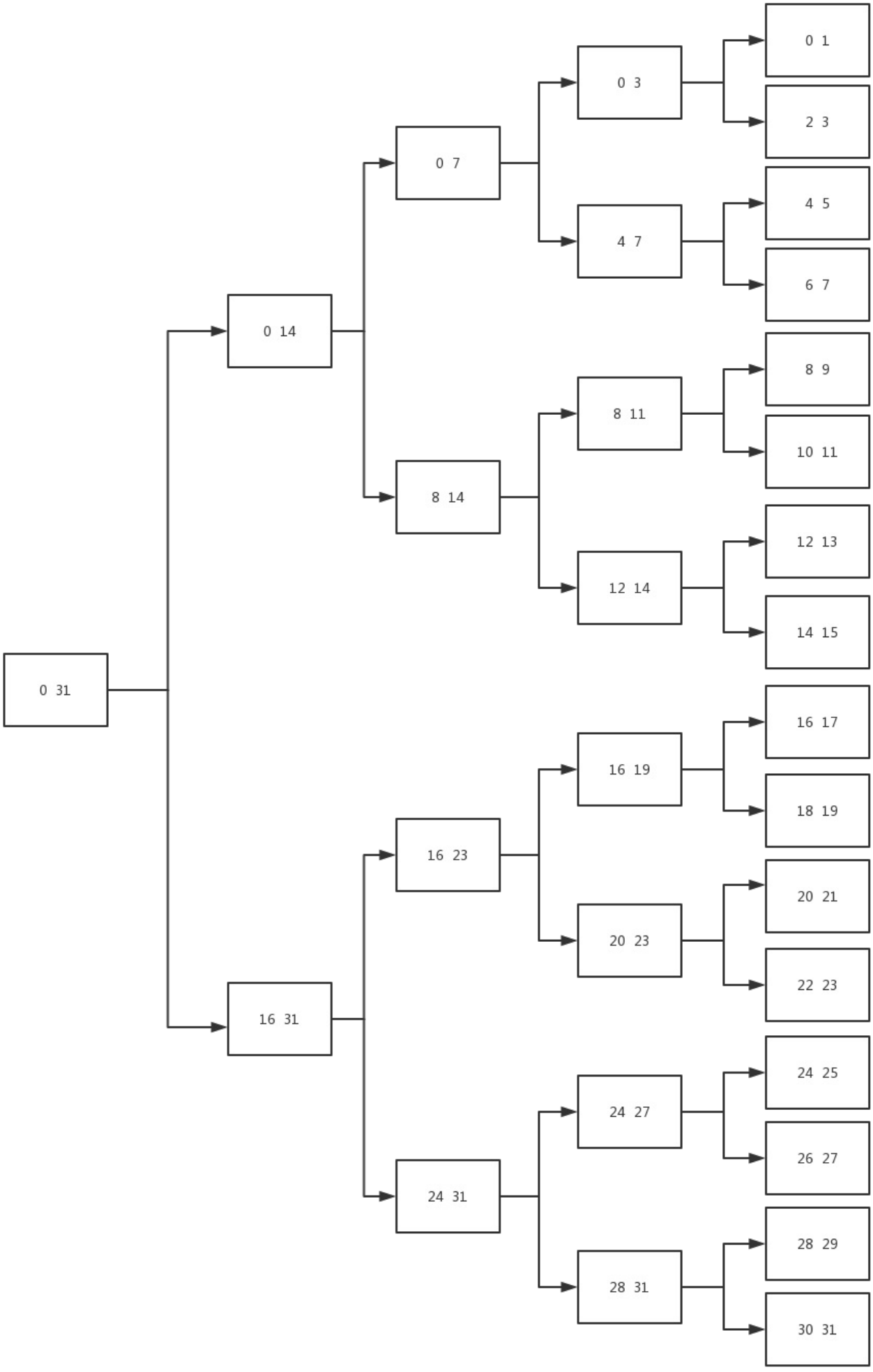
```
    dff u_0(q[0],data[0],clk,reset,en);
    dff u_1(q[1],data[1],clk,reset,en);
    //
    dff u_31(q[31],data[31],clk,reset,en);
endmodule

module mux_32(
    output reg [31:0]q;
    input [31:0]q[31:0];
    input [4:0]raddr;
);
    always@(raddr or q[31:0])
        case(raddr)
            5'd0:   q<=q[0];
            5'd1:   q<=q[1];
            //
            5'd31:  q<=q[31];
            default: q<= X;
        endcase
endmodule

module decoder(
    decoderout,waddr
);
    output[31:0]decoderout;
    input[4:0] waddr;
    reg [31:0]decoderout;
```

```
    always@(wadder)
        case(wadder)
            5'd0:   decoderout<=32'b0000_00000_0000_0000_
0000_0000_0000_0001;
            5'd1:   decoderout<=32'b0000_00000_0000_0000_
0000_0000_0000_0010;
            //
            5'd31:  decoderout<=32'b1000_00000_0000_0000_
0000_0000_0000_0000;
            default:  decoderout<= 32'bxxxx_xxxx_xxxx_xxx
x_xxxx_xxxx_xxxx_xxxx;
        endcase
endmodule
```

32-4g Decoder


0 31
0 14
16 31
0 7
8 14
16 23
24 31
0 3
4 7
8 11
12 14
16 19
20 23
24 27
28 31
0 1
2 3
4 5
6 7
8 9
10 11
12 13
14 15
16 17
18 19
20 21
22 23
24 25
26 27
28 29
30 31

BigNumMult

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

#define N 100

// char[] To int[]
void getdigits(int *a, char *s) {
  int i;
  char digit;
  int len = strlen(s);

  // init Arr
  for (i = 0; i < N; ++i) *(a + i) = 0;
  for (i = 0; i < len; ++i) {
    digit = *(s + i);
    // back to first
    *(a + len - 1 - i) = digit - '0';
  }
}

// a mult b to c
void multiply(int *a, int *b, int *c) {
  int i, j;
  for (i = 0; i < 2 * N; ++i) *(c + i) = 0;
```

```
  for (i = 0; i < N; ++i)
    for (j = 0; j < N; ++j) *(c + i + j) += *(a + i) * *(
b + j);
  for (i = 0; i < 2 * N - 1; ++i) {
    *(c + i + 1) += *(c + i) / 10;
    *(c + i) = *(c + i) % 10;
  }
}

int main() {
  int a[N], b[N], c[2 * N];
  char s1[N], s2[N];
  int j = 2 * N - 1;
  int i;

  printf("Input the first number:");
  scanf("%s", s1);
  printf("/nInput the second number:");
  scanf("%s", s2);

  getdigits(a, s1);
  getdigits(b, s2);

  multiply(a, b, c);

  while (c[j] == 0) j--;
  for (i = j; i >= 0; --i) printf("%d", c[i]);
```

```
    printf("/n");
    return 0;
}
```