Design of voice-activated snake game based on FPGA

Li Jinjie， Lei Tongtong， Zhao Qian

Contents

01

FUNCTION

An overall understanding

Functions

Why do this ?

- high parallelism, high speed
- shorten the game development cycle
- somatosensory game (体感)

a somatosensory control game based on FPGA

Functions

Input circuit

- Keyboard
- Voice

The rules of the Snake game

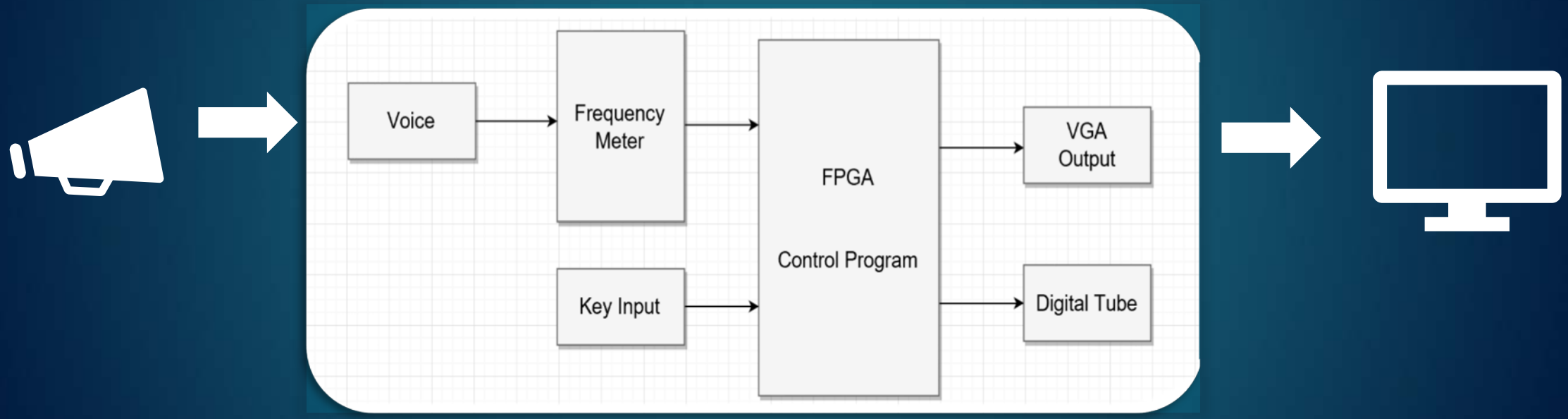
- Eat a mouse, the snake will grow longer
- Next mouse appears
- Bite itself or hit the wall, FAIL
- Up to 10 points

Display through VGA port

- External display is connected to VGA
- Different items, different colours

Functions

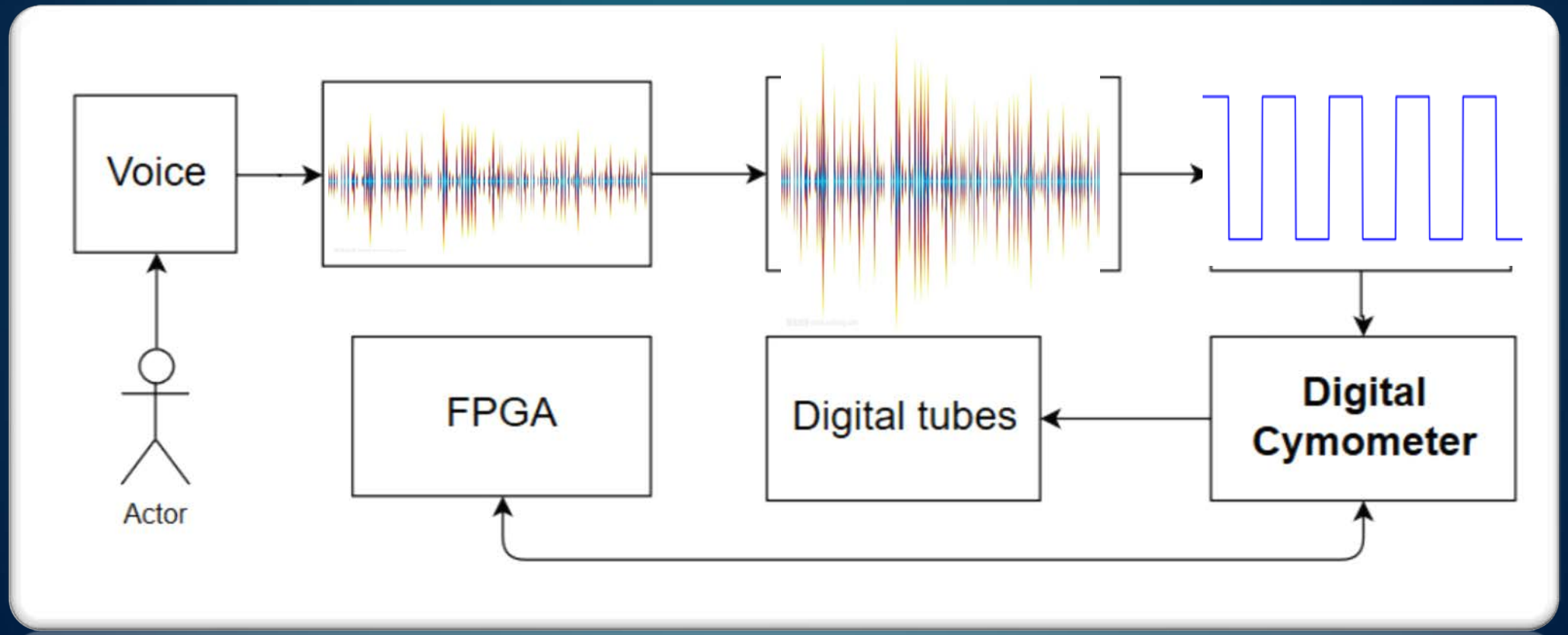
Hardware block diagram



02 SCHEME DESIGN

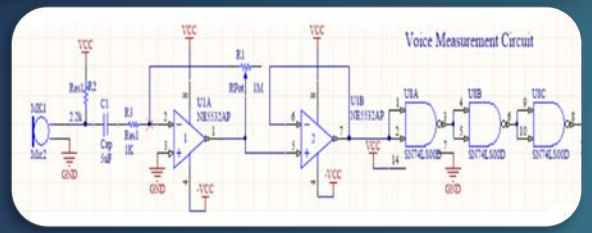
Content input, control and output

Frequency sampling flowchart

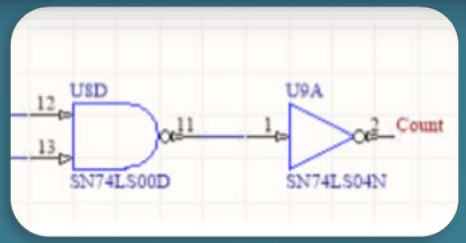


Digital Cymometer block diagram

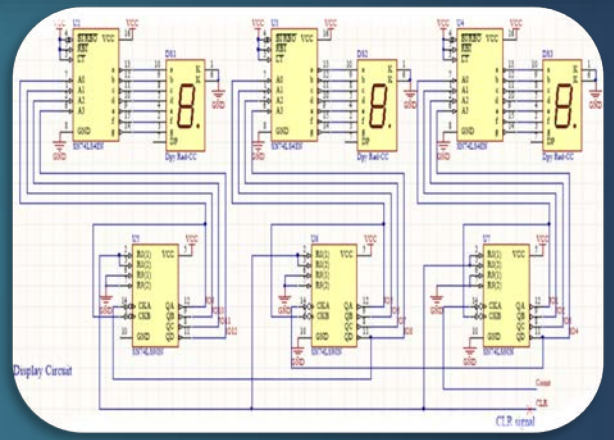
Signal to be measured



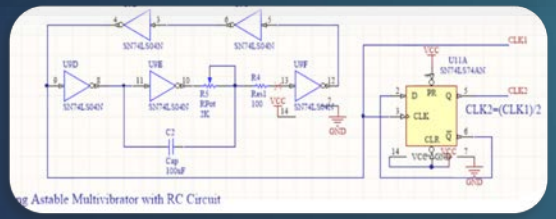
Lock gate



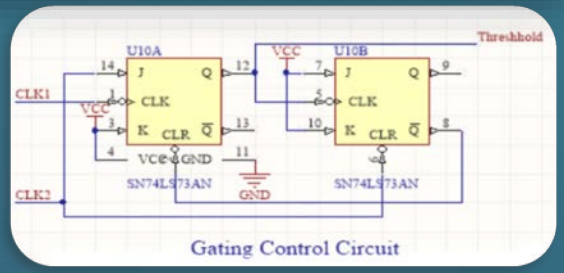
3-bit mod 10 Counter



Astable Multivibrator And frequency demultiplier



Gate circuit

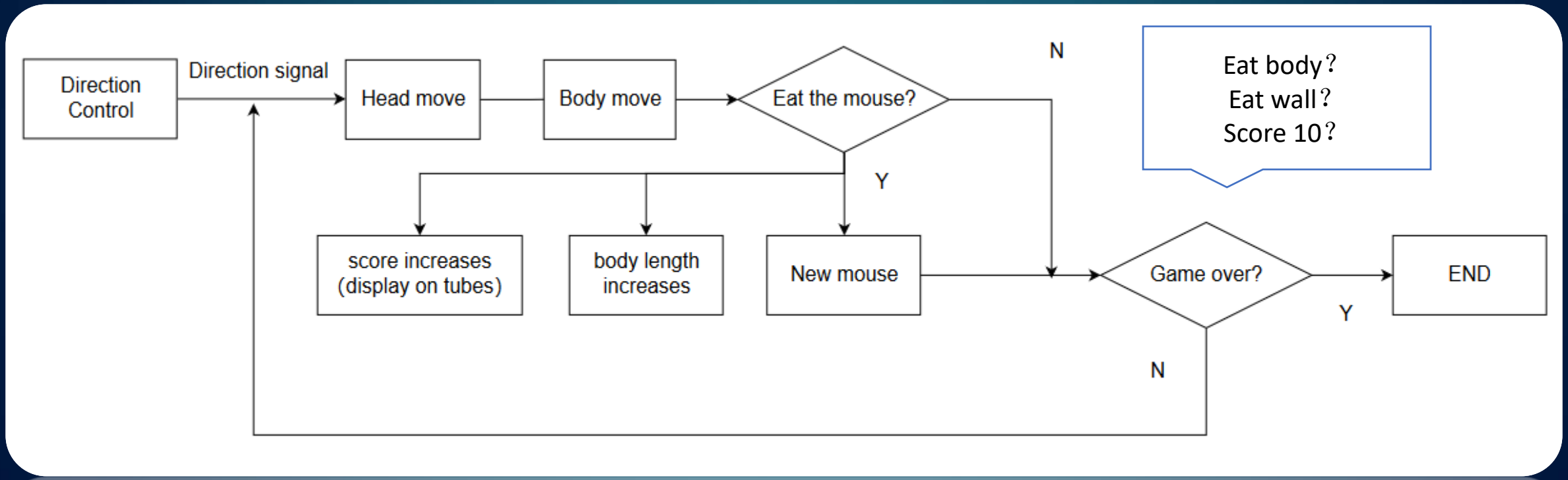


FPGA

Control program

Scheme Design- FPGA control program

Direction control, snake movement, mouse coordinate generation and scorer



Scheme Design- VGA output

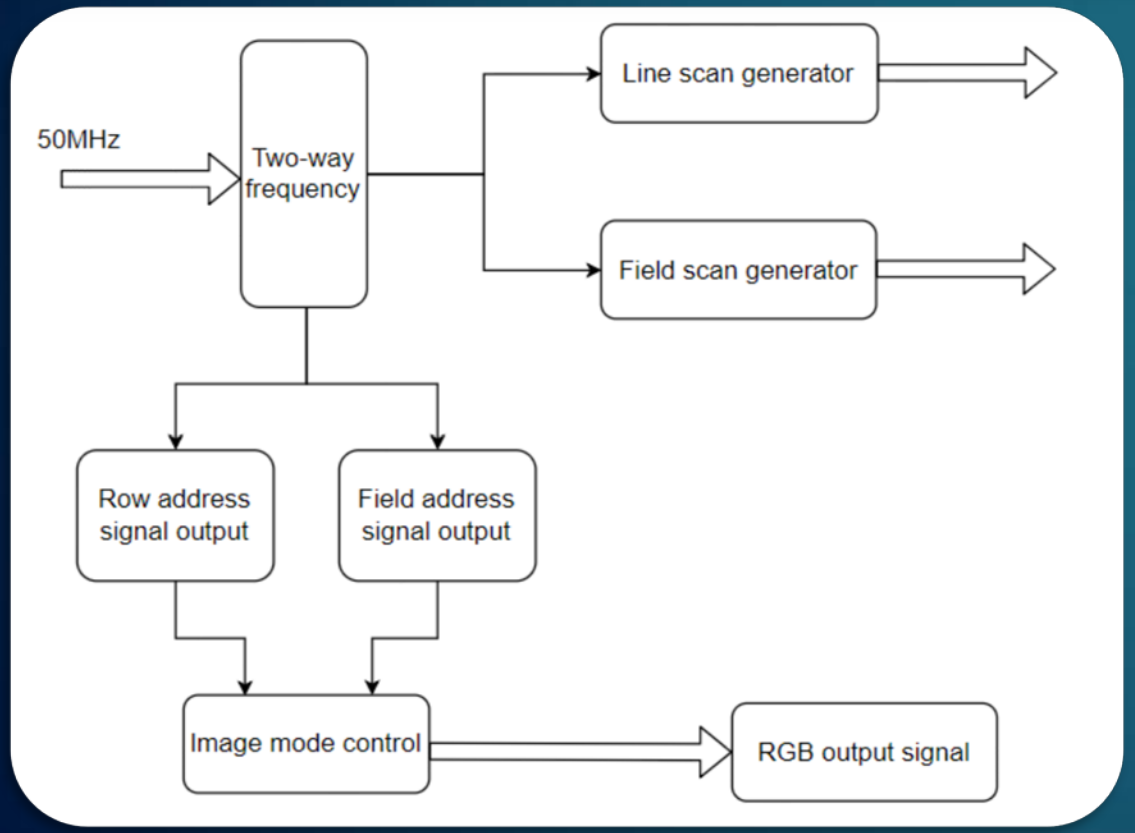
VGA Port

Scanning by line

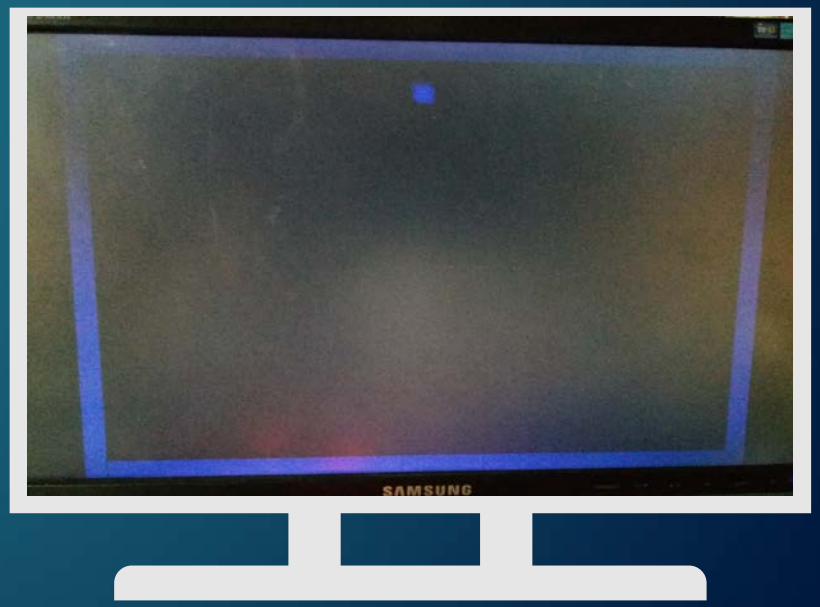
Scan from the upper left corner
Scan each pixel(像素) from left to right
Return to the left side of the next line
Scan the next line
Until all the lines are scanned,completed

Scheme Design- VGA output

VGA module design



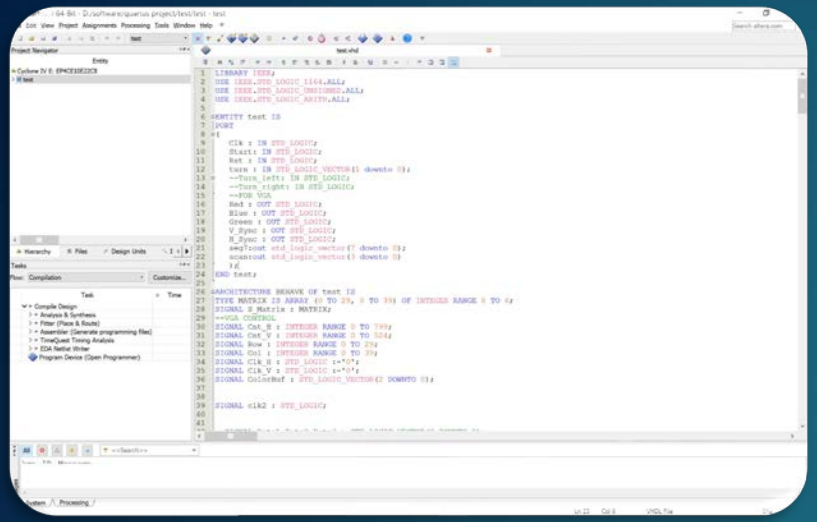
Control the RGB number to display the wall, the snake body, and the randomly generated mouse



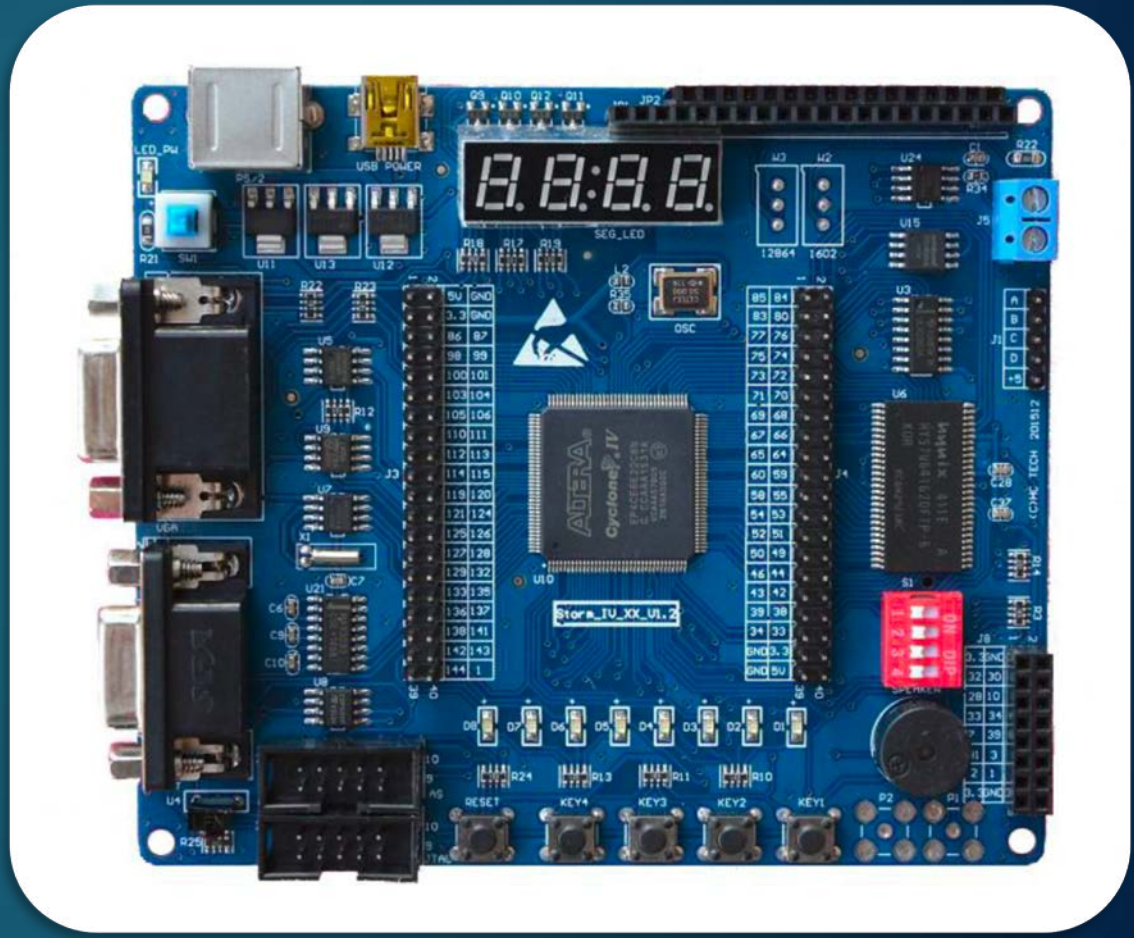
03 ACHIEVEMENT

What have we done?

Achievement: Learning, Design and Finish all programming task

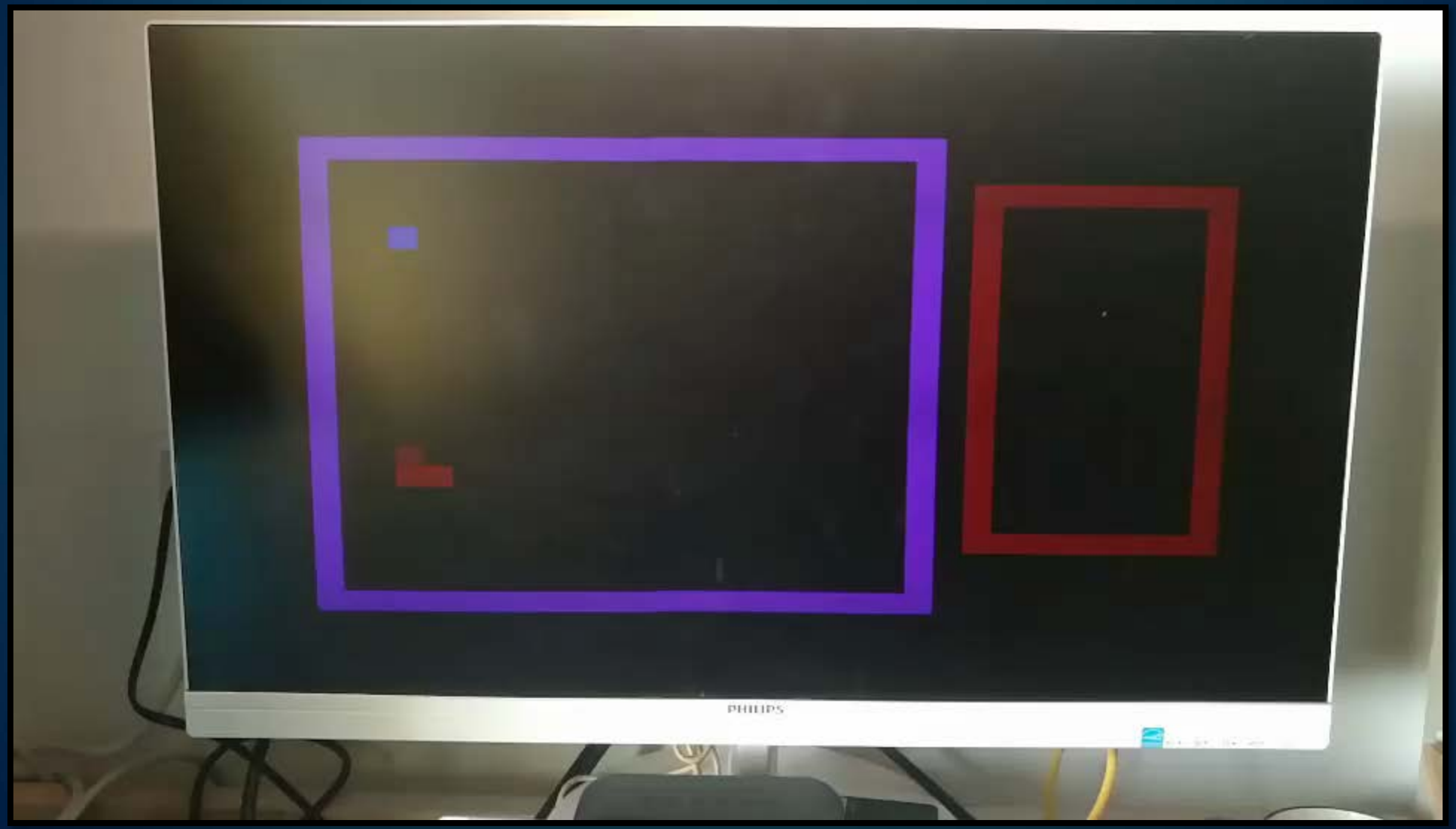


```
--DISPLAY ON VGA
PROCESS(Clk_H,Rst)
BEGIN
    if(Rst='1') then
        ColorBuf<="000";
    elsif(rising_edge(Clk_H)) then
        if(Cnt_H >= 144) and (Cnt_H <=783) then
            Col <= (Cnt_H-144)/16;
        else
            ColorBuf <= "000";
        end if;
        if(Cnt_V >= 35) and (Cnt_V <=510) then
            Row <= (Cnt_V-35)/16;
        else
            ColorBuf <= "000";
        end if;
        case S_Matrix(Row,Col) is
            when 0 => ColorBuf <="000";    --BACKGROUND
            when 1 => ColorBuf <="111";    --WALLS
            when 2 => ColorBuf <="010";    --HEAD
            when 3 => ColorBuf <="011";    --BODY
            when 4 => ColorBuf <="100";    --FOOD
            when 5 => ColorBuf <="110";
            when others => ColorBuf <="000";
        end case;
    end if;
END PROCESS;
```

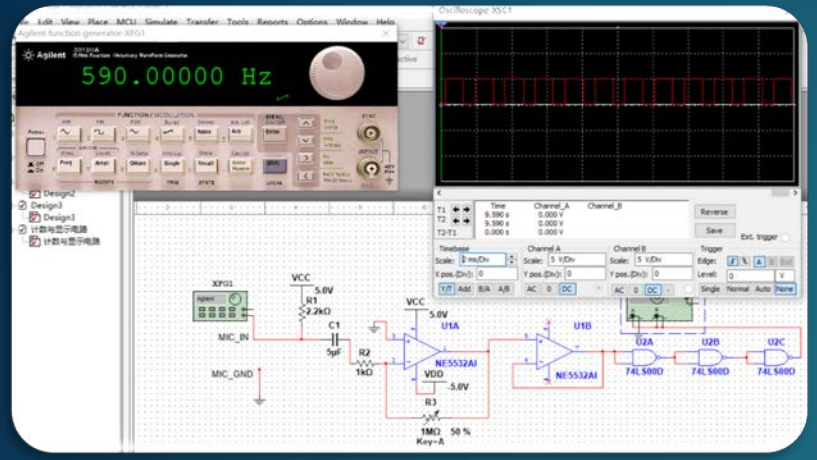


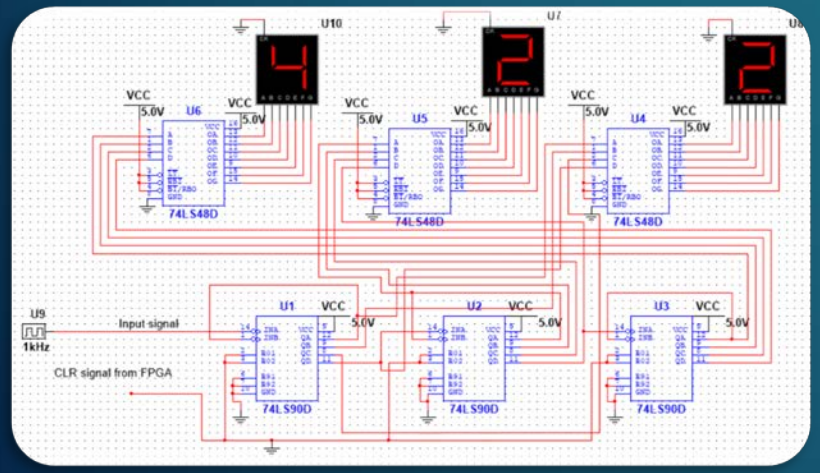
DEBUG ! ! ! ! ! !

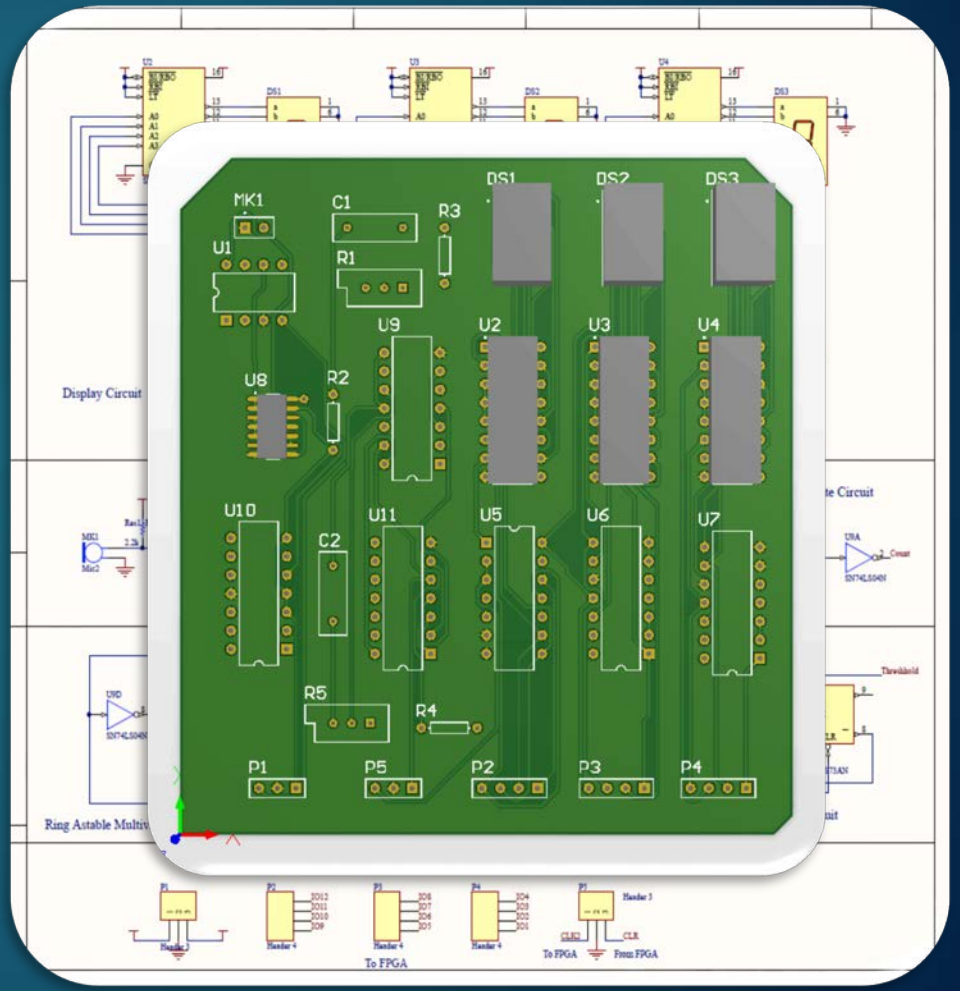
Achievement: Finish all programming task



Achievement： Design, Simulation, Schematic and PCB Board







Thanks