交通灯作业

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1Hz 分频

```
LIBRARY IEEE;
USE IEEE.STD_LOGIC_1164.ALL;
USE IEEE.STD_LOGIC_UNSIGNED.ALL;

ENTITY div1 IS

GENERIC(m: INTEGER := 50000000);   --原来有 50000000 个脉冲。现在每一个脉冲里包含
原来的 50000000 个脉冲，所以变成 1hz
PORT (clk: IN STD_LOGIC;
        q: OUT STD_LOGIC);

END div1;

ARCHITECTURE behave OF div1 IS

signal count :integer range m-1 downto 0:=m-1;
BEGIN

    process(clk)
    begin

      if rising_edge(clk) then
        count<=count-1;
         if count>=m/2 then      --脉冲占空比是 1/2，前半部分输出低电平，后半部分输
出高电平
            q<='0';
              else
               q<='1';
          end if;
          if count<=0 then
            count<=m-1;
          end if;
      end if;
```

```
    end process;
end behave;
```

1000Hz 分频

```
LIBRARY IEEE;
USE IEEE.STD_LOGIC_1164.ALL;
USE IEEE.STD_LOGIC_UNSIGNED.ALL;

ENTITY div1000 IS

GENERIC(m: INTEGER := 50000);   --原来有 50000000 个脉冲。现在每一个脉冲里包含原来
的 50000 个脉冲，所以变成 1000hz
PORT (clk: IN STD_LOGIC;
        q: OUT STD_LOGIC);

END div1000;

ARCHITECTURE behave OF div1000 IS

signal count :integer range m-1 downto 0:=m-1;
BEGIN

    process(clk)
    begin

      if rising_edge(clk) then
        count<=count-1;
         if count>=m/2 then      --脉冲占空比是 1/2，前半部分输出低电平，后半部分输
出高电平
           q<='0';
             else
              q<='1';
          end if;
          if count<=0 then
            count<=m-1;
          end if;
      end if;

    end process;
end behave;
```

数码管显示部分

```vhdl
LIBRARY IEEE;
USE IEEE.STD_LOGIC_1164.ALL;

ENTITY seg7led IS
    PORT(
        clk: IN STD_LOGIC;      --clk 为 1000Hz
         LIGHT1, LIGHT2, NUM1, NUM2: IN INTEGER RANGE 0 TO 9 ;
         TOseg7com: OUT STD_LOGIC_VECTOR(3 downto 0);
         data_out:OUT STD_LOGIC_VECTOR(7 downto 0)
            );
END seg7led;

ARCHITECTURE example OF seg7led IS
    SIGNAL CNT4: INTEGER RANGE 0 TO 3 := 0;
     SIGNAL SHUJU: INTEGER RANGE 0 TO 9;
BEGIN

    PROCESS(clk)
     BEGIN
        IF (clk'EVENT AND clk = '1') THEN
                CNT4 <= CNT4+1;
                  CASE CNT4 IS
                    WHEN 0 =>
                                TOseg7com <= "0111"; SHUJU <= NUM2;
                     WHEN 1 =>
                                TOseg7com <= "1011"; SHUJU <= NUM1;
                     WHEN 2 =>
                                TOseg7com <= "1101"; SHUJU <= LIGHT2;
                     WHEN 3 =>
                                TOseg7com <= "1110"; SHUJU <= LIGHT1;
                     WHEN OTHERS => NULL;
                  END CASE;
          END IF;
      END PROCESS;


    process(SHUJU)
    begin
            case SHUJU is
                when 0 => data_out <= "11000000"; -- 0
                when 1 => data_out <= "11111001"; -- 1
```

```vhdl
                when 2 => data_out <= "10100100"; -- 2
                when 3 => data_out <= "10110000"; -- 3
                when 4 => data_out <= "10011001"; -- 4
                when 5 => data_out <= "10010010"; -- 5
                when 6 => data_out <= "10000010"; -- 6
                when 7 => data_out <= "11111000"; -- 7
                when 8 => data_out <= "10000000"; -- 8
                when 9 => data_out <= "10010000"; -- 9
                when others => NULL;
            end case;
    end process;

END example;
```

主要判断部分

```vhdl
LIBRARY IEEE;
USE IEEE.STD_LOGIC_1164.ALL;
USE IEEE.STD_LOGIC_UNSIGNED.ALL;

ENTITY jiaotongdeng IS
PORT ( clk, subway: IN STD_LOGIC;         --subway 按键代表次干道有无车等待，clk 为 1Hz
        LIGHT1, LIGHT2, NUM1, NUM2: OUT INTEGER RANGE 0 TO 9 ); --数码管依次显示
主干道灯，次干道灯，十位数，个位数
END jiaotongdeng;

ARCHITECTURE example OF jiaotongdeng IS
 TYPE STATES IS (S1,S2,S3,S4) ; --四种状态:
 SIGNAL STATE: STATES := S1;
 SIGNAL COUNT : INTEGER RANGE 0 TO 45 := 0;
BEGIN

PROCESS (subway, clk)
  BEGIN
        IF(clk'EVENT AND clk='1')THEN
            CASE STATE IS
              WHEN S1 =>
                        IF (subway = '0' and COUNT =0) THEN
                                STATE <= S2;
                                  COUNT <= 5;
                                  LIGHT1 <= 2;
                                LIGHT2 <= 4;
                                  ELSE
```

```
                    IF (COUNT = 0) THEN
                            COUNT <= 45;
                            ELSE
                             COUNT <= COUNT-1;
                        END IF;
                          LIGHT1 <= 1;
                          LIGHT2 <= 4;
                    END IF;
        WHEN S2 =>
                    IF (COUNT = 0) THEN
                            STATE <= S3;
                              COUNT <= 25;
                            LIGHT1 <= 4;
                          LIGHT2 <= 1;
                            ELSE
                               COUNT <= COUNT-1;
                    END IF;
        WHEN S3 =>
                    IF (COUNT = 0 OR SUBWAY = '1') THEN
                            STATE <= S4;
                              COUNT <= 5;
                              LIGHT1 <= 4;
                            LIGHT2 <= 2;
                              ELSE
                                 COUNT <= COUNT-1;

                    END IF;
          WHEN S4 =>
                    IF (COUNT = 0) THEN
                              STATE <= S1;
                                COUNT <= 45;
                                LIGHT1 <= 1;
                            LIGHT2 <= 4;
                              ELSE
                                 COUNT <= COUNT-1;
                    END IF;
            END CASE;
        END IF;
 NUM1 <= COUNT/10;          --得十位
 NUM2 <= COUNT REM 10;    --得个位
END PROCESS;
END example;
```
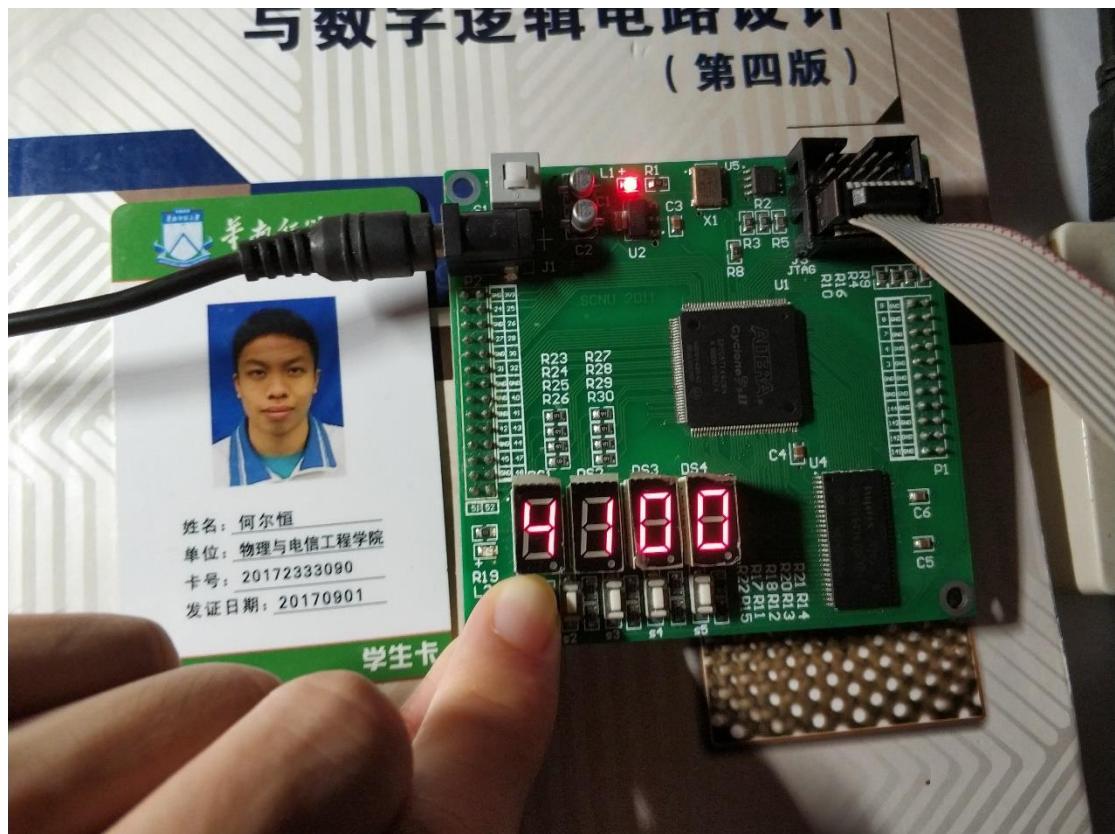
顶层文件

次干道无车等待，一直循环主绿次红 45 秒
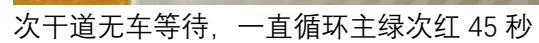
次干道有车等待（按键按下），且等 45 秒计完后，转变为主黄次红维持 5 秒

随后进入主红次绿状态，倒计时 25 秒

当 25 秒倒计时完或者未倒计时完之前次干道已无车等待（按键松开），进入主黄次绿状态

维持 5 秒

又进入主绿次红的状态，倒计时 45 秒