Course 15 ---Nixie tube

The purpose of the experiment:

In this experiment, we need to finish to display 1-9 on a single 8-segment Nixie tube.

Introduction to digital tube:

Nixie tube is a semiconductor luminescent device, its basic unit is a light-emitting diode. It is divided into 7-segment Nixie tube and 8-segment Nixie tube. 8-segment Nixie tube more than 7-segment Nixie tube a light-emitting diode unit (more than a decimal point), this experiment we use the 8-segment Nixie tube. The actual object is shown below.

According to the light-emitting diode unit connection mode, it is divided into anode Nixie tubes and cathode Nixie tubes.

Anode Nixie tubes that connects the anodes of all light-emitting diodes together to form a common anode (COM). The common pole (COM) shall be connected to +5V when the common anode digital tube is applied. When the cathode of a certain field of light-emitting diode is low , the corresponding field will be light up. When the cathode of a field is high, the field does not light up.

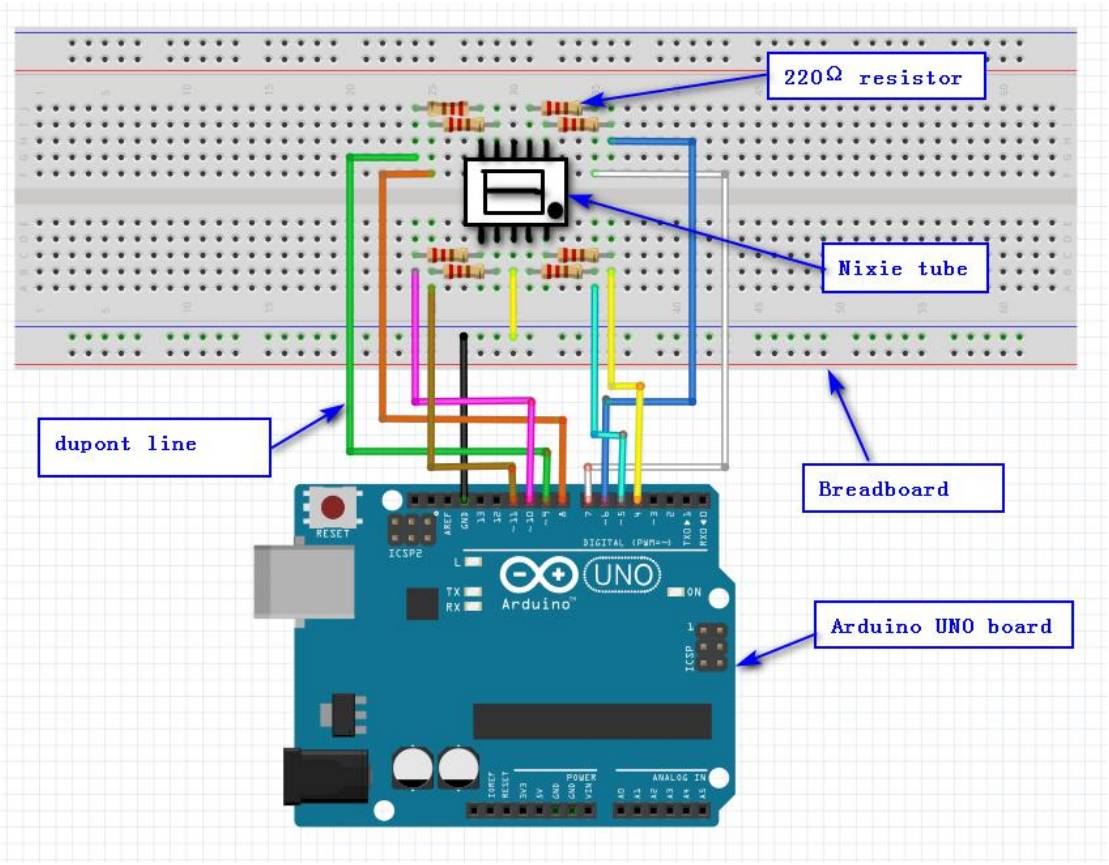
Cathode Nixie tubes that connects the cathodes of all light-emitting diodes together to form a common cathode (COM). The common pole COM shall be connected to GND when the common cathode digital tube is applied. When the anode of a certain field of light-emitting diode is high , the corresponding field will be light up. When the anode of a field is low, the field does not light up.

List of components required for the experiment:

Arduino UNO board *1
USB cable *1
220Ω resistor *8
8-segment digital tube *1
Breadboard *1
Dupont line *1bunch

Actual object connection diagram:

We need to connect the circuit as shown in the figure below.



Experimental code analysis:

```
int a=7;    // Digital port 7 is connected to digital tube section a
int b=6;    // Digital port 6 is connected to digital tube section b
int c=5;    // Digital port 5 is connected to digital tube section c
int d=11;    // Digital port 11 is connected to digital tube section d
int e=10;    //Digital port 10 is connected to digital tube section e
int f=8;    //Digital port 8 is connected to digital tube section f
int g=9;    //Digital port 9 is connected to digital tube section g
int dp=4; //Digital port 4 is connected to digital tube decimal point section
void digital_1(void) //Displaying 1
{
    unsigned char j;
    digitalWrite(c,HIGH); //Light digital tube section c
    digitalWrite(b,HIGH); //Light digital tube section b
    for(j=7;j<=11;j++) //The level is pulled low of tube section 7~11(a,f,g,e,d)
        digitalWrite(j,LOW);
    digitalWrite(dp,LOW); //Tube decimal point section is off
}
void digital_2(void)    //Displaying 1
{
```

```
unsigned char j;
digitalWrite(b,HIGH);
digitalWrite(a,HIGH);
for(j=9;j<=11;j++)
digitalWrite(j,HIGH);
digitalWrite(dp,LOW);
digitalWrite(c,LOW);
digitalWrite(f,LOW);
}
void digital_3(void) //Displaying 3
{
unsigned char j;
digitalWrite(g,HIGH);
digitalWrite(d,HIGH);
for(j=5;j<=7;j++)
digitalWrite(j,HIGH);
digitalWrite(dp,LOW);
digitalWrite(f,LOW);
digitalWrite(e,LOW);
}
void digital_4(void) //Displaying 4
{
digitalWrite(c,HIGH);
digitalWrite(b,HIGH);
digitalWrite(f,HIGH);
digitalWrite(g,HIGH);
digitalWrite(dp,LOW);
digitalWrite(a,LOW);
digitalWrite(e,LOW);
digitalWrite(d,LOW);
}
void digital_5(void) //Displaying 5
{
unsigned char j;
for(j=7;j<=9;j++)
digitalWrite(j,HIGH);
digitalWrite(c,HIGH);
digitalWrite(d,HIGH);
digitalWrite(dp,LOW);
digitalWrite(b,LOW);
digitalWrite(e,LOW);
}
void digital_6(void) //Displaying 6
{
```

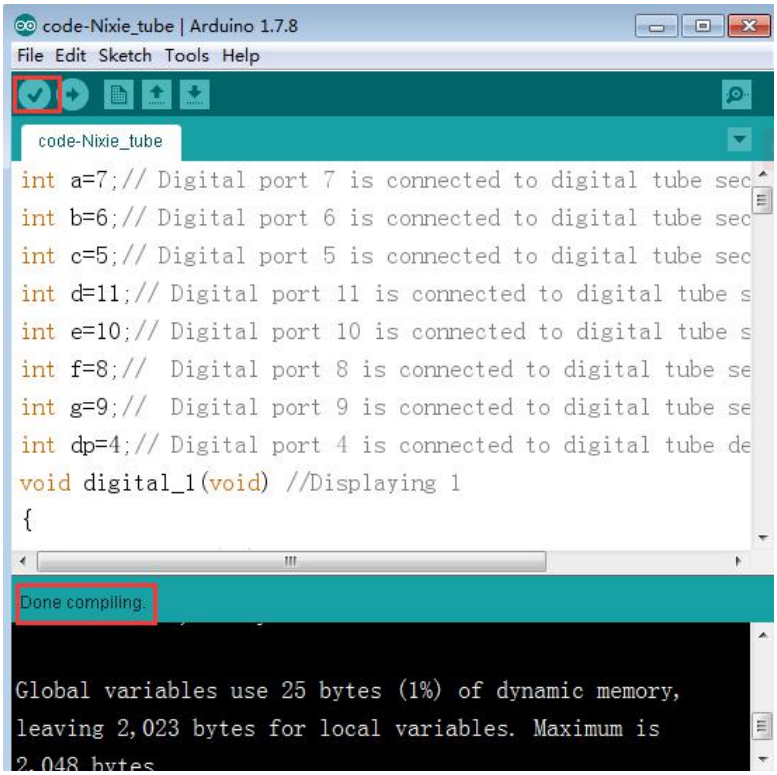
```
unsigned char j;
for(j=7;j<=11;j++)
digitalWrite(j,HIGH);
digitalWrite(c,HIGH);
digitalWrite(dp,LOW);
digitalWrite(b,LOW);
}
void digital_7(void) //Displaying 7
{
unsigned char j;
for(j=5;j<=7;j++)
digitalWrite(j,HIGH);
digitalWrite(dp,LOW);
for(j=8;j<=11;j++)
digitalWrite(j,LOW);
}
void digital_8(void) //Displaying 8
{
unsigned char j;
for(j=5;j<=11;j++)
digitalWrite(j,HIGH);
digitalWrite(dp,LOW);
}

void digital_9(void) //Displaying 9
{
digitalWrite(a,HIGH);
digitalWrite(b,HIGH);
digitalWrite(c,HIGH);
digitalWrite(d,HIGH);
digitalWrite(e,LOW);
digitalWrite(f,HIGH);
digitalWrite(g,HIGH);
digitalWrite(dp,HIGH);
}
void setup()
{
      int i;    //Declarations of variables
      for(i=4;i<=11;i++)
            pinMode(i,OUTPUT);    //Defining the    port4-11 for the input port
}
void loop()
{
   while(1)
```

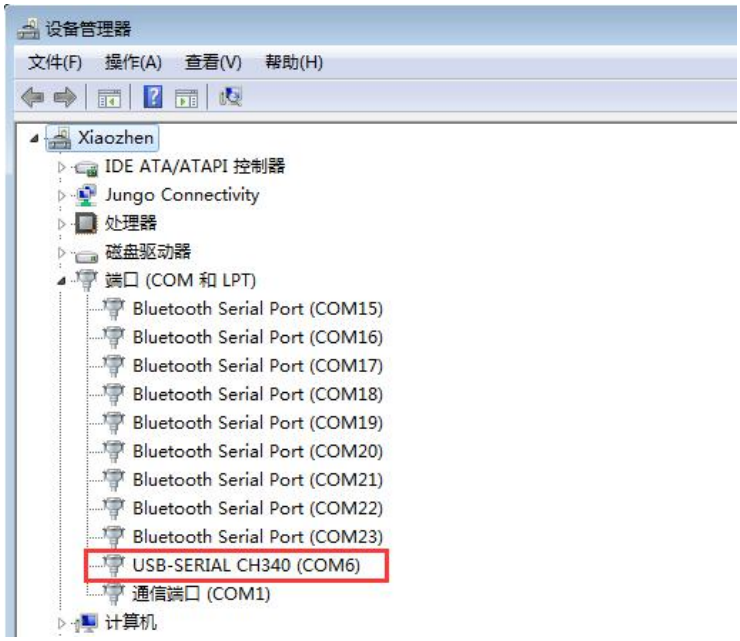
```
  {
    digital_1();    //Displaying 1
    delay(1000);
    digital_2(); //Displaying 2
    delay(1000);
    digital_3(); //Displaying 3
    delay(1000);
    digital_4(); //Displaying 4
    delay(1000);
    digital_5(); //Displaying 5
    delay(1000);
    digital_6(); //Displaying 6
    delay(1000);
    digital_7(); //Displaying 7
    delay(1000);
    digital_8(); //Displaying 8
    delay(1000);
    digital_9(); //Displaying 9
    delay(1000);
  }
}
```

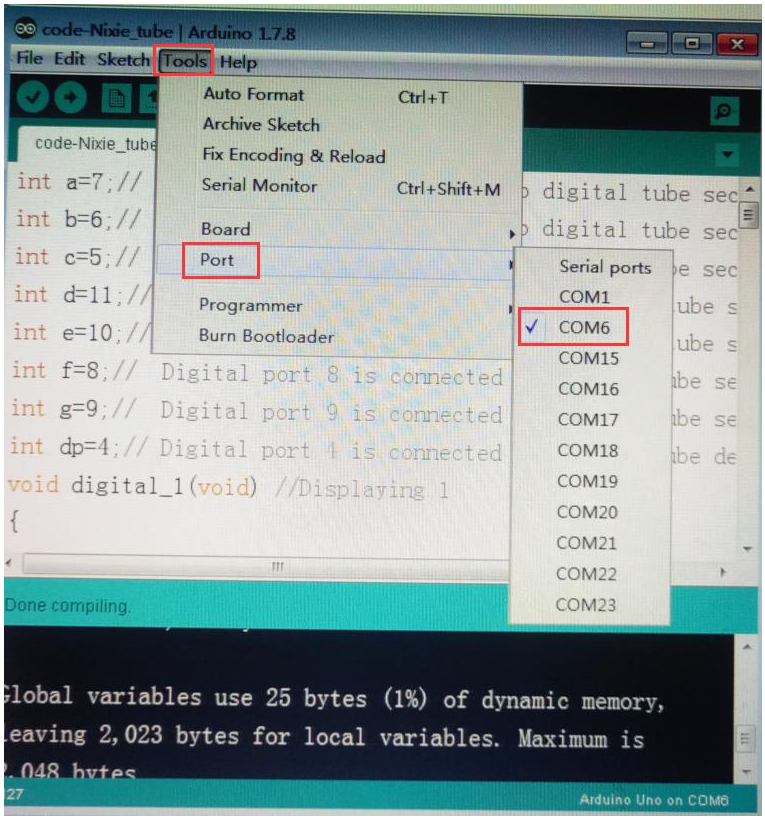
Experimental steps:

1.We need to open the code for this experiment: **code-Tilt_switch.ino**, click "√"under the menu bar,compile the code, and wait for the words of **Done compiling** in the lower left corner, as shown in the following figure.

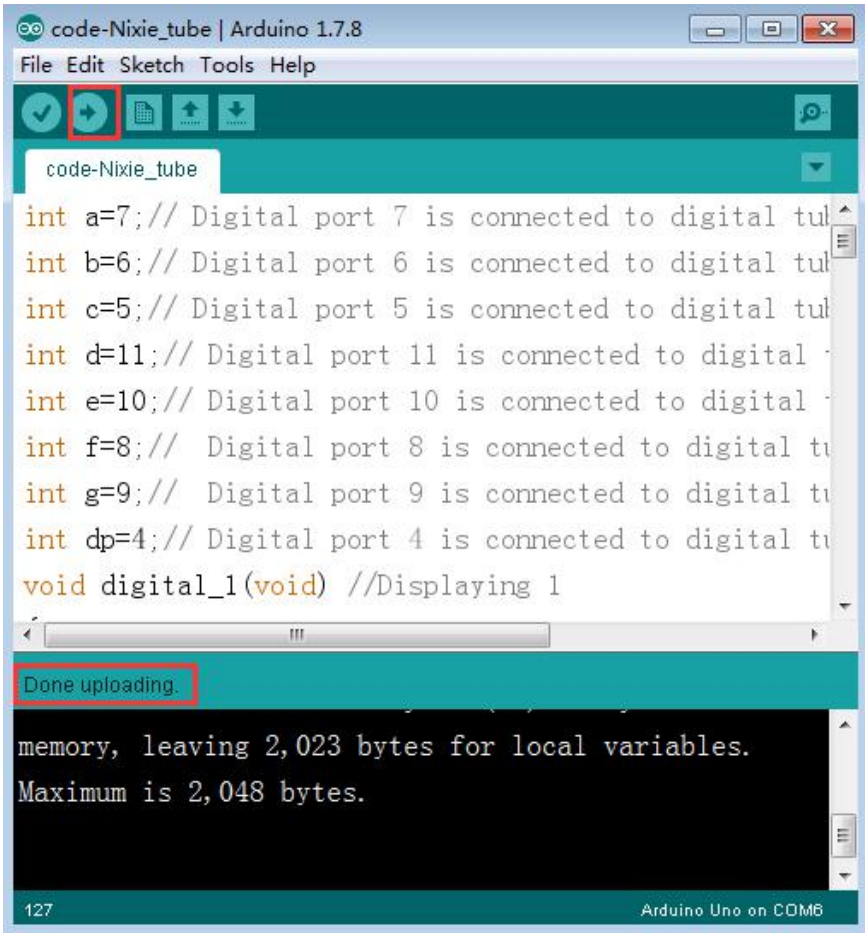


2. In the menu bar of Arduino IDE, we need to select 【Tools】---【Port】--- selecting the port that the serial number displayed by the device manager just now, as shown in the figure below. For example:COM6,as shown in the following figure.

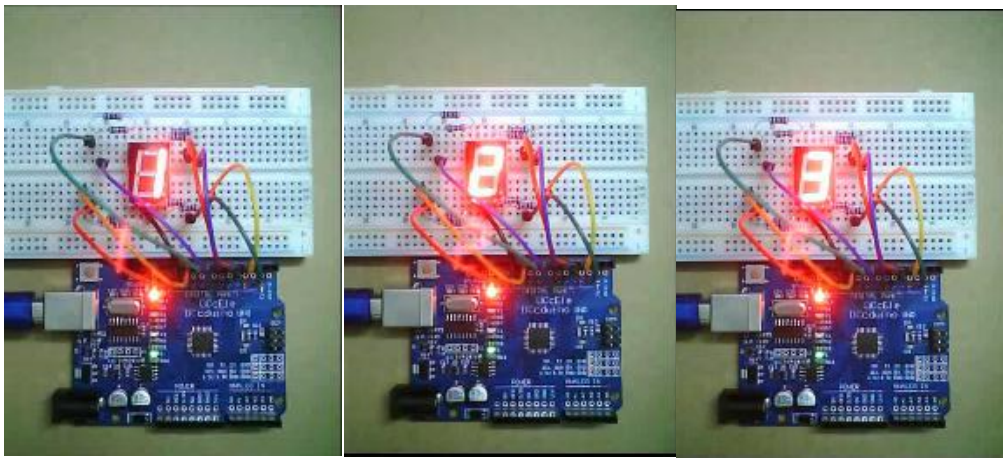


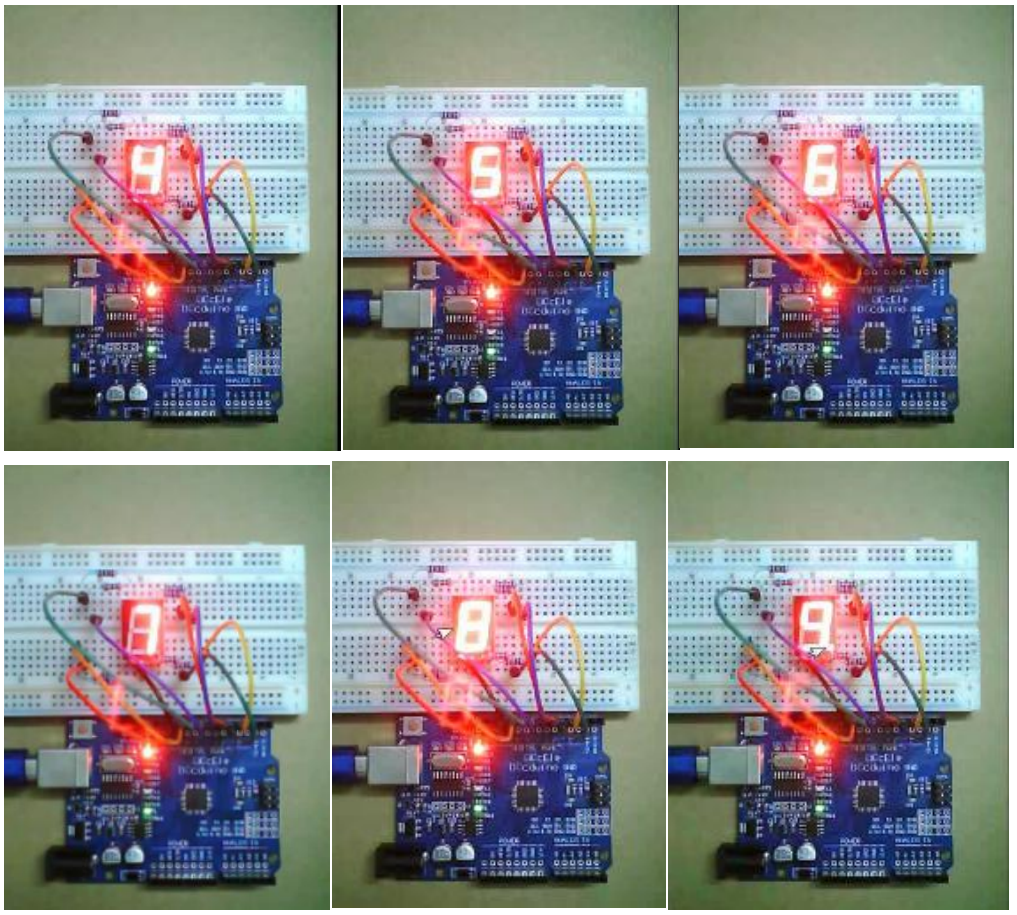


3. After the selection is completed, you need to click "→"under the menu bar to upload the code to the Arduino UNO board. When the word "**Done uploading**" appears in the lower left corner, the code has been successfully uploaded to the Arduino UNO board, as shown in the figure below.



4. After the code is uploaded, we can see that display 1-9 on a single 8-segment digital tube, as shown in the figure below.





The code of the experiment: