实验8 创新实验 单片机播放音乐

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1.使用步骤

1.用proteus打开PlayMusic.pdsprj
2.点击左下角调试，播放音乐

2.目的和需求

在课程实验中我们学会了如何使用单片机驱动蜂鸣器Buzzer鸣叫，
由此可以设想：能否通过编写特定程序，改变蜂鸣器或音响的音高，使其播放一首完整音乐?

3.设计思路

3.1 器件选用：

CPU:AT89C51
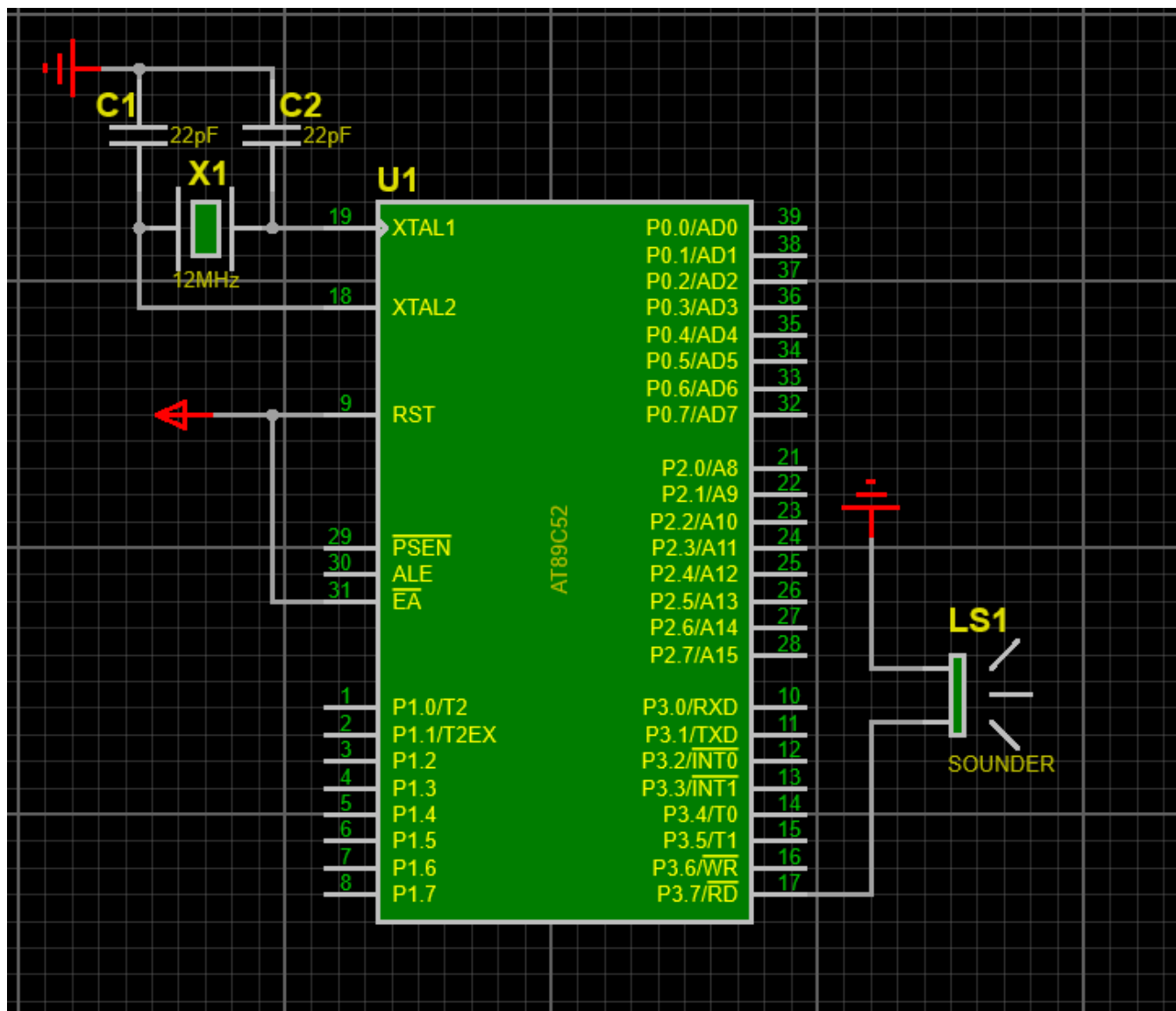SOUNDER:音响

3.2 音乐储存：

将音乐音符用c语言数组的形式存储

3.3 播放：

通过单片机的定时器产生不同频率的方波信号，并控制IO口输出，从而模拟不同音高的音符。通过预设的音符频率表和时值表，以及对音符编码的解析，代码可以按照指定的乐谱播放出相应的旋律。核心思想是利用单片机的定时器产生精确的时序信号，控制输出引脚的高低电平，从而产生不同频率的声音。

4.实现过程:

4.1 电路图连接与绘制:

如图:

4.2 音乐的获取:

选取了较为经典且简单的三首歌曲:

- 挥着翅膀的女孩
- 同一首歌
- 两只蝴蝶

下载wav音频后，使用特定软件将wav转换为C语言数组：

4.3 程序编写:

```c
//SoundPlay.h
#ifndef __SOUNDPLAY_H_REVISION_FIRST__
#define __SOUNDPLAY_H_REVISION_FIRST__


//********************************************************************


#define SYSTEM_OSC              12000000        //  徧  Ƶ  12000000HZ
#define SOUND_SPACE       4/5                   //        ͨ     ij  Ј    ,//ÿ4
sbit    BeepIO    =           P3^7;             //            ◇

unsigned int  code FreTab[12]  = { 262,277,294,311,330,349,369,392,415,440,466,494 }; //Ҳ’Ƶ ħ
unsigned char code SignTab[7]  = { 0,2,4,5,7,9,11 };
unsigned char code LengthTab[7]= { 1,2,4,8,16,32,64 };
unsigned char Sound_Temp_TH0,Sound_Temp_TL0;            //       ħ      ɼ
unsigned char Sound_Temp_TH1,Sound_Temp_TL1;            //       ħ      ɼ
//********************************************************************
void InitialSound(void)
{
        BeepIO = 0;
        Sound_Temp_TH1 = (65535-(1/1200)*SYSTEM_OSC)/256;       //     TL1Öͦ  ij  ͺ         (10ms ij
        Sound_Temp_TL1 = (65535-(1/1200)*SYSTEM_OSC)%256;       //     TH1Öͦ  ij  ͺ
        TH1 = Sound_Temp_TH1;
        TL1 = Sound_Temp_TL1;
        TMOD  |= 0x11;
        ET0   = 1;
        ET1         = 0;
        TR0         = 0;
        TR1   = 0;
        EA    = 1;
}


void BeepTimer0(void) interrupt 1        //           ж
{
        BeepIO = !BeepIO;
        TH0    = Sound_Temp_TH0;
         TL0    = Sound_Temp_TL0;
}
//********************************************************************
void Play(unsigned char *Sound,unsigned char Signature,unsigned Octachord,unsigned int Speed)
```

```c
{
        unsigned int NewFreTab[12];                    // μ Ƶ ʰ
        unsigned char i,j;
        unsigned int Point,LDiv,LDiv0,LDiv1,LDiv2,LDiv4,CurrentFre,Temp_T,SoundLength;
        unsigned char Tone,Length,SL,SH,SM,SLen,XG,FD;
        for(i=0;i<12;i++)                              //    ڛ ż        ˮ        μ Ƶ ʰ
        {
                j = i + Signature;
                if(j > 11)
                {
                        j = j-12;
                        NewFreTab[i] = FreTab[j]*2;
                }
                else
                        NewFreTab[i] = FreTab[j];

                if(Octachord == 1)
                        NewFreTab[i]>>=2;
                else if(Octachord == 3)
                        NewFreTab[i]<<=2;
        }

        SoundLength = 0;
        while(Sound[SoundLength] != 0x00)          //
        {
                SoundLength+=2;
        }

        Point = 0;
        Tone   = Sound[Point];
        Length = Sound[Point+1];                       //          ʰ              ʰʰ

        LDiv0 = 12000/Speed;                           //    1         ij  (      10ms)
        LDiv4 = LDiv0/4;                               //    4         ij
        LDiv4 = LDiv4-LDiv4*SOUND_SPACE;        //   ᶜ ◈      ◈
        TR0            = 0;
        TR1    = 1;
        while(Point < SoundLength)
        {
```

```c
                    SL=Tone%10;                                                    //
                    SM=Tone/10%10;                                                    //
                    SH=Tone/100;                                                    //
                    CurrentFre = NewFreTab[SignTab[SL-1]+SH];           //      Ö      Ƶ
                    if(SL!=0)
                    {
                            if (SM==1) CurrentFre >>= 2;                    //
                            if (SM==3) CurrentFre <<= 2;                    //
                            Temp_T = 65536-(50000/CurrentFre)*10/(12000000/SYSTEM_OSC);//
                            Sound_Temp_TH0 = Temp_T/256;
                            Sound_Temp_TL0 = Temp_T%256;
                            TH0 = Sound_Temp_TH0;
                            TL0 = Sound_Temp_TL0 + 12; //  12 Ю  ж    ʰ IJ
                    }
                    SLen=LengthTab[Length%10];           //      Ǽ
                    XG=Length/10%10;                                 //                 (0 1ᶜ   2    )
                    FD=Length/100;
                    LDiv=LDiv0/SLen;                                 //                      ij  (    10 ¿ms)
                    if (FD==1)
                            LDiv=LDiv+LDiv/2;
                    if(XG!=1)
                            if(XG==0)                                         //          ᶜ        ◇
                                    if (SLen<=4)
                                            LDiv1=LDiv-LDiv4;
                                    else
                                            LDiv1=LDiv*SOUND_SPACE;
                            else
                                    LDiv1=LDiv/2;                    //                 ◇
                    else
                            LDiv1=LDiv;
                    if(SL==0) LDiv1=0;
                            LDiv2=LDiv-LDiv1;                         //             ij
                      if (SL!=0)
                    {
                            TR0=1;
                            for(i=LDiv1;i>0;i--)           //    涨    η₆
                            {
                                    while(TF1==0);
                                    TH1 = Sound_Temp_TH1;
```

```c
                        TL1 = Sound_Temp_TL1;
                        TF1=0;
                }
        }
        if(LDiv2!=0)
        {
                TR0=0; BeepIO=0;
                for(i=LDiv2;i>0;i--)            //      1
                {
                        while(TF1==0);
                        TH1 = Sound_Temp_TH1;
                        TL1 = Sound_Temp_TL1;
                        TF1=0;
                }
        }
        Point+=2;
        Tone=Sound[Point];
        Length=Sound[Point+1];
    }
    BeepIO = 0;
}
//*************************************************************************
#endif
```

```c
PlayMusic.c
#include <REG52.H>
#include "SoundPlay.h"

void Delay1ms(unsigned int count)
{
        unsigned int i,j;
        for(i=0;i<count;i++)
        for(j=0;j<120;j++);
}

//****************************Music****************************************
//挥着翅膀的女孩
unsigned char code Music_Girl[]={ 0x17,0x02, 0x17,0x03, 0x18,0x03, 0x19,0x02, 0x15,0x03,
                                  0x16,0x03, 0x17,0x03, 0x17,0x03, 0x17,0x03, 0x18,0x03,
                                  0x19,0x02, 0x16,0x03, 0x17,0x03, 0x18,0x02, 0x18,0x03,
                                  0x17,0x03, 0x15,0x02, 0x18,0x03, 0x17,0x03, 0x18,0x02,
                                  0x10,0x03, 0x15,0x03, 0x16,0x02, 0x15,0x03, 0x16,0x03,
                                  0x17,0x02, 0x17,0x03, 0x18,0x03, 0x19,0x02, 0x1A,0x03,
                                  0x1B,0x03, 0x1F,0x03, 0x1F,0x03, 0x17,0x03, 0x18,0x03,
                                  0x19,0x02, 0x16,0x03, 0x17,0x03, 0x18,0x03, 0x17,0x03,
                                  0x18,0x03, 0x1F,0x03, 0x1F,0x02, 0x16,0x03, 0x17,0x03,
                                  0x18,0x03, 0x17,0x03, 0x18,0x03, 0x20,0x03, 0x20,0x02,
                                  0x1F,0x03, 0x1B,0x03, 0x1F,0x66, 0x20,0x03, 0x21,0x03,
                                  0x20,0x03, 0x1F,0x03, 0x1B,0x03, 0x1F,0x66, 0x1F,0x03,
                                  0x1B,0x03, 0x19,0x03, 0x19,0x03, 0x15,0x03, 0x1A,0x66,
                                  0x1A,0x03, 0x19,0x03, 0x15,0x03, 0x15,0x03, 0x17,0x03,
                                  0x16,0x66, 0x17,0x04, 0x18,0x04, 0x18,0x03, 0x19,0x03,
                                  0x1F,0x03, 0x1B,0x03, 0x1F,0x66, 0x20,0x03, 0x21,0x03,
                                  0x20,0x03, 0x1F,0x03, 0x1B,0x03, 0x1F,0x66, 0x1F,0x03,
                                  0x1B,0x03, 0x19,0x03, 0x19,0x03, 0x15,0x03, 0x1A,0x66,
                                  0x1A,0x03, 0x19,0x03, 0x19,0x03, 0x1F,0x03, 0x1B,0x03,
                                  0x1F,0x00, 0x1A,0x03, 0x1A,0x03, 0x1A,0x03, 0x1B,0x03,
                                  0x1B,0x03, 0x1A,0x03, 0x19,0x03, 0x19,0x02, 0x17,0x03,
                                  0x15,0x17, 0x15,0x03, 0x16,0x03, 0x17,0x03, 0x18,0x03,
                                  0x17,0x04, 0x18,0x0E, 0x18,0x03, 0x17,0x04, 0x18,0x0E,
                                  0x18,0x66, 0x17,0x03, 0x18,0x03, 0x17,0x03, 0x18,0x03,
                                  0x20,0x03, 0x20,0x02, 0x1F,0x03, 0x1B,0x03, 0x1F,0x66,
                                  0x20,0x03, 0x21,0x03, 0x20,0x03, 0x1F,0x03, 0x1B,0x03,
```

```
                                      0x1F,0x66, 0x1F,0x04, 0x1B,0x0E, 0x1B,0x03, 0x19,0x03,
                                      0x19,0x03, 0x15,0x03, 0x1A,0x66, 0x1A,0x03, 0x19,0x03,
                                      0x15,0x03, 0x15,0x03, 0x17,0x03, 0x16,0x66, 0x17,0x04,
                                      0x18,0x04, 0x18,0x03, 0x19,0x03, 0x1F,0x03, 0x1B,0x03,
                                      0x1F,0x66, 0x20,0x03, 0x21,0x03, 0x20,0x03, 0x1F,0x03,
                                      0x1B,0x03, 0x1F,0x66, 0x1F,0x03, 0x1B,0x03, 0x19,0x03,
                                      0x19,0x03, 0x15,0x03, 0x1A,0x66, 0x1A,0x03, 0x19,0x03,
                                      0x19,0x03, 0x1F,0x03, 0x1B,0x03, 0x1F,0x00, 0x18,0x02,
                                      0x18,0x03, 0x1A,0x03, 0x19,0x0D, 0x15,0x03, 0x15,0x02,
                                      0x18,0x66, 0x16,0x02, 0x17,0x02, 0x15,0x00, 0x00,0x00};
//同一首歌
unsigned char code Music_Same[]={ 0x0F,0x01, 0x15,0x02, 0x16,0x02, 0x17,0x66, 0x18,0x03,
                                      0x17,0x02, 0x15,0x02, 0x16,0x01, 0x15,0x02, 0x10,0x02,
                                      0x15,0x00, 0x0F,0x01, 0x15,0x02, 0x16,0x02, 0x17,0x02,
                                      0x17,0x03, 0x18,0x03, 0x19,0x02, 0x15,0x02, 0x18,0x66,
                                      0x17,0x03, 0x19,0x02, 0x16,0x03, 0x17,0x03, 0x16,0x00,
                                      0x17,0x01, 0x19,0x02, 0x1B,0x02, 0x1B,0x70, 0x1A,0x03,
                                      0x1A,0x01, 0x19,0x02, 0x19,0x03, 0x1A,0x03, 0x1B,0x02,
                                      0x1A,0x0D, 0x19,0x03, 0x17,0x00, 0x18,0x66, 0x18,0x03,
                                      0x19,0x02, 0x1A,0x02, 0x19,0x0C, 0x18,0x0D, 0x17,0x03,
                                      0x16,0x01, 0x11,0x02, 0x11,0x03, 0x10,0x03, 0x0F,0x0C,
                                      0x10,0x02, 0x15,0x00, 0x1F,0x01, 0x1A,0x01, 0x18,0x66,
                                      0x19,0x03, 0x1A,0x01, 0x1B,0x02, 0x1B,0x03, 0x1B,0x03,
                                      0x1B,0x0C, 0x1A,0x0D, 0x19,0x03, 0x17,0x00, 0x1F,0x01,
                                      0x1A,0x01, 0x18,0x66, 0x19,0x03, 0x1A,0x01, 0x10,0x02,
                                      0x10,0x03, 0x10,0x03, 0x1A,0x0C, 0x18,0x0D, 0x17,0x03,
                                      0x16,0x00, 0x0F,0x01, 0x15,0x02, 0x16,0x02, 0x17,0x70,
                                      0x18,0x03, 0x17,0x02, 0x15,0x03, 0x15,0x03, 0x16,0x66,
                                      0x16,0x03, 0x16,0x02, 0x16,0x03, 0x15,0x03, 0x10,0x02,
                                      0x10,0x01, 0x11,0x01, 0x11,0x66, 0x10,0x03, 0x0F,0x0C,
                                      0x1A,0x02, 0x19,0x02, 0x16,0x03, 0x16,0x03, 0x18,0x66,
                                      0x18,0x03, 0x18,0x02, 0x17,0x03, 0x16,0x03, 0x19,0x00,
                                      0x00,0x00 };
//两只蝴蝶
unsigned char code Music_Two[] ={ 0x17,0x03, 0x16,0x03, 0x17,0x01, 0x16,0x03, 0x17,0x03,
                                      0x16,0x03, 0x15,0x01, 0x10,0x03, 0x15,0x03, 0x16,0x02,
                                      0x16,0x0D, 0x17,0x03, 0x16,0x03, 0x15,0x03, 0x10,0x03,
                                      0x10,0x0E, 0x15,0x04, 0x0F,0x01, 0x17,0x03, 0x16,0x03,
                                      0x17,0x01, 0x16,0x03, 0x17,0x03, 0x16,0x03, 0x15,0x01,
```

```c
                                        0x10,0x03, 0x15,0x03, 0x16,0x02, 0x16,0x0D, 0x17,0x03,
                                        0x16,0x03, 0x15,0x03, 0x10,0x03, 0x15,0x03, 0x16,0x01,
                                        0x17,0x03, 0x16,0x03, 0x17,0x01, 0x16,0x03, 0x17,0x03,
                                        0x16,0x03, 0x15,0x01, 0x10,0x03, 0x15,0x03, 0x16,0x02,
                                        0x16,0x0D, 0x17,0x03, 0x16,0x03, 0x15,0x03, 0x10,0x03,
                                        0x10,0x0E, 0x15,0x04, 0x0F,0x01, 0x17,0x03, 0x19,0x03,
                                        0x19,0x01, 0x19,0x03, 0x1A,0x03, 0x19,0x03, 0x17,0x01,
                                        0x16,0x03, 0x16,0x03, 0x16,0x02, 0x16,0x0D, 0x17,0x03,
                                        0x16,0x03, 0x15,0x03, 0x10,0x03, 0x10,0x0D, 0x15,0x00,
                                        0x19,0x03, 0x19,0x03, 0x1A,0x03, 0x1F,0x03, 0x1B,0x03,
                                        0x1B,0x03, 0x1A,0x03, 0x17,0x0D, 0x16,0x03, 0x16,0x03,
                                        0x16,0x0D, 0x17,0x01, 0x17,0x03, 0x17,0x03, 0x19,0x03,
                                        0x1A,0x02, 0x1A,0x02, 0x10,0x03, 0x17,0x0D, 0x16,0x03,
                                        0x16,0x01, 0x17,0x03, 0x19,0x03, 0x19,0x03, 0x17,0x03,
                                        0x19,0x02, 0x1F,0x02, 0x1B,0x03, 0x1A,0x03, 0x1A,0x0E,
                                        0x1B,0x04, 0x17,0x02, 0x1A,0x03, 0x1A,0x03, 0x1A,0x0E,
                                        0x1B,0x04, 0x1A,0x03, 0x19,0x03, 0x17,0x03, 0x16,0x03,
                                        0x17,0x0D, 0x16,0x03, 0x17,0x03, 0x19,0x01, 0x19,0x03,
                                        0x19,0x03, 0x1A,0x03, 0x1F,0x03, 0x1B,0x03, 0x1B,0x03,
                                        0x1A,0x03, 0x17,0x0D, 0x16,0x03, 0x16,0x03, 0x16,0x03,
                                        0x17,0x01, 0x17,0x03, 0x17,0x03, 0x19,0x03, 0x1A,0x02,
                                        0x1A,0x02, 0x10,0x03, 0x17,0x0D, 0x16,0x03, 0x16,0x01,
                                        0x17,0x03, 0x19,0x03, 0x19,0x03, 0x17,0x03, 0x19,0x03,
                                        0x1F,0x02, 0x1B,0x03, 0x1A,0x03, 0x1A,0x0E, 0x1B,0x04,
                                        0x17,0x02, 0x1A,0x03, 0x1A,0x03, 0x1A,0x0E, 0x1B,0x04,
                                        0x17,0x16, 0x1A,0x03, 0x1A,0x03, 0x1A,0x0E, 0x1B,0x04,
                                        0x1A,0x03, 0x19,0x03, 0x17,0x03, 0x16,0x03, 0x0F,0x02,
                                        0x10,0x03, 0x15,0x00, 0x00,0x00 };
//*************************************************************************
main()
{
    InitialSound();
    while(1)
    {
        Play(Music_Girl,0,3,360);
        Delay1ms(500);
        Play(Music_Same,0,3,360);
        Delay1ms(500);
        Play(Music_Two,0,3,360);
```

```
            Delay1ms(500);
        }
}
```