

## **Embedded Systems Mini-Project**

### **5th Semester- Information Technology**

#### **Team Details:**

Batch 5, Team 6

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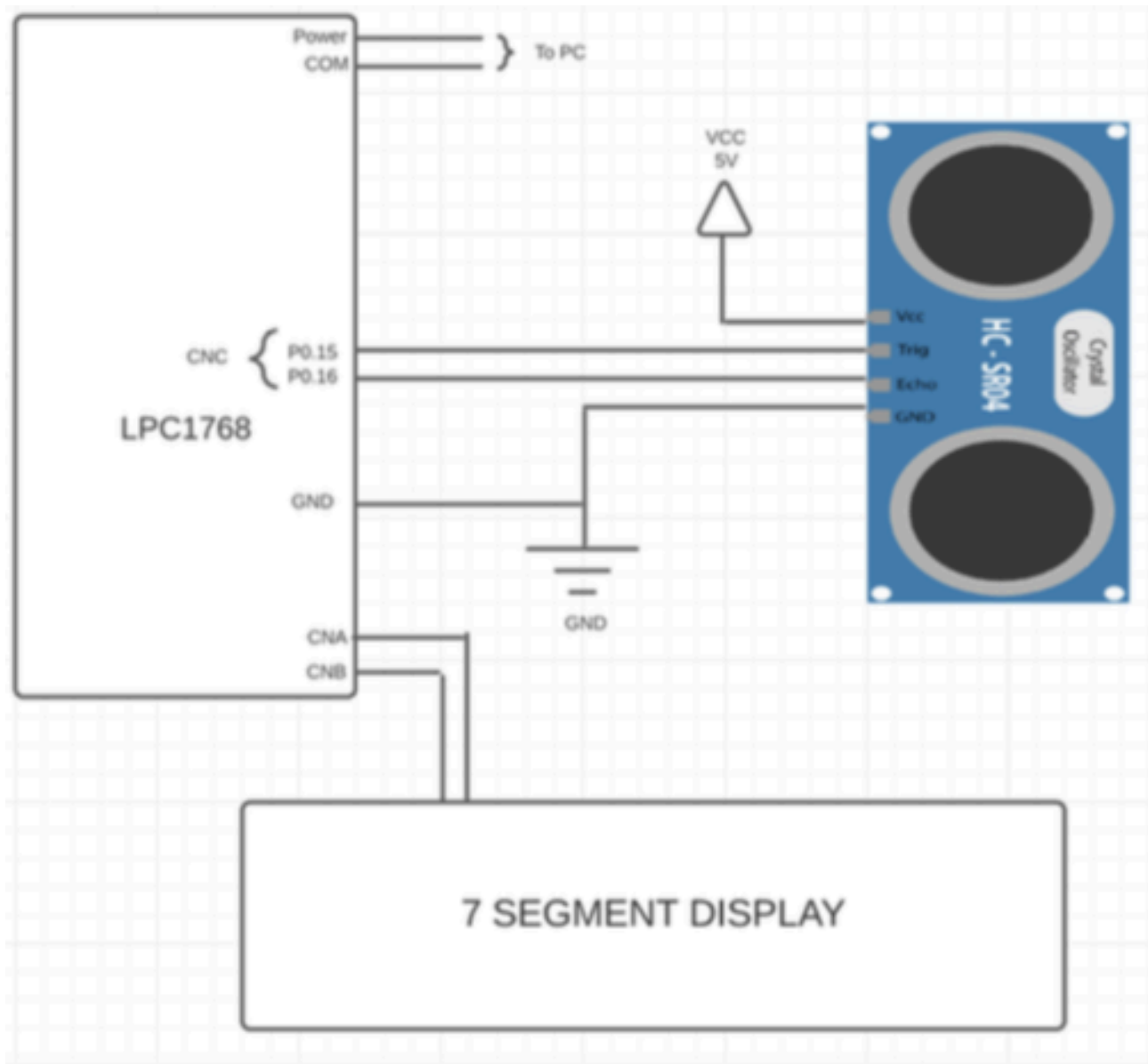
#### **Problem Statement:**

*Interfacing the Doppler sensor- HC SR04 to the LPC1768 microcontroller and displaying the distance of an object on a 7 segment display.*

#### **Hardware Components Used:**

- HC SR04 ultrasonic sensor
- LPC 1768 microcontroller kit
- Flat Ribbon Cables
- Wires

**Detailed diagram with pin details:**



**Code:**

```
#include<lpc17xx.h>
#include<stdio.h>
#include<math.h>

void display(float); //Seven Seg Display function declaration

unsigned int timeval=0;
```

```

float result=0.00;
int i = 0;

unsigned long SevenSeg[] = {0x3F0, 0x060, 0x5B0, 0x4F0, 0x660, 0x6D0,
0x7D0, 0x070, 0x7F0, 0x6F0};    //0,1,2,3,4,5,6,7,8,9 Display on seven
seg

void timer_init1()
{
    LPC_TIM0->TCR=0x02;    //TC and PC Reset
    LPC_TIM0->PR=0x02;
    //LPC_TIM0->MR0=49;
    LPC_TIM0->MR0=0x09;
    LPC_TIM0->CTCR=0x00;    //Timer Mode
    LPC_TIM0->EMR=0x20;    //Set match bit upon match
    LPC_TIM0->MCR=0x04;    //Stop on MR0. TC and PC stopped and TCR0[0]
= 0 if MR0 = TC
    LPC_TIM0->TCR=0x01;    //Enabled for Counting
}

void timer_init2()
{
    LPC_TIM1->TCR=0x02;    //TC and PC Reset
    LPC_TIM1->PR=0x02;
    LPC_TIM1->MR0=0x00;
    LPC_TIM1->CTCR=0x00;    //Timer Mode
    LPC_TIM1->EMR=0x10;
    LPC_TIM1->MCR=0x00;
    LPC_TIM1->TCR=0x01;    //Enable for Counting
}

int main()
{
    //P0.15=trig, P0.16=echo
    SystemInit();
    SystemCoreClockUpdate();
    LPC_PINCON->PINSEL0 &= 0x3F0000FF;    //P0.4 to P0.11 for 7
segment, P0.15 for Trigger HC-SR04
    LPC_PINCON->PINSEL1 &= 0xFFFFFFFF;    //P0.16 for Echo HC-SR04
    LPC_PINCON->PINSEL3 &= 0XFFC03FFF;    //P1.23 to P1.26 for 7
segment
    LPC_GPI00->FIODIR = 0x00008FF0;    //P0.4 to P0.11 Output for 7
segment, P0.15 Output for Trigger, P0.16 Input for Echo
    LPC_GPI01->FIODIR = 0x07800000;    //P1.23 to P1.26 Output for 7
Segment

    while(1)
    {
        LPC_GPI00->FIOSET =(1<<15);    //Set P0.15
        timer_init1();    //Trigger

        while(!(LPC_TIM0->EMR & (0x01)));    //10 microsecond Delay

        LPC_TIM0->TCR=0x02;    //Stop Timer
        LPC_GPI00->FIOCLR =(1<<15);    // clear P0.15
    }
}

```

```

        while(!(LPC_GPIO0->FIOPIN&(1<<16)));

        timer_init2();                                //Counting till we get
Echo
        while((LPC_GPIO0->FIOPIN&(1<<16)));

        LPC_TIM1->TCR=0x00;                            //Stop Counter

        timeval= LPC_TIM1->TC;                        //Time between
        result=timeval/58.31;                        //Result in cm. result =
(T(microseconds) * 0.0343 (cm / microseconds)) / 2
        //Distance D = Dist / 2, Dist = Velocity * Time, Dist is twice
the gap between the sensor and object since it travels from sensor to
object and comes back
        display(result);                            //Seven Segment Display
    }
}

void display(float f)
{
    int a, b,c,d,j;
    float dec1;

    a = f/10;                                        //a is the digit at tens place
    b = fmod(f,10);                                //b is the digit at unit place
    dec1=fmod(f,1);
    dec1 = dec1 *100;
    c = dec1/10;                                    //c is the digit at tenth place
    d = fmod(dec1,10);                             //d is the digit at hundredth
place

    LPC_GPIO1->FIOPINH = 0x0000;
    LPC_GPIO0->FIOPINL = SevenSeg[d];              //setting the 4th display
    for(j=0;j<100;j++);

    LPC_GPIO1->FIOPINH = 0x0080;
    LPC_GPIO0->FIOPINL = SevenSeg[c];              //setting the 3rd display
    for(j=0;j<100;j++);

    LPC_GPIO1->FIOPINH = 0x0100;
    LPC_GPIO0->FIOPINL = SevenSeg[b];              //setting the 2nd display
    for(j=0;j<100;j++);

    LPC_GPIO1->FIOPINH = 0x0180;
    LPC_GPIO0->FIOPINL = SevenSeg[a];              //setting the 1st display
    for(j=0;j<100;j++);

    for(j=0;j<1000;j++); //delay
}

```

Result:

