

```

#include <reg51.h>
#include <stdio.h>
#include <intrins.h>
#include <math.h>
#define sound_velocity 34300
#define period_in_us pow(10,-6)
#define Clock_period 1.085*period_in_us
#define PWM_Period 0xB7FE
sbit clk1 = P3^0;
sbit anticlk1= P3^1;
sbit control1 = P2^0;
sbit clk2 = P3^2;
sbit anticlk2= P3^3;
sbit control2 = P2^1;
sbit clk3 = P3^4;
sbit anticlk3= P3^5;
sbit control3 = P2^2;
sbit clk4 = P1^0;
sbit anticlk4= P1^1;
sbit control4= P2^3;
sbit output=P2^4;
sbit Trigger_pin=P2^5;
sbit Echo_pin=P2^6;
int distanceStraight=14;
int distanceR=30;
int distanceL=80;
int goesForward=0;
void turnRight(void);
void turnLeft(void);
void moveForward(void);
void moveBackward(void);
void moveStop(void);
void delay(unsigned int);
void msdelay(unsigned int);
void servo_delay(int);
void delay_ms2(unsigned int ms);
void rotateToPositive90(void);
void rotateToNegative90(void);
unsigned int ON_Period, OFF_Period, DutyCycle;
void delayreal(unsigned int);
void Timer_init(void);
void Set_DutyCycle_To(float);
void Delay_us(void);
void init_timer(void);
void send_trigger_pulse(void);
void ultraSonic_init(void);
void servoMotor_init(void);
void Timer_init()
{
    TMOD = 0x01;
    TH0 = (PWM_Period >> 8);
    TLO = PWM_Period;
    TR0 = 1; }
void delay(unsigned int count) {
    unsigned int i,j;
    for ( i = 0; i < count; i++) {
        for ( j = 0; j < 922; j++);
    }
}
void main(void) {
    clk1=0;
    anticlk1=0;
    control1=1;

```

```

        clk2=0;
    anticlk2=0;
    control2=1;
        clk3=0;
    anticlk3=0;
    control3=1;
        clk4=0;
    anticlk4=0;
    control4=1;
distanceStraight=30;
distanceR=30;
distanceL=80;
if(distanceStraight<=15)
{
    moveStop();
    delayreal(100);
    moveBackward();
    delayreal(300);
    moveStop();
    delayreal(200);
    servoMotor_init();
    if(distanceR>=distanceL)
    {
        turnRight();
        moveStop();
    }
    else
    {
        turnLeft();
        moveStop();
    }
}
else
{
    moveForward();
}

}
void moveForward()
{
    if(!goesForward)
        goesForward=1;
    clk1=1;
    anticlk1=0;
    clk2=1;
    anticlk2=0;
    clk3=1;
    anticlk3=0;
    clk4=1;
    anticlk4=0;
}
void moveBackward()
{
    goesForward=0;
    clk1=0;
    anticlk1=1;
    clk2=0;
    anticlk2=1;
    clk3=0;
    anticlk3=1;
    clk4=0;
    anticlk4=1;
}

```

```

}
void turnRight()
{
    clk1=1;
    anticlk1=0;
    clk2=1;
    anticlk2=0;
    clk3=0;
    anticlk3=1;
    clk4=0;
    anticlk4=1;
    delay(100);
        clk1=1;
    anticlk1=0;
    clk2=1;
    anticlk2=0;
    clk3=1;
    anticlk3=0;
    clk4=1;
    anticlk4=0;

}
void turnLeft()
{
        clk1=0;
    anticlk1=1;
    clk2=0;
    anticlk2=1;
        clk3=1;
    anticlk3=0;
    clk4=1;
    anticlk4=0;
    delay(100);
        clk1=1;
    anticlk1=0;
    clk2=1;
    anticlk2=0;
    clk3=1;
    anticlk3=0;
    clk4=1;
    anticlk4=0;

}
void moveStop()
{
    clk1=0;
    anticlk1=0;
        clk2=0;
    anticlk2=0;
        clk3=0;
    anticlk3=0;
        clk4=0;
    anticlk4=0;
}
void msdelay(unsigned int time)
{
    unsigned i,j ;
    for(i=0;i<time;i++)
    for(j=0;j<1275;j++);}

void servo_delay(int times)
{
    int m;

```

```

for(m=0;m<times;m++)
{
    TH0=0xFF;
    TL0=0xD2;
    TR0=1;
    while(TF0==0);
    TF0=0;
    TR0=0;
}
void delayreal(unsigned int count)
{
    int i,j;
    for(i=0; i<count; i++)
        for(j=0; j<112; j++);
}
void Timer0_ISR() interrupt 1
{
    output= !output;
    if(output)
    {
        TH0 = (ON_Period >> 8);
        TL0 = ON_Period;
    }
    else
    {
        TH0 = (OFF_Period >> 8);
        TL0 = OFF_Period;
    }
}
void Set_DutyCycle_To(float duty_cycle)
{
    float period = 65535 - PWM_Period;
    ON_Period = ((period/100.0) * duty_cycle);
    OFF_Period = (period - ON_Period);
    ON_Period = 65535 - ON_Period;
    OFF_Period = 65535 - OFF_Period;
}
void Delay_us()
{
    TL0=0xF5;
    TH0=0xFF;
    TR0=1;
    while (TF0==0);
    TR0=0;
    TF0=0;
}

void init_timer(){
    TMOD=0x01;
    TF0=0;
    TR0 = 0;
}

void send_trigger_pulse(){
    Trigger_pin= 1;
    Delay_us();
    Trigger_pin = 0;
}
void ultraSonic_init()
{
    float distance_measurement, value;
    unsigned char distance_in_cm[10];

```

```

init_timer();

send_trigger_pulse();                                /* send trigger pulse of 10us */

while(!Echo_pin);                                   /* Waiting for Echo */
TRO = 1;                                           /* Timer Starts */
while(Echo_pin && !TF0);                             /* Waiting for Echo goes LOW */
TRO = 0;                                           /* Stop the timer */

/* calculate distance using timer */
value = Clock_period * sound_velocity;
distance_measurement = (TRO|(TH0<<8)); /* read timer register for time count */
distance_measurement = (distance_measurement*value)/2.0; /* find distance(in cm) */
sprintf(distance_in_cm, "%.2f", distance_measurement);

delay(100);}}

void servoMotor_init()
{
    output=0;
    EA = 1; /* Enable global interrupt */
    ETO = 1; /* Enable timer0 interrupt */
    Timer_init();
    Set_DutyCycle_To(7);/* 1.4ms(7%) of 20ms(100%) period */
    delayreal(1000);
    Set_DutyCycle_To(7);/* 0.54ms(2.7%) of 20ms(100%) period */
    delayreal(1000);
    Set_DutyCycle_To(12);/* 2.4ms(12%) of 20ms(100%) period */
    delayreal(1000);
    Set_DutyCycle_To(2.7);/* 0.54ms(2.7%) of 20ms(100%) period */
    delayreal(1000);
}

```

