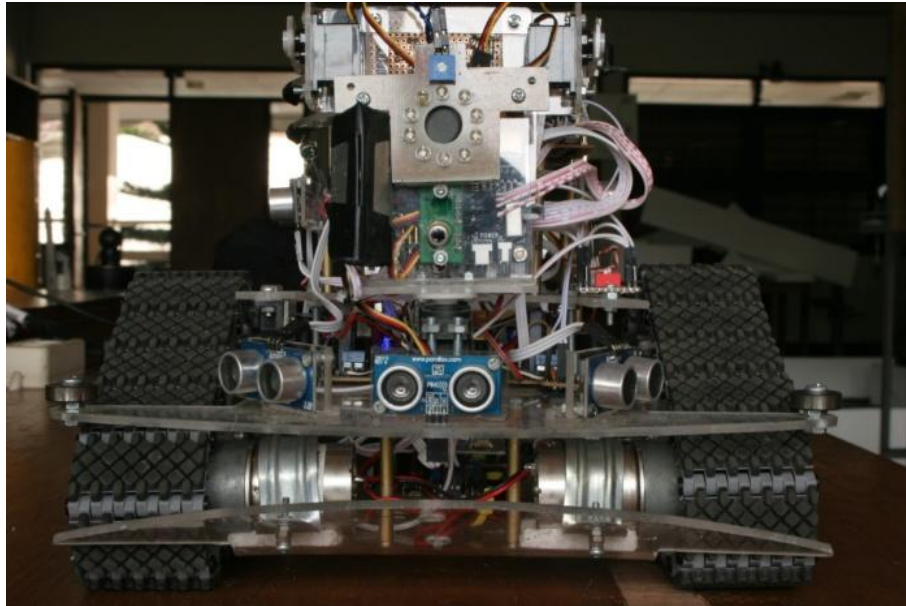
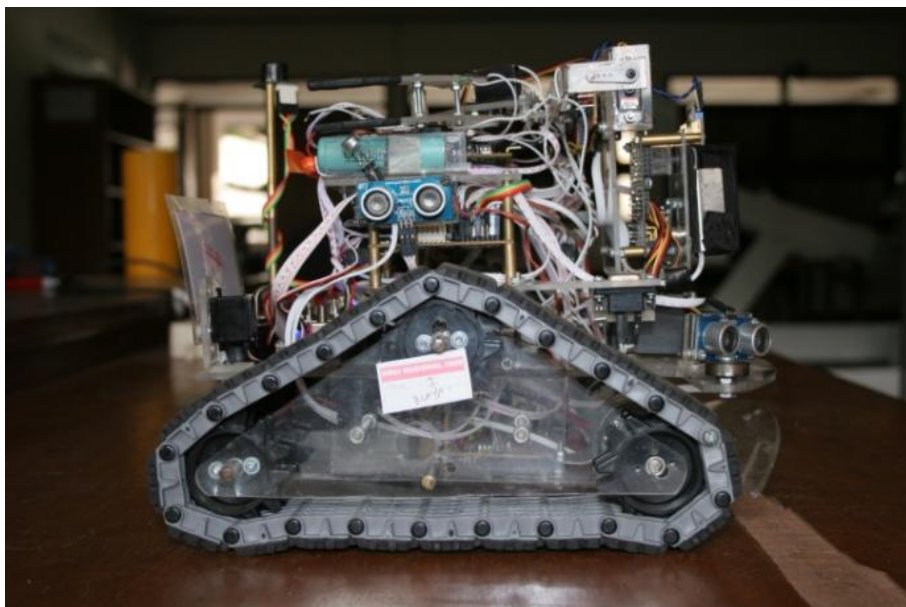


**LAMPIRAN A**  
**FOTO ROBOT MOBIL TANK**

**TAMPAK DEPAN**



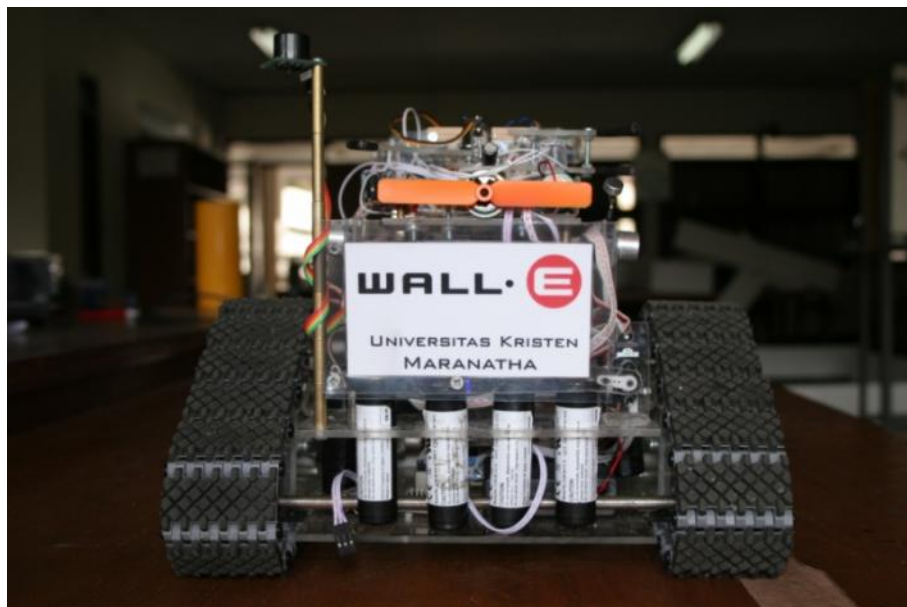
**TAMPAK SAMPING KANAN**



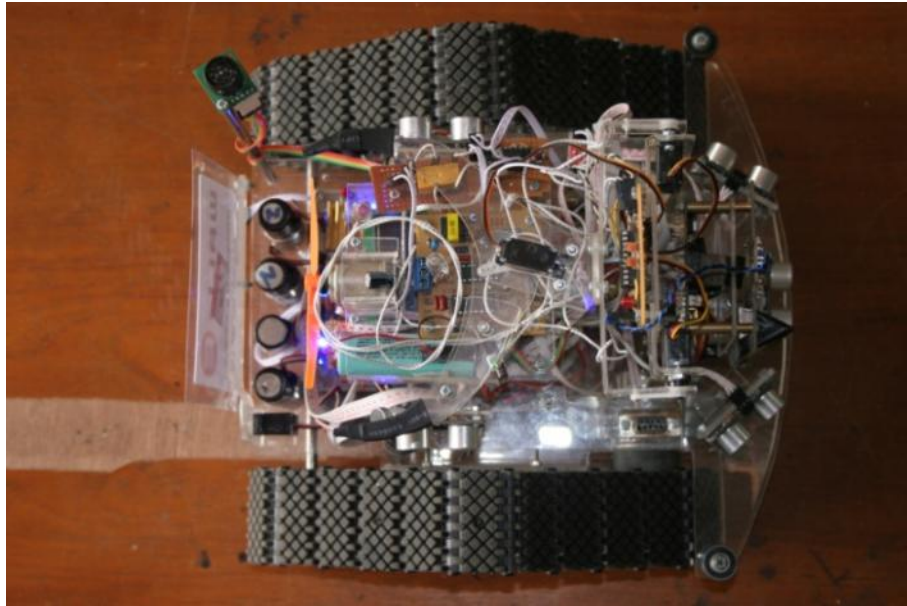
**TAMPAK SAMPING KIRI**



**TAMPAK BELAKANG**



**TAMPAK ATAS**



**LAMPIRAN B**  
**PROGRAM PADA PENGONTROL MIKRO**  
**ATMEGA16 DAN ATTINY2313**

<b>ATMEGA16 .....</b>	<b>B-1</b>
<b>ATTINY2313.....</b>	<b>B-24</b>

## PROGRAM UTAMA ATMEGA16

/\*\*\*\*\*\*  
This program was produced by the  
CodeWizardAVR V1.25.3 Standard  
Automatic Program Generator  
© Copyright 1998-2007 Pavel Haiduc, HP InfoTech s.r.l.  
http://www.hpinfotech.com  
Project : WALL\_E  
Version : 1  
Date : 3/3/2009  
Author : SUFENDI && WIWIK && TEAM  
Company : LAB FISIKA  
Comments: KRCI EXPERT SINGLE 2009  
Chip type : ATmega16  
Program type : Application  
Clock frequency : 11.059200 MHz  
Memory model : Small  
External SRAM size : 0  
Data Stack size : 256  
\*\*\*\*\*/  
#include <mega16.h>  
#include <delay.h>  
#include <stdio.h>  
// I2C Bus functions  
#asm  
.equ \_\_i2c\_port=0x18 ;PORTB  
.equ \_\_sda\_bit=4  
.equ \_\_scl\_bit=0  
#endasm  
#include <i2c.h>  
unsigned char text[32],dat2[32],dat[32];  
unsigned int i,t,ki,kik,te,kak,ka,z,x,ar,pos,ats,atas1,atas2,b,a,c,d;  
unsigned char kps,kps2,temp,temp1,temp2,temp3,temp4,temp5,temp6,servo;  
char tangga(void);  
char bayi(void);  
char lilin(void);  
char cek(void);  
bit ada2,ada;  
// Alphanumeric LCD Module functions  
#asm  
.equ \_\_lcd\_port=0x15 ;PORTC  
#endasm  
#include <lcd.h>  
#define RXB8 1  
#define TXB8 0  
#define UPE 2  
#define OVR 3  
#define FE 4  
#define UDRE 5  
#define RXC 7

```

#define FRAMING_ERROR (1<<FE)
#define PARITY_ERROR (1<<UPE)
#define DATA_OVERRUN (1<<OVR)
#define DATA_REGISTER_EMPTY (1<<UDRE)
#define RX_COMPLETE (1<<RXC)

// USART Receiver buffer
#define RX_BUFFER_SIZE 8
char rx_buffer[RX_BUFFER_SIZE];

#if RX_BUFFER_SIZE<256
unsigned char rx_wr_index,rx_rd_index,rx_counter;
#else
unsigned int rx_wr_index,rx_rd_index,rx_counter;
#endif

// This flag is set on USART Receiver buffer overflow
bit rx_buffer_overflow;

// USART Receiver interrupt service routine
interrupt [USART_RXC] void usart_rx_isr(void)
{
char status,data;
status=UCSRA;
data=UDR;
if ((status & (FRAMING_ERROR | PARITY_ERROR | DATA_OVERRUN))==0)
{
rx_buffer[rx_wr_index]=data;
if (++rx_wr_index == RX_BUFFER_SIZE) rx_wr_index=0;
if (++rx_counter == RX_BUFFER_SIZE)
{
rx_counter=0;
rx_buffer_overflow=1;
};
};
if(data==255) x=0;// carry return
dat[x]=data;
x++;
}

#ifndef _DEBUG_TERMINAL_IO_
// Get a character from the USART Receiver buffer
#define _ALTERNATE_GETCHAR_
#pragma used+
char getchar(void)
{
char data;
while (rx_counter==0);
data=rx_buffer[rx_rd_index];
if (++rx_rd_index == RX_BUFFER_SIZE) rx_rd_index=0;
#asm("cli")
--rx_counter;
#asm("sei")
return data;
}
#pragma used-
#endif

// Standard Input/Output functions
#include <stdio.h>

// Timer 0 output compare interrupt service routine

```

```

interrupt [TIM0_COMP] void timer0_comp_isr(void)
{
// Place your code here

}

// Timer 2 output compare interrupt service routine
interrupt [TIM2_COMP] void timer2_comp_isr(void)
{
// Place your code here

}

// Declare your global variables here

void main(void)
{
// Declare your local variables here

// Input/Output Ports initialization
// Port A initialization
// Func7=In Func6=In Func5=Out Func4=In Func3=In Func2=In Func1=Out Func0=Out
// State7=P State6=T State5=0 State4=T State3=P State2=T State1=0 State0=0
PORTA=0x88;
DDRA=0x23;

// Port B initialization
// Func7=In Func6=In Func5=In Func4=In Func3=Out Func2=Out Func1=Out Func0=In
// State7=T State6=T State5=T State4=T State3=0 State2=0 State1=0 State0=T
PORTB=0x00;
DDRB=0x0E;

// Port C initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTC=0x00;
DDRC=0x00;

// Port D initialization
// Func7=Out Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=In
// State7=0 State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTD=0x00;
DDRD=0x80;

// Timer/Counter 0 initialization
// Clock source: System Clock
// Clock value: 10.800 kHz
// Mode: Fast PWM top=FFh
// OC0 output: Non-Inverted PWM
TCCR0=0x6D;
TCNT0=0x00;
OCR0=0xFF;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: Timer 1 Stopped
// Mode: Normal top=FFFFh
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge

```



```

// Timer 1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x00;
TCNT1H=0x00;
TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x00;
OCR1AL=0x00;
OCR1BH=0x00;
OCR1BL=0x00;

// Timer/Counter 2 initialization
// Clock source: System Clock
// Clock value: 10.800 kHz
// Mode: Fast PWM top=FFh
// OC2 output: Non-Inverted PWM
ASSR=0x00;
TCCR2=0x6F;
TCNT2=0x00;
OCR2=0xFF;

// External Interrupt(s) initialization
// INT0: Off
// INT1: Off
// INT2: Off
MCUCR=0x00;
MCUCSR=0x00;

// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x82;

// USART initialization
// Communication Parameters: 8 Data, 1 Stop, No Parity
// USART Receiver: On
// USART Transmitter: On
// USART Mode: Asynchronous
// USART Baud rate: 115200
UCSRA=0x00;
UCSRB=0x98;
UCSRC=0x86;
UBRRH=0x00;
UBRRL=0x05;

// Analog Comparator initialization
// Analog Comparator: Off
// Analog Comparator Input Capture by Timer/Counter 1: Off
ACSR=0x80;
SFIOR=0x00;

// I2C Bus initialization
i2c_init();

// LCD module initialization
lcd_init(16);

// Global enable interrupts
#asm("sei")
pos=0;

```

```

ada=0;//bayi
ada2=0;//api
b=0;
while (1)
{

//-----
//          lantai 1
//-----
//-----inisialisasi awal-----
ar=160; //arah tangga
switch (pos) {
case 0:

//cek sound activation.....
//-----
OCR0=0x00;
OCR2=0x00;
lcd_clear();
sprintf(dat2," mana tepuk tangannya!!!!");
lcd_puts(dat2);
wait:
if(PINA.6==1 ) goto next;
else goto wait;
next:

//setting kamera
printf("RS \r");
delay_ms(100);
printf("sv 0 120\r");
delay_ms(100);
printf("RM 3 \r");
delay_ms(100);
printf("PM 0 \r");
delay_ms(100);

goto no;
//-----bila kondisi dibawah tangga-----

bawahtangga: kompas();
kps2=kps;
//patok kanan bawah tangga
if(kps2>=ar || kps2<=(ar-128) )
{
while(pos==0)
{
if(PINA.7==1) cek();
if(PINA.7==0) c=0;
if(pos==1) goto end1;
OCR2=0xcc; //kanan
if(kak>=40) {kak=55;OCR2=0xee; }
if(kak<=10) kak=10;
PORTB.2=0;
PORTB.1=0;
OCR0=(-5.1*kak)+306; //kanan
lcd_clear();
sprintf(dat2,"bwh kak=%3d ocr0=%3d",kak,OCR0);
lcd_puts(dat2);
kanank();
tengah();
kirik();
}
}
}

```

```

if(te<=8 && kak<=20 && kik<=20)
{
    while(kps<(ar-5) || kps>(ar+5))//putar 180 derajat
    {
        PORTB.2=0;
        PORTB.1=1;
        OCR0=0xdd;
        OCR2=0xdd;
        kompas();
    }
    while(pos==0) //patok kiri
    {
        if(PINA.7==1) cek();
        if(PINA.7==0) c=0;
        if(pos==1) goto end1;
        OCR0=0xcc; //kanan
        if(kik>=40) {kik=55;OCR0=0xee; }
        if(kik<=10) kik=10;
        if( te<=8 || kak<=15)
        {
            while(te<=8 || kak<=15)
            {
                PORTB.2=0;//kanan
                PORTB.1=1;//kiri
                OCR0=0xdd;
                OCR2=0xdd;
                tengah();
                kanank();
            }
        }
        PORTB.2=0;
        PORTB.1=0;
        OCR2=(-5.1*kik)+306; //kiri
        lcd_clear();
        sprintf(dat2," bwh1 kik=%3d ocr2=%3d",kik,OCR2);
        lcd_puts(dat2);
        kirik();
        tengah();
        kanank();
    }
}
}
//patok kiri bawah tangga
else if((ar-128)<kps2<ar)
{
    while(pos==0)
    {
        if(PINA.7==1) cek();
        if(PINA.7==0) c=0;
        if(pos==1) goto end1;
        OCR0=0xcc; //kanan
        if(kik>=40) {kik=55;OCR0=0xee; }
        if(kik<=10) kik=10;
        PORTB.2=0;
        PORTB.1=0;
        OCR2=(-5.1*kik)+306; //kiri
        lcd_clear();
        sprintf(dat2," bwh kik=%3d ocr2=%3d",kik,OCR2);
        lcd_puts(dat2);
        kirik();
        tengah();
    }
}

```

```

kanank();
if(te<=8 && kak<=20 && kik<=20)
{
    while(kps<(ar-5) || kps>(ar+5))//putar 180 derajat
    {
        PORTB.2=0;
        PORTB.1=1;
        OCR0=0xdd;
        OCR2=0xdd;
        kompas();
    }
    while(pos==0) //patok kanan
    {
        if(PINA.7==1) cek();
        if(PINA.7==0) c=0;
        if(pos==1) goto end1;
        OCR2=0xcc; //kanan
        if(kak>=40) {kak=55;OCR2=0xee; }
        if(kak<=10) kak=10;
        if( te<=8 || kak<=15)
        {
            while(te<=8 || kik<=15)
            {
                PORTB.2=1;//kanan
                PORTB.1=0;//kiri
                OCR0=0xdd;
                OCR2=0xdd;
                tengah();
                kirik();
            }
        }
        PORTB.2=0;
        PORTB.1=0;
        OCR0=(-5.1*kak)+306; //kanan
        lcd_clear();
        sprintf(dat2,"bwh1 kak=%3d ocr0=%3d",kak,OCR0);
        lcd_puts(dat2);
        kanank();
        tengah();
        kirik();
    }
}
}

//-----akhir dari kondisi dibawah tangga-----
//-----tidak ada tangga-----
no:  lcd_clear();
    sprintf(dat2,"ga dapat tangga");
    lcd_puts(dat2);
    while( kps<(ar-5) || kps>(ar+5))//putar kearah tangga
    {
        PORTB.2=0;
        PORTB.1=1;
        OCR0=0xdd;
        OCR2=0xdd;
        kompas();
        lcd_clear();
        sprintf(dat2,"ar=%d kps=%d",ar,kps);
        lcd_puts(dat2);
    }
    tengah();

```

```

kirik();
kanank();
ulang:
while(te>10)//maju osilasi
{
if(PINA.7==1) cek();
if(PINA.7==0) c=0;
if(pos==1) goto end1;
tengah();
kirik();
kanank();
if(kik>=20) kik=20;
if(kik<=10) kik=10;
if(kak>=20) kak=20;
if(kak<=10) kak=10;
PORTB.2=0;
PORTB.1=0;
OCR2=(25.5*kak)-255; //kiri
OCR0=(25.5*kik)-255; //kanan
}
tengah();
kirik();
kanank();
if(te<15 && kik<40 && kak<40)
goto terus;
else goto ulang;
terus:
atas();
delay_ms(200);
while(te<30 || kik<12)//putar kanan awal
{
OCR0=0xff;
OCR2=0xff;
PORTB.2=1;//kanan
PORTB.1=0;//kiri
tengah();
kirik();
}
//-----proses perulangan di lantai satu-----
loop:
atas();
tengah();
kiri();
kanan();
kirik();
kanank();
if(ats<25) goto bawahtangga;
if(PINA.7==1) cek();
if(PINA.7==0) c=0;
if(pos==1) goto end1;

if(PINA.3==1)
{
if(te<20 || kak<35)
{
OCR0=0x00;
OCR2=0x00;
lilin();
while(dat[8]>=10 || dat[9]>=10 || kik<12)
{
PORTB.2=1;//kanan
PORTB.1=0;//kiri

```

```

        OCR0=0xff;
        OCR2=0xff;
        lilin();
        kirik();
        lcd_clear();
        sprintf(dat2,"%d %d kik=%d",dat[8],dat[9],kik);
        lcd_puts(dat2);
    }
}
//depan atau kiri ada halanganm putar kanan
if(te<8 || kik<12)
{
    while(te<8 || kak<12 ||kik<12)
    {
        PORTB.2=1;//kanan
        PORTB.1=0;//kiri
        OCR0=0xff;
        OCR2=0xff;
        tengah();
        kanank();
        kirik();
        lcd_clear();
        sprintf(dat2,"kak=%d te=%d kik=%d",kak,te,kik);
        lcd_puts(dat2);
    }
}
//kanan ada halangan
if(kak<10)
{
    if(kik>12)
    { //putar kiri menghindar
        while(te<10 || kak<12)
        {
            OCR0=0xff;
            OCR2=0xff;
            PORTB.2=0;//kanan
            PORTB.1=1;//kiri
            tengah();
            kanank();
            lcd_clear();
            sprintf(dat2,"kanan=%3d kiri>12",kak);
            lcd_puts(dat2);
        }
    }
    else
    { //putar kanan menghindar
        while(te<10 || kak<12 || kik<12)
        {
            OCR0=0xff;
            OCR2=0xff;
            PORTB.2=0;//kanan
            PORTB.1=1;//kiri
            tengah();
            kirik();
            kanank();
            lcd_clear();
            sprintf(dat2,"kanan=%3d kiri=%3d",kak,kik);
            lcd_puts(dat2);
        }
    }
}
}

```

```

    }
    //kondisi normal,patok kiri
    else
    {
    a=0;
    OCR0=0xcc; //kanan
    if(kik>=40) {kik=55;OCR0=0xee;}
    PORTB.2=0; //kanan
    PORTB.1=0; //kiri
    OCR2=(-5.1*kik)+306; //kiri
    lcd_clear();
    sprintf(dat2,"GA ADA kik=%3d ocr2=%3d ",kik,OCR2);
    lcd_puts(dat2);
    }
    goto loop;

end1:

break;

//-----
//          lantai 2
//-----

case 1:
    OCR0=0x00;
    OCR2=0x00;
    for(z=0;z<70;z++)//bendera turun
    {
    PORTA.0=1;
    delay_us(1800);
    PORTA.0=0;
    delay_ms(18);
    }
    printf("RS \r"); //setting kamera
    delay_ms(100);
    printf("sv 0 120\r");
    delay_ms(100);
    printf("RM 3 \r");
    delay_ms(100);
    printf("PM 0 \r");
    bayi();
    delay_ms(100);

loop1:

if(PINA.2==1 && ada==0) ada2=1;//bila global mendeteksi api sebelum bayi diselamatkan
if(PINA.3==1 && ada==1) goto api;

//-----program gerak ikut dinding kanan-----
--

if(ada==1 && ada2==1)//api ditemukan terlebih dahulu sebelum bayi dan bayi telah diselamatkan
{
    tengah();
    kiri();
    kanan();
    kanank();

```

```

kirik();
OCR2=0xcc; //kanan
if(kak>=40) {kak=55;OCR2=0xee; }
PORTB.2=0; //kanan
PORTB.1=0; //kiri
OCR0=(-5.1*kak)+306; //kiri
lcd_clear();
sprintf(dat2,"Int2 kak=%3d ocr0=%3d %d %d %d",kak,OCR0,PINA.3);
lcd_puts(dat2);
//program menghindari dan perlu revisi*****
if(te<8)
  { //putar kiri
    if(PINA.2==1) goto api;
    while(te<30 || kak<12)
      {
        OCR0=0xff;
        OCR2=0xff;
        PORTB.2=0; //kanan
        PORTB.1=1; //kiri
        tengah();
        kanank();
      }
  }
if(kak<10 && kik>18)
  { //putar kiri
    while(kak<12)
      {
        OCR0=0xcc;
        OCR2=0xcc;
        PORTB.2=0; //kanan
        PORTB.1=1; //kiri
        kanank();
      }
  }
if(kik<10)
  {
    if(kak>12)
      { //putar kanan dikit
        while(kik<12)
          {
            OCR0=0xcc;
            OCR2=0xcc;
            PORTB.2=1; //kanan
            PORTB.1=0; //kiri
            kirik();
          }
      }
    else
      { //putar kiri
        while(kak<12)
          {
            OCR0=0xcc;
            OCR2=0xcc;
            PORTB.2=0; //kanan
            PORTB.1=1; //kiri
            kanank();
          }
      }
  }
}

```



```
//-----program gerak ikut dinding kiri-----
```

```
else
{
//----bila bayi belum ditemukan dan cek bayi
if(ada==0)
{
if(dat[8]>=10 && dat[9]>=7)//ada warna bayi
{
OCR0=0x00; //kanan
OCR2=0x00; //kiri
printf("RS \r"); //setting kamera
delay_ms(100);
printf("sv 0 120\r");
delay_ms(100);
printf("RM 3 \r");
delay_ms(100);
printf("PM 0 \r");
bayi();
delay_ms(100);
kompas();
kps2=kps;
while(dat[2]<=34 || dat[2]>=54 || dat[8]<=2 || dat[9]<=2)
{
OCR0=0x00;
OCR2=0x00;
if(kps<=kps2-30 || kps>kps2+30) goto loop1;
if(dat[2]<=54)
{
PORTB.2=1; //kanan
PORTB.1=0; //kiri
}
if(dat[2]>=34)
{
PORTB.2=0; //kanan
PORTB.1=1; //kiri
}
printf("RS \r"); //setting kamera
delay_ms(100);
printf("sv 0 120\r");
delay_ms(100);
printf("RM 3 \r");
delay_ms(100);
printf("PM 0 \r");
bayi();
delay_ms(100);
OCR0=0xff;
OCR2=0xff;
lcd_clear();
sprintf(dat2, "%d %d %d kps2=%d kps=%d", dat[2], dat[8], dat[9], kps2, kps);
lcd_puts(dat2);
kompas();
delay_ms(75);
}
tengah();
kirik();
kanank();
ceklagi:
while(te>=8)
{
if(dat[2]>=24 && dat[2]<=64)
```

```

        {
        lcd_clear();
        sprintf(dat2,"%d %d %d kps2=%d kps=%d",dat[2],dat[8],dat[9],kps2,kps);
        lcd_puts(dat2);
        tengah();
        kirik();
        kanank();
        //if(kik>=20) kik=20;
        if(kik<=10) kik=10;
        //if(kak>=20) kak=20;
        if(kak<=10) kak=10;
        PORTB.2=0;
        PORTB.1=0;
        OCR2=(25.5*kak)-255; //kiri
        OCR0=(25.5*kik)-255; //kanan
        if(kik>=20) OCR0=0xaf;
        if(kak>=20) OCR2=0xaf;
        }
        else goto loop1;
    }
    OCR0=0x00; //kanan
    OCR2=0x00; //kiri
    tengah();
    if(te>=8) goto ceklagi;
    printf("RS \r");
    tpa81();
    delay_ms(100);
    OCR0=0x00; //kanan
    OCR2=0x00; //kiri
    for (servo=100;servo<140;servo++)
    {
        tpa81();
        if(temp1>=100 || temp2>=100 || temp3>=100 || temp4>=100 || temp5>=100 ||
temp6>=100 ) //temp ada
        {
            for(z=0;z<100;z++)//bendera naikkan
            {
                PORTA.0=1;
                delay_us(700);
                PORTA.0=0;
                delay_ms(19);
            }
            //angkat bayi
            PORTA.5=1;
            delay_ms(500);
            DDRA.5=0;
            PORTA.5=1;
            while(PINA.5==0)
            {
                lcd_clear();
                sprintf(dat2,"angkat bayi");
                lcd_puts(dat2);
                delay_ms(100);
                OCR0=0x00; //kanan
                OCR2=0x00; //kiri
            }

            printf("sv 0 120\r");
            ada=1;
            //----menghindari bayi-----
            tengah();

```

```

    kirik();
    kanank();
    while( te<25 || kik<12 || kak<12)
    {
    tengah();
    kirik();
    kanank();
    OCR0=0xcc;
    OCR2=0xcc;
    PORTB.2=1;//kanan
    PORTB.1=1;//kiri
    }
    OCR0=0xcc;
    OCR2=0xcc;
    if(ada==1 && ada2==1)
    {
    PORTB.2=0;//kanan
    PORTB.1=1;//kiri
    }
    else
    {
    PORTB.2=1;//kanan
    PORTB.1=0;//kiri
    }
    delay_ms(800);
    //-----
    //---mendeteksi api setelah ada bayi
    if(PINA.2==1)
    {
    PORTB.2=0;//kanan
    PORTB.1=1;//kiri
    while(PINA.3==0)
    {
    OCR0=0xcc;
    OCR2=0xcc;
    delay_ms(100);
    OCR0=0x00;
    OCR2=0x00;
    delay_ms(100);
    }
    goto lanjut;
    //-----
    }
    else goto loop1;
    }
    lcd_clear();
    sprintf(dat2,"srv=%d temp=%d %d %d %d %d %d %d %d %d" ,servo ,temp ,temp1 ,temp2
    ,temp3 ,temp4 ,temp5 ,temp6 ,temp6);
    lcd_puts(dat2);
    sprintf(text,"sv 0 %u\r",servo);
    puts(text);
    delay_ms(200);
    }
    printf("sv 0 120\r");
    delay_ms(100);
    printf("RM 3 \r");
    delay_ms(100);
    printf("PM 0 \r");
    bayi();
    delay_ms(100);
    }
}

```

```

//----ikuti dinding kiri
tengah();
kiri();
kanan();
kirik();
kanank();
OCR0=0xcc; //kanan
PORTB.2=0; //kanan
PORTB.1=0; //kiri
if(kik>=40) {kik=55; OCR0=0xee;}
OCR2=(-5.1*kik)+306; //kiri
lcd_clear();
printf(dat2, "Int2 kik=%d ocr2=%d %d %d %d %d %d %d", kik, OCR2, dat[8], dat[9], PINA.3,
PINA.2, ada2, ada);
lcd_puts(dat2);
//program menghindari *****perlu revisi (bila bayi telah ditemukan cek api)===

if(PINA.3==1 && PINA.2==1 && ada==0)
{
if(te<20 || kak<35)
{
OCR0=0x00;
OCR2=0x00;
while(te<15 || kik<35 || kak<10)
{
tengah();
kirik();
kanank();
PORTB.2=1; //kanan
PORTB.1=0; //kiri
OCR0=0xff;
OCR2=0xff;
delay_ms(100);
}
}
}
if(te<8)
{//putar kanan
if(PINA.2==1 && ada==1) goto api;
while(te<30 || kik<12)
{
OCR0=0xff;
OCR2=0xff;
PORTB.2=1; //kanan
PORTB.1=0; //kiri
tengah();
kirik();
}
}
if(kik<10 && kak>18)
{//putar kanan
while(kik<12)
{
OCR0=0xcc;
OCR2=0xcc;
PORTB.2=1; //kanan
PORTB.1=0; //kiri
kirik();
}
}
if(kak<10)

```

```

    {
        if(kik>12)
        { //putar kiri dikit
            while(kak<12)
            {
                OCR0=0xcc;
                OCR2=0xcc;
                PORTB.2=0; //kanan
                PORTB.1=1; //kiri
                kanank();
            }
        }
        else
        { //putar kanan
            while(kik<12)
            {
                OCR0=0xcc;
                OCR2=0xcc;
                PORTB.2=1; //kanan
                PORTB.1=0; //kiri
                kirik();
            }
        }
    }

}

goto loop1;

api: printf("sv 0 122\r");
lcd_clear();
sprintf(dat2,"api %d %d",PINA.2,PINA.3);
lcd_puts(dat2);
while(PINA.2==1) //global mendeteksi api
{
    if(PINA.3==0)
    {
        lcd_clear();
        sprintf(dat2,"cari api depan");
        lcd_puts(dat2);
        if(ada==1 && ada2==1)
        {
            PORTB.2=0; //kanan
            PORTB.1=1; //kiri
        }
        else
        {
            PORTB.2=1; //kanan
            PORTB.1=0; //kiri
        }
        OCR0=0xcc;
        OCR2=0xcc;
        delay_ms(100);
        OCR0=0x00;
        OCR2=0x00;
        delay_ms(50);
    }
    else goto lanjut; //dapat api ke label lanjut
}

```

```

goto loop1;

lanjut:   lili();
          tengah();
          while(te>23)//maju keapi dengan osilasi
          {
            tengah();
            lili();
//          if(dat[2]<=34 || dat[2]>=54 || dat[8]<=2 || dat[9]<=2)
//          {
              while(dat[2]<=24 || dat[2]>=64)
              {
                if(dat[2]<=64)
                {
                  PORTB.2=1;//kanan
                  PORTB.1=0;//kiri
                  OCR0=0xcc;
                  OCR2=0xcc;
                  delay_ms(100);
                  OCR0=0x00;
                  OCR2=0x00;
                }
                if(dat[2]>=24)
                {
                  PORTB.2=0;//kanan
                  PORTB.1=1;//kiri
                  OCR0=0xcc;
                  OCR2=0xcc;
                  delay_ms(100);
                  OCR0=0x00;
                  OCR2=0x00;
                }
              }
            lili();
          }
//        }
//        else
//        {
          tengah();
          kirik();
          kanank();
          PORTB.2=0;
          PORTB.1=0;
          if(kik<=10) kik=10;
          if(kak<=10) kak=10;
          OCR2=(25.5*kak)-255; //kiri
          OCR0=(25.5*kik)-255; //kanan
          if(kik>=20) OCR0=0xaf;
          if(kak>=20) OCR2=0xaf;
//        }
          lcd_clear();
          sprintf(dat2,"%d %d %d te=%d ",dat[2],dat[8],dat[9],te);
          lcd_puts(dat2);
        }
        OCR0=0x00;
        OCR2=0x00;
        if( PINA.3==1 && PINA.2==1)
        {
          tpa81();
          printf("RS \r");
          delay_ms(200);
          for (servo=80;servo<160;servo++)

```

```

{
tpa810);
ada
    if(temp>110||temp1>110||temp2>110||temp3>110||temp4>110||temp5>110||temp>110) //temp
    {
    kompas();
    kps2=kps;
    tengah();
    kirik();
    kanank();
    while(te<15 || kik<10 || kak<10) //mundur dikit
    {
    PORTB.2=1;//kanan
    PORTB.1=1;//kiri
    OCR0=0xcc;
    OCR2=0xcc;
    tengah();
    kirik();
    kanank();
    }
    //balik badan
    while(kps<=kps2-138 || kps>=kps2-128)//128
    {
    PORTB.2=0;//kanan
    PORTB.1=1;//kiri
    OCR0=0xff;
    OCR2=0xff;
    delay_ms(100);
    OCR0=0x00;
    OCR2=0x00;
    delay_ms(100);
    kompas();
    lcd_clear();
    sprintf(dat2,"kps2=%d kps=%d ",kps2,kps);
    lcd_puts(dat2);
    }
    PORTA.1=1;
    OCR0=0xcc;
    OCR2=0xcc;
    PORTB.2=1;//kanan
    PORTB.1=0;//kiri
    delay_ms(800);
    while(PINA.2==1)
    {
    PORTA.1=1;
    OCR0=0xcc;
    OCR2=0xcc;
    PORTB.2=0;//kanan
    PORTB.1=1;//kiri
    delay_ms(1000);
    PORTB.2=1;//kanan
    PORTB.1=0;//kiri
    delay_ms(1000);
    }
    PORTA.1=0;
    goto loop1;
    }
    sprintf(text,"sv 0 %u\r",servo);
    puts(text);
    lcd_clear();
    sprintf(dat2,"srv=%d temp=%d %d %d %d %d %d %d %d %d", servo, temp, temp1, temp2,
temp3, temp4, temp5, temp6, temp6);

```

```

        lcd_puts(dat2);
        delay_ms(100);
    }
}
goto api;
pos=1;

break;
}

};
}

char tangga(void)
{
printf("RS \r");
delay_ms(100);
printf("sv 0 120\r");
delay_ms(100);
printf("RM 3 \r");
delay_ms(100);
printf("PM 0 \r");
delay_ms(100);
printf("tc 20 35 46 70 20 55\r");
delay_ms(200);
}
char bayi(void)//00255
{
printf("L1 1\r");
delay_ms(100);
printf("L1 0\r");
delay_ms(100);
printf("tc 16 30 16 40 50 240 \r");//@$%^&*percobaab
delay_ms(100);
}
char lilin(void)
{
printf("RS \r"); //setting kamera
delay_ms(100);
printf("sv 0 120\r");
delay_ms(100);
printf("RM 3 \r");
delay_ms(100);
printf("PM 0 \r");
delay_ms(100);
printf("tc 240 240 240 240 240 \r");
delay_ms(100);
}
char cek(void) //warna tangga luar dan dalam beda
{
c++;
lcd_clear();
sprintf(dat2,"c=%d ",c);
lcd_puts(dat2);
delay_ms(100);
if(c>=6)
{
OCR0=0x00;
OCR2=0x00;
kiri();
}
}

```



```
kanan();
if((ki+ka)<=60 && ki<30 && ka<30)
{
kompas();
    if(kps>(ar-10) && kps<(ar+10))
    {
        lcd_clear();
        sprintf(dat2,"tangga");
        lcd_puts(dat2);
        delay_ms(1000);
        d++;
    }
}
if(d>=3) pos=1;
}

}
```

## SUBPROGRAM PENGGUNAAN SENSOR - SENSOR

```
void kiri(void) // Sensor Ping Kiri
{
mulai:
    t=1;
    DDRD.6=1;
    PORTD.6=1;
    delay_us(5);
    PORTD.6=0;
    DDRD.6=0;
    PORTD.6=1 ;
    for(i=0;i<1050;i++)
    {
        if(PIND.6==1)
            goto coun;
    }
goto mulai;
coun:
    if(PIND.6==0)
        goto hitung;
    t=t+1 ;
    delay_us(1);
goto coun;
hitung:
    ki=460*0.0001*t;
return;
}

void kirik(void) // Sensor Ping Serong Kiri 450
{
mulai:
    t=1;
    DDRD.5=1;
    PORTD.5=1;
    delay_us(5);
    PORTD.5=0;
    DDRD.5=0;
    PORTD.5=1 ;
    for(i=0;i<1050;i++)
    {
        if(PIND.5==1)
            goto coun;
    }
goto mulai;
coun:
    if(PIND.5==0)
        goto hitung;
    t=t+1 ;
    delay_us(1);
goto coun;
hitung:
    kik=460*0.0001*t;
return;
}

void tengah(void) // Sensor Ping Tengah
{
mulai:
    t=1;
    DDRD.4=1;
```

```

    PORTD.4=1;
    delay_us(5);
    PORTD.4=0;
    DDRD.4=0;
    PORTD.4=1 ;
    for(i=0;i<1050;i++)
    {
        if(PIND.4==1)
            goto coun;
    }
goto mulai;
coun:
    if(PIND.4==0)
        goto hitung;
    t=t+1 ;
    delay_us(1);
goto coun;
hitung:
    te=460*0.0001*t;
return;
}

void kanank(void) // Sensor Ping Serong Kanan 450
{
mulai:
    t=1;
    DDRD.3=1;
    PORTD.3=1;
    delay_us(5);
    PORTD.3=0;
    DDRD.3=0;
    PORTD.3=1 ;
    for(i=0;i<1050;i++)
    {
        if(PIND.3==1)
            goto coun;
    }
goto mulai;
coun:
    if(PIND.3==0)
        goto hitung;
    t=t+1 ;
    delay_us(1);
goto coun;
hitung:
    kak=460*0.0001*t;
return;
}

void kanan(void) // Sensor Ping Kanan
{
mulai:
    t=1;
    DDRD.2=1;
    PORTD.2=1;
    delay_us(5);
    PORTD.2=0;
    DDRD.2=0;
    PORTD.2=1 ;
    for(i=0;i<1050;i++)
    {
        if(PIND.2==1)

```

```

        goto coun;
    }
    goto mulai;
coun:
    if(PIND.2==0)
        goto hitung;
    t=t+1 ;
    delay_us(1);
    goto coun;
hitung:
    ka=460*0.0001*t;
return;
}

void atas() //Sensor SRF02
{
i2c_start();
i2c_write(0xE0);
i2c_write(0x00);
i2c_write(0x51);
i2c_start();
i2c_write(0xE0);
i2c_write(0x02);
i2c_start();
i2c_write(0xE1);
atas1=i2c_read(1);
atas2=i2c_read(0);
ats=(atas1*256)+atas2;
i2c_stop();
}

void kompas() // Sensor CMPS03
{
i2c_start();
i2c_write(0xC0);
i2c_write(0x01);
i2c_start();
i2c_write(0xC1);
kps=i2c_read(0);
i2c_stop();
}

void tpa81() // Sensor Thermal Infrared
{
i2c_start();
i2c_write(0xD0);
i2c_write(0x01);
i2c_start();
i2c_write(0xD1);
temp=i2c_read(1);
temp1=i2c_read(1);
temp2=i2c_read(1);
temp3=i2c_read(1);
temp4=i2c_read(1);
temp5=i2c_read(1);
temp6=i2c_read(0);
i2c_stop();
}

```

## PROGRAM UTAMA ATTINY2313

/\*  
\*\*\*\*\*  
\*/

This program was produced by the  
CodeWizardAVR V1.25.3 Standard  
Automatic Program Generator  
© Copyright 1998-2007 Pavel Haiduc, HP InfoTech s.r.l.  
<http://www.hpinfotech.com>

Project :  
Version :  
Date : 5/19/2009  
Author : F4CG  
Company : F4CG  
Comments:

Chip type : ATtiny2313  
Clock frequency : 11.059200 MHz  
Memory model : Tiny  
External SRAM size : 0  
Data Stack size : 32  
\*\*\*\*\*/

```
#include <tiny2313.h>  
#include <delay.h>
```

```
// Declare your global variables here  
unsigned int a,b;  
eeprom unsigned int c;  
void main(void)  
{  
// Declare your local variables here
```

```
// Crystal Oscillator division factor: 1  
#pragma optimize-  
CLKPR=0x80;  
CLKPR=0x00;  
#ifdef _OPTIMIZE_SIZE_  
#pragma optimize+  
#endif
```

```
// Input/Output Ports initialization  
// Port A initialization  
// Func2=In Func1=In Func0=In  
// State2=T State1=T State0=T  
PORTA=0x00;  
DDRA=0x00;
```

```
// Port B initialization  
// Func7=Out Func6=Out Func5=Out Func4=Out Func3=In Func2=Out Func1=Out Func0=Out  
// State7=0 State6=0 State5=0 State4=0 State3=P State2=0 State1=0 State0=0  
PORTB=0x08;  
DDRB=0xF7;
```

```
// Port D initialization  
// Func6=Out Func5=Out Func4=In Func3=In Func2=In Func1=Out Func0=Out  
// State6=0 State5=0 State4=T State3=T State2=T State1=0 State0=0
```

```

PORTD=0x00;
DDRD=0x63;

// Timer/Counter 0 initialization
// Clock source: System Clock
// Clock value: Timer 0 Stopped
// Mode: Normal top=FFh
// OC0A output: Disconnected
// OC0B output: Disconnected
TCCR0A=0x00;
TCCR0B=0x00;
TCNT0=0x00;
OCR0A=0x00;
OCR0B=0x00;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: Timer 1 Stopped
// Mode: Normal top=FFFFh
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer 1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x00;
TCNT1H=0x00;
TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x00;
OCR1AL=0x00;
OCR1BH=0x00;
OCR1BL=0x00;

// External Interrupt(s) initialization
// INT0: Off
// INT1: Off
// Interrupt on any change on pins PCINT0-7: Off
GIMSK=0x00;
MCUCR=0x00;

// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x00;

// Universal Serial Interface initialization
// Mode: Disabled
// Clock source: Register & Counter=no clk.
// USI Counter Overflow Interrupt: Off
USICR=0x00;

// Analog Comparator initialization
// Analog Comparator: Off
// Analog Comparator Input Capture by Timer/Counter 1: Off
ACSR=0x80;

while (1)
{

```

```

// Place your code here
if(PINB.3==0) //switch
{
//nyalakan led setting
PORTD.6=0;
PORTB.0=1;
delay_ms(200);
PORTD.6=1;
delay_ms(300);
PORTD.6=0;
PORTB.0=1;
delay_ms(200);
PORTD.6=1;
//cari nilai kemiringan
cek:  if(PIND.3==0)
    {
    while(PIND.3==0)
    {}
    if(PIND.3==1)
    {
    a=0;b=0;
    while (PIND.3==1)
    {
    delay_us(10);
    a++;
    }
    if(PIND.3==0)
    {
    while (PIND.3==0)
    {
    delay_us(10);
    b++;
    }
    }
    }
    goto hasil;
    }
    else goto cek;
//penentuan nilai hasil kemiringan
hasil:
c=a;
PORTB.2=0;
PORTB.1=1;
delay_ms(200);
PORTB.1=0;

}
else
{
//cek kemiringan
PORTD.0=1;
PORTD.1=0;
delay_ms(100);
cek1:  if(PIND.3==0)
    {
    while(PIND.3==0)
    {}
    if(PIND.3==1)
    {
    a=0;b=0;
    while (PIND.3==1)
    {

```

```

        delay_us(10);
        a++;
    }
    if(PIND.3==0)
    {
        while (PIND.3==0)
        {
            delay_us(10);
            b++;
        }
    }
    goto hasil1;
}
else goto cek1;
//membandingkan dengan akhir
hasil1:
PORTD.0=0;
delay_ms(100);
if(a>=(c-8) && a<=(c+8))
{
    PORTB.2=0;
    PORTB.1=1;
    delay_ms(200);
    PORTB.1=0;
    PORTD.5=1;
}
else PORTD.5=0;

}
};
}

```



**LAMPIRAN C**  
**DATASHEET**

<b>SENSOR KEMIRINGAN ADXL202E .....</b>	<b>C-1</b>
<b>SENSOR JARAK ULTRASONIK PING .....</b>	<b>C-13</b>
<b>SENSOR JARAK ULTRASONIK SRF02 .....</b>	<b>C-23</b>
<b>DRIVER MOTOR LMD18200 .....</b>	<b>C-27</b>
<b>SENSOR KOMPAS .....</b>	<b>C-40</b>