

```
/* stepping motor controller */
/* PIC16F873A 使用 */
/* 2014/8/8 by T.Inoue */
/* R1:2014/10/30 PhotoReflector 応用*/
```

```
#include<htc.h>
#include<stdio.h>
```

```
__CONFIG(LVPDIS & BORDIS & UNPROTECT & PWRTEN & WDTDIS & HS);
```

```
#define _XTAL_FREQ 4000000 /* 4MHz */
#define JIKAN 3 /* msec */
#define rest 100 /* msec */
#define n 25 /*bunkatsu*/
#define kakou 12 //加工戻りしろ mm
#define area 24 //加工範囲 1/2 辺 mm
#define dp 2 //ドリル径または移動ピッチ
```

```
signed char xe,ye,ze,sx,sy,sz,xe0,ye0,ze0;
```

```
signed char i,j,b,k,m,u,v,p;
```

```
unsigned char ss;
```

```
ioport0;
timng0;
stop_x0;
stop_y0;
stop_z0;
clw_x0;
uclw_x0;
clw_y0;
uclw_y0;
clw_z0;
uclw_z0;
run_px0;
run_mx0;
run_py0;
run_my0;
```

```

run_pxpy0;
run_mxmy0;
run_mxy0;
run_pxmy0;
run_pz0;
run_mz0;
genten0;
dw_line0;
photoR_p0;
dril0;
photoR_a0;
MicroSw_p0;
MicroSw_a0;

//メイン
main0{

    ioport0;

    RC4=1;

    genten0;                /*原点調整・設定*/
        xe0=ye0=ze0=0; //スタート位置

    //スタート位置に移動
        xe=xe0;
        ye=ye0;
        dw_line0;
        ze=ze0+kakou;
        dril0;

    while(1){
        if(RA5==0){
            ss=0;break; //スタート with PhReflector
        }
        else if(RA4==0){
            ss=1;break; //Start with MicroSwitch
        }
    }
}

```

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}

while(1){

    RC4=1;
    p=area/dp;
    for(j=-1*p;j<p;j++){          /*補間数繰り返し*/
        ye=dp;                    /*移動ピッチ*/
        xe=0;
        dw_line();                /*直線補間*/
        if(RA2 == 0)break;
        for(i=-1*p;i<p;i++){
            xe=dp;
            ye=0;
            timng();
            if(ss=0)photoR_p();    /*加工*/
            else MicroSw_p();
            __delay_ms(rest);
            if(ss=0)photoR_a();    /*加工後*/
            else MicroSw_a();
            timng();
            dw_line();            /*直線補間 x 軸移動*/
            if(RA2 == 0)break;
        }
        ze=kakou;
        dril();
        RC5=0;                    //ドリル停止
        xe=-2*area;
        ye=0;
        dw_line();                /* x 戻り、直線補間*/
        if(RA2 == 0)break;
    }
    ze=ze0;
    stop_z();                      //z 軸停止
    RC5=0;
    break;
}
while(1){

```

```

        RC4^=1;
        __delay_ms(rest);
        __delay_ms(rest);
        __delay_ms(rest);
    }

}

ioport0{

    TRISA = 0x3F;          /* b00111111 */
    TRISB = 0x00;          /* b00000000 */
    TRISC = 0x80;          /* b10000000 */

    ADCON0=0;              //AD 変換は使わない

    PCFG1 = 1;             //AN0~AN4 デジタル IO 設定
    PCFG2 = 1;
    PCFG3 = 0;
}

timng0{
    __delay_ms(JIKAN);
}

stop_x0{                  /* stop x */
    RB0 = RB1 = RB2 = RB3 = 0;
}

stop_y0{                  /* stop y */
    RB4 = RB5 = RB6 = RB7 = 0;
}

stop_z0{                  /* stop x */
    RC0 = RC1 = RC2 = RC3 = 0;
}

clw_x0{                  /* x 正転 */

```

```

    timng0;
    RB0=RB2=1;RB1=RB3=0;      /*0x05*/
    timng0;
    RB0=RB3=0;RB1=RB2=1;      /*0x06*/
    timng0;
    RB0=RB2=0;RB1=RB3=1;      /*0x0A*/
    timng0;
    RB0=RB3=1;RB1=RB2=0;      /*0x09*/
}

```

```

uclw_x0{                          /* x 逆転*/

```

```

    timng0;
    RB0=RB2=1;RB1=RB3=0;      /*0x05*/
    timng0;
    RB0=RB3=1;RB1=RB2=0;      /*0x09*/
    timng0;
    RB0=RB2=0;RB1=RB3=1;      /*0x0A*/
    timng0;
    RB0=RB3=0;RB1=RB2=1;      /*0x06*/
}

```

```

clw_y0{                          /* y 正転 */

```

```

    timng0;
    RB7=RB5=0;RB6=RB4=1;      /*0101*/
    timng0;
    RB7=RB4=0;RB6=RB5=1;      /*0110*/
    timng0;
    RB7=RB5=1;RB6=RB4=0;      /*1010*/
    timng0;
    RB7=RB4=1;RB6=RB5=0;      /*1001*/
}

```

```

uclw_y0{                          /*y 逆転*/

```

```

    timng0;

```

```

RB7=RB5=0;RB6=RB4=1;      /*0101*/
timng0;
RB7=RB4=1;RB6=RB5=0;      /*1001*/
timng0;
RB7=RB5=1;RB6=RB4=0;      /*1010*/
timng0;
RB7=RB4=0;RB6=RB5=1;      /*0110*/
}

clw_z0{                      /* z 正転 */

timng0;
RC0=RC2=1;RC1=RC3=0;      /*0x05*/
timng0;
RC0=RC3=0;RC1=RC2=1;      /*0x06*/
timng0;
RC0=RC2=0;RC1=RC3=1;      /*0x0A*/
timng0;
RC0=RC3=1;RC1=RC2=0;      /*0x09*/
}

uclw_z0{                      /* z 逆転*/

timng0;
RC0=RC2=1;RC1=RC3=0;      /*0x05*/
timng0;
RC0=RC3=1;RC1=RC2=0;      /*0x09*/
timng0;
RC0=RC2=0;RC1=RC3=1;      /*0x0A*/
timng0;
RC0=RC3=0;RC1=RC2=1;      /*0x06*/

}

run_px0{
for(k=sx;k>0;k--){
for(u=n;u>0;u--) uclw_x0;
stop_x0;
}
}

```

```

    }
}

run_mx(){
    for(k=sx;k<0;k++){
        for(u=n;u>0;u--) clw_x();
        stop_x();
    }
}

run_py(){
    for(k=sy;k>0;k--){
        for(u=n;u>0;u--) clw_y();
        stop_y();
    }
}

run_my(){
    for(k=sy;k<0;k++){
        for(u=n;u>0;u--) uclw_y();
        stop_x();
    }
}

run_pz(){
    for(k=sz;k>0;k--){          /*+z */
        for(u=n;u>0;u--) clw_z();
        stop_z();
    }
}

run_mz(){
    for(k=sz;k<0;k++){          /*-z */
        while(!RA2){
            stop_z();
            __delay_ms(rest);
            RC4^=1;
            __delay_ms(rest);
        }
    }
}

```

```

    }
    for(u=n;u>0;u--) uclw_z0;
    stop_z0;
}
}

run_pxpy0{
    for(k=sx;k>0;k--){          /*-x 逆転+y 正転*/
        for(u=n;u>0;u--) uclw_x0;
        stop_x0;
        for(v=m;v>0;v--) clw_y0;
        stop_y0;
    }
}

run_mxpy0{
    for(k=sx;k<0;k++){          /*x+y 正転*/
        for(u=n;u>0;u--) clw_x0;
        stop_x0;
        for(v=m;v>0;v--) clw_y0;
        stop_y0;
    }
}

run_pxmy0{
    for(k=sx;k>0;k--){          /*+x-y */
        for(u=n;u>0;u--) uclw_x0;
        stop_x0;
        for(v=m;v>0;v--) uclw_y0;
        stop_y0;
    }
}

run_mxmy0{
    for(k=sx;k<0;k++){          /*-x 逆転-y */
        for(u=n;u>0;u--) clw_x0;
        stop_x0;
        for(v=m;v>0;v--) uclw_y0;
        stop_y0;
    }
}

```



```
    }  
}
```

```
dw_line0  
{
```

```
    b=50/n;  
    sx=xe*b;  
    sy=ye*b;  
  
    if(ye == 0){  
        if(xe>0)run_px0;  
        else if(xe<0)run_mx0;  
        else stop_x0;  
    }  
    if(xe == 0){  
        if(ye>0)run_py0;  
        else if(ye<0)run_my0;  
        else stop_y0;  
    }  
    if(xe>0){  
        if (ye>0){  
            m=n*ye/xe;  
            run_pxpy0;  
        }  
  
        else if(ye<0){  
            m=-n*ye/xe;  
            run_pxmy0;  
        }  
    }  
    if(xe<0){  
        if(ye>0){  
            m=-n*ye/xe;  
            run_mxpy0;  
        }  
        else if (ye<0){  
            m=n*ye/xe;  
            run_mxmy0;  
        }  
    }  
}
```

```

    }
}

photoR_p() //画像前認識
{
    do{ //PhR1(フォトリフレクタ 1)検知なし
        ze=-1; //z 軸降下
        dril();
        timng();
    }while(RA0); //PhR1(フォトリフレクタ 1)が検知するまで
}

photoR_a() //画像後認識・加工後処理
{
    do{ //加工実施後
        ze=1*dp; //z 軸上昇
        dril();
        timng();
    }while(!RA0); //PhR1(フォトリフレクタ 1)検知なしまで上昇
}

dril()
{
    b=50/n;
    sz=ze*b;
    if(ze == 0){
        stop_z(); //z 軸停止
    }
    if(ze > 0){
        run_pz(); //z 軸上昇
        RC5=1; //ドリル運転
    }
    if(ze < 0){
        RC5=1; //ドリル運転
        run_mz(); //z 軸下降
    }
}
}

```

```

genten0
{
    while(1){
        clw_z0;
        if(RA3 == 0)break;
        if(RA2 == 0)break;
    }
    stop_z0;
    __delay_ms(rest);
    while(1){
        uclw_x0;
        if(RA5 == 0) break;
        if(RA2 == 0)break;
    }
    stop_x0;
    __delay_ms(rest);
    while(1){
        uclw_y0;
        if(RA4 == 0) break;
        if(RA2 == 0)break;
    }
    stop_y0;
    __delay_ms(rest);
    while(1){
        clw_z0;
        if(RA3 == 0)break;
        if(RA2 == 0)break;
    }
    stop_z0;
    __delay_ms(rest);
    while(1){
        clw_x0;
        if(RA5 == 0) break;
        if(RA2 == 0)break;
    }
    stop_x0;
    __delay_ms(rest);
}

```

```

while(1){
    clw_y0;
    if(RA4 == 0) break;
    if(RA2 == 0)break;
}
stop_y0;
__delay_ms(rest);
while(1){
    uclw_z0;
    if(RA3 == 0)break;
    if(RA2 == 0)break;
}
stop_z0;
}

MicroSw_p0 //材検知前認識
{
    do{ //MicroSwitch が検知なし
        ze=-1; //z 軸降下
        dril0;
        timng0;
    }while(RA1); //MicroSwitch が検知するまで
}

MicroSw_a0 //材検知後認識・加工後処理
{
    do{ //加工実施後
        ze=2*dp; //z 軸上昇
        dril0;
        timng0;
    }while(!RA1); //MicroSwitch が検知なしまで
}

```