```
int motor_1[] = { 2, 3, 4, 5};
int motor_2[] = { 9, 8, 7, 6};
int motor_3[] = {10,11,12,13};

int motor_dir[] = { 0, 0, 0};
int motor_state[] = { 0, 0, 0};

int pin[] = {0, 0, 0, 0};

int x_axis = A0;
int y_axis = A1;
int button = A2;
int input_speed = A3;

int x_val = 0;
int y_val = 0;

int delay_time = 2;
int b = 0;

void setup() {
        // set up the pins
        for(int i=0; i<4; i++){
                pinMode(motor_1[i],OUTPUT);
                digitalWrite(motor_1[i], LOW);
                pinMode(motor_2[i],OUTPUT);
                digitalWrite(motor_2[i], LOW);
                pinMode(motor_3[i],OUTPUT);
                digitalWrite(motor_3[i], LOW);
        }

        // make sure all the motors are stopped
        motor_dir[0] = 0;
        motor_dir[1] = 0;
        pinMode(x_axis, INPUT); // analogue input
        pinMode(y_axis, INPUT); // analogue input
        pinMode(button, INPUT_PULLUP); // digital input
        pinMode(input_speed, INPUT); // analogue input

}

void loop() {
        // -------------------------------
        // update motor coils if necessary
        // -------------------------------

        for(int i=0; i<=2; i++){
                if(motor_dir[i] == 1){ motor_state[i] ++; }
                if(motor_dir[i] ==-1){ motor_state[i] --; }
                if(motor_state[i] > 3){ motor_state[i] = 0;}
                if(motor_state[i] < 0){ motor_state[i] = 3;}

                for(int j=0; j<4; j++){
                        if(i==0){ pin[j] = motor_1[j]; }
                        if(i==1){ pin[j] = motor_2[j]; }
                        if(i==2){ pin[j] = motor_3[j]; }
                }
```

```cpp
        // since our motors are highly geared, we only really need to
        // power the coils to make them move - at rest we can power them
        // down (so the motors don't get/stay warm)
        // (unlike a CNC machine, we don't need locking)

        if(motor_dir[i]==0){

                digitalWrite(pin[0], LOW);
                digitalWrite(pin[1], LOW);
                digitalWrite(pin[2], LOW);
                digitalWrite(pin[3], LOW);

        }else{

                switch(motor_state[i]){

                        case 0: // orange + yellow
                        digitalWrite(pin[0], HIGH);
                        digitalWrite(pin[1], HIGH);
                        digitalWrite(pin[2], LOW);
                        digitalWrite(pin[3], LOW);
                        break;

                        case 1: // yellow + pink
                        digitalWrite(pin[0], LOW);
                        digitalWrite(pin[1], HIGH);
                        digitalWrite(pin[2], HIGH);
                        digitalWrite(pin[3], LOW);
                        break;

                        case 2: // pink + blue
                        digitalWrite(pin[0], LOW);
                        digitalWrite(pin[1], LOW);
                        digitalWrite(pin[2], HIGH);
                        digitalWrite(pin[3], HIGH);
                        break;

                        case 3: // blue + orange
                        digitalWrite(pin[0], HIGH);
                        digitalWrite(pin[1], LOW);
                        digitalWrite(pin[2], LOW);
                        digitalWrite(pin[3], HIGH);
                        Break;
                }
        }
}

// ------------------------------
// read the master speed setting
// ------------------------------
b = analogRead(input_speed);
delay_time = map(b, 0, 1023, 0, 20);
if(delay_time < 2){ delay_time=2; }

// -----------------------
// now check for input(s)
// -----------------------
```

```
x_val = analogRead(x_axis);
y_val = analogRead(y_axis);

// the joystick should give us a range of values but in
// practice, central point is around 500, then we get 300, 100, 0
// (or thereabouts) so let's just check a between a range of values

// -------------------------------------
// check the left/right joystick position
// -------------------------------------
motor_dir[0] = 0;

if(x_val < 450){
        // this is moving to the left
        motor_dir[0]=-1;
        // how far away from the centre are we?
        if(x_val < 10){
                // extreme left, allow full speed
        }else if(x_val < 150){
                delay_time = delay_time * 2;
        }else if(x_val < 300){
                delay_time = delay_time * 4;
        }else{
                delay_time = delay_time * 8;
        }
}

if(x_val > 550){
        // this is moving to the right
        motor_dir[0]=1;
        // how far away from the centre are we?
        if(x_val > 1000){
                // extreme left, allow full speed
        }else if(x_val > 850){
                delay_time = delay_time * 2;
        }else if(x_val > 700){
                delay_time = delay_time * 4;
        }else{
                delay_time = delay_time * 8;
        }
}

// -------------------------------------
// check the up/down joystick position
// -------------------------------------
motor_dir[1] = 0;
if(motor_dir[0]==0){

        // if we're not rotating left/right,
        // check to see if we're moving up/down
        // (so slowing down the motors doesn't affect
        // a previously set value)

        if(y_val < 450){
                // this is moving up
                motor_dir[1]=-1;
                // how far away from the centre are we?
```

```
            if(y_val < 10){
                    // extreme left, allow full speed
            }else if(y_val < 150){
                    delay_time = delay_time * 2;
            }else if(y_val < 300){
                    delay_time = delay_time * 4;
            }else{
                    delay_time = delay_time * 8;
            }
        }

        if(y_val > 550){
                // this is moving down
                motor_dir[1]=1;
                // how far away from the centre are we?
                if(y_val > 1000){
                        // extreme left, allow full speed
                }else if(y_val > 850){
                        delay_time = delay_time * 2;
                }else if(y_val > 700){
                        delay_time = delay_time * 3;
                }else{
                        delay_time = delay_time * 4;
                }
        }
    }

    // -----------------------------------
    // now add the delay between steps
    // (modified by the joystick position)
    // -----------------------------------
    delay(delay_time);

}
```