Article

Open-Source Culture Platform for Multi-Cell Type Study with Integrated Pneumatic Stimulation

Nicolò Cacocciola [1,*], Simone Luigi Marasso [1,2,*], Giancarlo Canavese [1], Matteo Cocuzza [1,2,3], Candido Fabrizio Pirri [1,3,4] and Francesca Frascella [1,3]

[1] DISAT–Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Turin, Italy
[2] CNR-IMEM, Parco Area delle Scienze 37°, 43124 Parma, Italy
[3] PolitoBIOMed Lab, Politecnico di Torino, C.so Duca degli Abruzzi 24, 10129 Turin, Italy
[4] Center for Sustainable Future Technologies, Italian Institute of Technology, Via Livorno 60, 10144 Turin, Italy
* Correspondence: nicolo.cacocciola@polito.it (N.C.); simone.marasso@polito.it (S.L.M.); Tel.: +39-349-060-9967 (C.N.); +39-011-090-8406 (S.L.M.)

```
#include <Wire.h>

byte fetch_humidity_temperature(unsigned int *p_Humidity, unsigned int *p_Temperature);
void print_float(float f, int num_digits);

#define TRUE 1
#define FALSE 0

int analogPin = A3;

int val = 0;
int Pressure;
int timer_p=2500;
int timer_p=2500;
int t=0;

void setup(void)
{
  Serial.begin(9600);
  Wire.begin();
  pinMode(2, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(7, OUTPUT);
  pinMode(8, OUTPUT);
  Serial.println(">>>>>>>>>>>>>>>>>>>>>>>>");
}

void colore (unsigned char rosso, unsigned char verde, unsigned char blu)
{
 analogWrite(8, rosso);
 analogWrite(7, blu);
 analogWrite(6, verde);
}

void loop(void)
```

```
{
  byte _status;
  unsigned int H_dat, T_dat;
  float RH, T_C;

  while(1)
  {
    for(t=0;t<timer_p;t++)
    {
      digitalWrite(2, HIGH);
      digitalWrite(4, LOW);
      colore(0,255,0);

      _status = fetch_humidity_temperature(&H_dat, &T_dat);
      RH = (float) H_dat * 6.10e-3;
      T_C = (float) T_dat * 1.007e-2 - 40.0;
      val = analogRead(analogPin);
     if (val<38) {val = 38;}

     if (val>1015) {val = 1015;}

     Pressure = map (val, 38, 1015, 0, 10000);
     Serial.print(Pressure);

     Serial.print("  ");

     print_float(T_C, 2);
     Serial.print("  ");
     print_float(RH, 1);
     Serial.println();
    }

    for(t=0;t<timer_sv;t++)
    {
      digitalWrite(2, LOW);
      digitalWrite(4, HIGH);
      colore(0,255,0);

      _status = fetch_humidity_temperature(&H_dat, &T_dat);
      RH = (float) H_dat * 6.10e-3;
      T_C = (float) T_dat * 1.007e-2 - 40.0;
      val = analogRead(analogPin);
     if (val<38) {val = 38;}

     if (val>1015) {val = 1015;}

     Pressure = map (val, 38, 1015, 0, 10000);
     Serial.print(Pressure);

     Serial.print("  ");

     print_float(T_C, 2);
    Serial.print("  ");
    print_float(RH, 1);
    Serial.println();
   }
  }
}
byte fetch_humidity_temperature(unsigned int *p_H_dat, unsigned int *p_T_dat)
{
   byte address, Hum_H, Hum_L, Temp_H, Temp_L, _status;
   unsigned int H_dat, T_dat;
   address = 0x27;;
   Wire.beginTransmission(address);
   Wire.endTransmission();
   delay(100);

   Wire.requestFrom((int)address, (int) 4);
   Hum_H = Wire.read();
   Hum_L = Wire.read();
   Temp_H = Wire.read();
   Temp_L = Wire.read();
   Wire.endTransmission();

   _status = (Hum_H >> 6) & 0x03;
   Hum_H = Hum_H & 0x3f;
   H_dat = (((unsigned int)Hum_H) << 8) | Hum_L;
   T_dat = (((unsigned int)Temp_H) << 8) | Temp_L;
   T_dat = T_dat / 4;
   *p_H_dat = H_dat;
   *p_T_dat = T_dat;
   return(_status);
}

void print_float(float f, int num_digits)
{
  int f_int;
  int pows_of_ten[4] = {1, 10, 100, 1000};
  int multiplier, whole, fract, d, n;

  multiplier = pows_of_ten[num_digits];
  if (f < 0.0)
  {
    f = -f;
    Serial.print("-");
  }
  whole = (int) f;
  fract = (int) (multiplier * (f - (float)whole));

  Serial.print(whole);
  Serial.print(".");

  for (n=num_digits-1; n>=0; n--) // print each digit with no leading zero suppression
  {
        d = fract / pows_of_ten[n];
        Serial.print(d);
        fract = fract % pows_of_ten[n];
    }
}
```