

# Manual for setting up the sensors of the Monitoring Box

Mick Nieman  
Amsterdam University of Applied Sciences

Pjotr Scholtze  
Amsterdam University of Applied Sciences

Heeyeon Joung  
Seoul National University of Science and Technology

November 2017

### **Abstract**

This has not been written yet and still needs content to be placed here.

# Contents

1	Introduction	2
2	Requirements	3
3	Glossary	5
4	Global Positioning System (GPS) sensor	6
5	Temperature and humidity sensor	7
6	Heartrate sensor	8
7	Regular carbon dioxide (CO <sub>2</sub> ) sensor	9
8	Advanced carbon dioxide (CO <sub>2</sub> ) sensor	12
9	Raspberry Pi Camera	13
10	Galvanic skin response sensor	14
11	Development issued example sensor	15
12	Development issued unknown sensor	16

## Chapter 1

# Introduction

# Chapter 2

## Requirements

For every sensor added there is need for an Arduino Nano. The Arduino Nano is a programmable microprocessor. Advanced users may be able to connect multiple sensors to a single Arduino Nano, note that this requires advanced knowledge of the communication protocols between the Raspberry Pi 3 b+ and Arduino Nano. Along with every Arduino Nano you need an USB A to Mini-USB B cable.

The first item needed for the GPS sensor is the Global Positioning System (GPS) module. We have used the Digilent 410-237 GPS-receiver board.

For the temperature and humidity sensor we have used the DHT22 module, this is a digital temperature- and humidity sensor. the DHT22 is more accurate (0,5° accuracy) than the previous, DHT11. It has a temperature reach from -40 to +80 °C. and has a humidity reach from 10% to 90% with an accuracy of 2,0 %.

The heart rate sensor consists of the MAXREFDES117# Reference Design Board with optical heart rate and pulse-oximetry monitor. It has integrated Red and Infrared LEDs. This works best on a person's fingertip or earlobe.

The CO<sub>2</sub> sensor comes in two varieties, the regular sensor which is affordable but less accurate and the advanced which has a higher costs and comes with higher accuracy.

The 'Regular CO<sub>2</sub> sensor' uses the MIKROE-1630 Daughter Board from Air Quality Click. It's an MQ-135 High sensitivity air quality sensor and potentiometer.

The 'Advanced CO<sub>2</sub> sensor' uses CO2meter.com its K-30 sensor. The K-30 sensor is an accurate gas sensor sensing up to 5000ppm (CO<sub>2</sub>) with an accuracy of 3%. Note that the advanced CO<sub>2</sub> meter does not work on the Arduino Nano and is only tested on the Arduino Uno.

The raspberry Pi Cam doesn't require to be connected to an Arduino and

can be plugged directly in to the Raspberry Pi its camera-port. For this project we used Sony's IMX219 8-Megapixel Pi Camera Board. It is able for taking photographs of 3280x2464 pixels or video's at 1080p at 30 frames per second.

The galvanic skin response sensor, or short GSR, measures the galvanic skin response based on the electrical conductance of the skin. For the Monitoring Box we have used the Grove-GSR sensor from seeed studio.

Every sensor has it's own schematics for assembling the sensors, the code running on the sensor can be downloaded from <https://github.com/pjotrscholtze/MonitoringBox>, for the exact link for a particular sensor see further into this document.

## Chapter 3

# Glossary

GND pin - Ground pin  
A1 pin - Analog pin 1

## Chapter 4

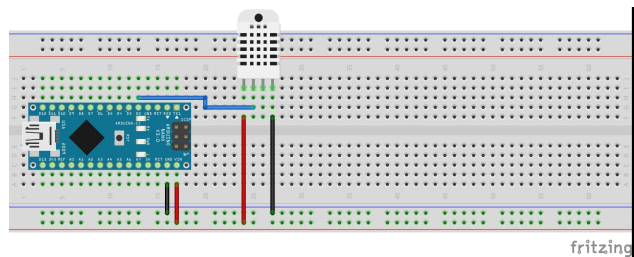
# Global Positioning System (GPS) sensor



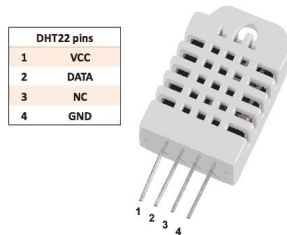
## Chapter 5

# Temperature and humidity sensor

The Temperature and humidity sensor is named 'DHT22' and 'AM2302'. The schematics for the assembly of the sensor are as follows.



There is no pin name on the sensor so you need to see the order in which the pins are listed. When looking at the sensor in front, the leftmost pin is VCC pin which goes onto the 5V on the Arduino and second pin is DATA pin which goes onto the D2 on the Arduino. The rightmost pin is GND pin and connected with GND on the Arduino. Note that the third pin means nothing. Below is the picture of explaining pin on the DHT22.



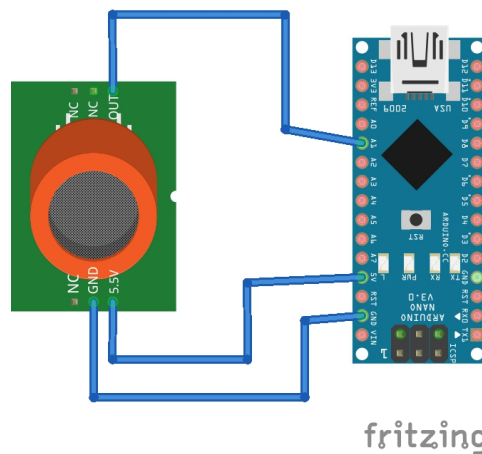
## Chapter 6

# Heartrate sensor

## Chapter 7

# Regular carbon dioxide (CO<sub>2</sub>) sensor

The regular carbon dioxide (CO<sub>2</sub>) sensor, from now on called the regular (CO<sub>2</sub>) sensor, is a sensor developed by mikroelectronics, and the schematics for the assembly of the sensor are as follows.



Note that the actual sensor looks slightly different, though the pinout is the same, the 5.5V pin of the Air-quility-click goes onto the 5.5V pin on the Arduino, the GND pin on the Air-quility-click goes onto the GND pin on the Arduino and the OUT pin on the Air-quility-click goes onto the A1 pin of the Arduino.

The actual sensor looks like the following:



The code coming with this sensor can be downloaded with the following link:  
*[https : //github.com/pjotrscholtze/MonitoringBox/tree/develop/Sensors/CO2\\_Sensor](https://github.com/pjotrscholtze/MonitoringBox/tree/develop/Sensors/CO2_Sensor)*  
Downloading the code and uploading this to the Arduino Nano and having  
it assembled as the schematics show should result in a functional sensor.

## Chapter 8

# Advanced carbon dioxide (CO<sub>2</sub>) sensor

## Chapter 9

# Raspberry Pi Camera

## Chapter 10

# Galvanic skin response sensor



## Chapter 11

# Development issued example sensor

## Chapter 12

# Development issued unknown sensor