Does me being in my room change the humidity of the room?

Research Design
13-10-2019

Revised
04-01-2020

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Abstract

In this experiment, the answer to “Does me being in my room change the humidity of the room?” will be answered. The hypotheses will be that is does and it will raise as people lose moisture through breathing and transpiration.

The experiment uses a si7021 Humidity and Temperature sensor and a Raspberry Pi Zero W. The sensor is connected to the Pi over I2C.

The code retrieves the humidity and temperature data from the sensor and adds a comma separated line with the data to a csv file. At the end of the day, the collecting is ended, and the file is renamed to the date of that day.

The experiment was done for two days. After these two days, the csv files were downloaded from the pi.

The first day resulted in 1461 records, the second day resulted in 1417 records, each record containing both humidity and temperature, bringing the total data points to 5756 points of data.

It is still not certain that me being in the room does influence the humidity in the room. It seems like there is too much interference from other influences.

A longer test with more logging would be necessary to give a more definitive answer.

The causes of the influences are a lot of guess work. It is known when I entered and left the room, but it is not known what the other influences are.

Content

Introduction

In this experiment, the answer to “Does me being in my room change the humidity of the room?” will be answered. The hypotheses will be that is does and it will raise as people lose moisture through breathing and transpiration.

Experimental setup

The experiment uses a si7021 Humidity and Temperature sensor and a Raspberry Pi Zero W. The sensor is connected to the Pi over I2C. The pi was used for another experiment and the code on it was reused for this experiment. The previous experiment used Node.js and this experiment thus as well. To gather the data from the sensor, the “si7021-sensor” npm-package was installed. The used code can be found in the appendix and on github.com/stefanvp/research_design. The datasets can be found there too.

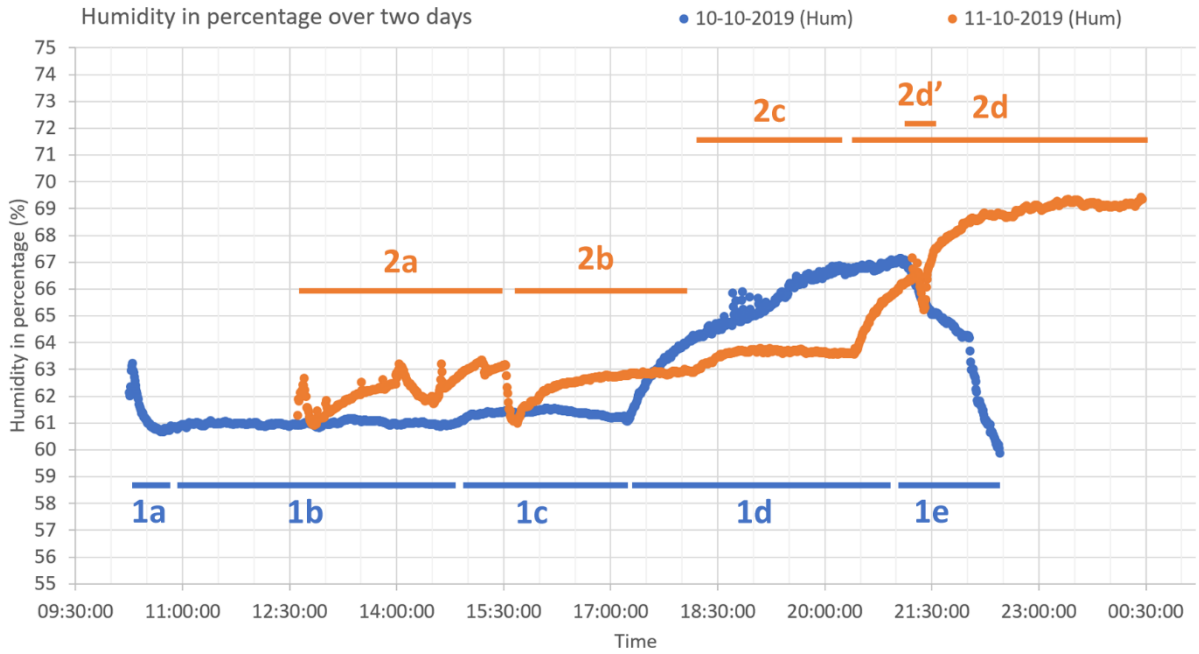
The code retrieves the humidity and temperature data from the sensor and adds a comma separated line with the data to a csv file. At the end of the day, the collecting is ended, and the file is renamed to the date of that day.

The experiment was done for two days, since I was only available for those two days, but given the time, it could be expended to more days.

After these two days, the csv files were downloaded from the pi.

The first day resulted in 1461 records, the second day resulted in 1417 records, each record containing both humidity and temperature, bringing the total data points to 5756 points of data.

Results



This is the graph created from the data collected on 10 and 11 October 2019. It displays the humidity over time. Indicators for periods are added to identify the periods discussed. The min and max of the vertical axes are 55% and 75%. Displaying from 0% to 100% would result in a line.

The full image can be found in the appendix and on github.com/stefanvp/research_design. The datasets can be found there too.

It looks like there is an average rise of humidity towards the end of the day, after which it falls to repeat again.

Day 1

(10:15:20 - 22:27:19)

The quantitative data for the first day:

Minimum:	59,88363647	Range:	7,263183594	Variance:	4,843743672
Maximum:	67,14682007	Mean:	61,39425659	Standard Deviation:	2,20085067

1a

(10:15:20 - 10:55:26)

The recording started soon after I got up and closed the window. It was raining at the time. This could mean that closing the window blocked the humidity generated by the rain.

After starting the recording, I did not enter the room again until 17:15, the start of 1d.

Minimum:	60,66946411	Range:	2,571105957	Variance:	0,476265016
Maximum:	63,24057007	Mean:	60,86782837	Standard Deviation:	0,690119567

1b

(10:55:56 - 14:45:04)

I was away during this time. The humidity is hovering around 61%.

Minimum:	60,822052	Range:	0,350952148	Variance:	0,004446686
Maximum:	61,17300415	Mean:	60,98226929	Standard Deviation:	0,066683479

1c

(14:45:34 - 17:14:28)

At around 15:00, it started raining again. I was still away, but the humidity in the room did raise with 0.5%. The weather can be checked on buienradar.nl, I live in Amsterdam.

Minimum:	60,94412231	Range:	0,617980957	Variance:	0,017795503
Maximum:	61,56210327	Mean:	61,37518311	Standard Deviation:	0,133399786

1d

(17:14:58 - 21:00:05)

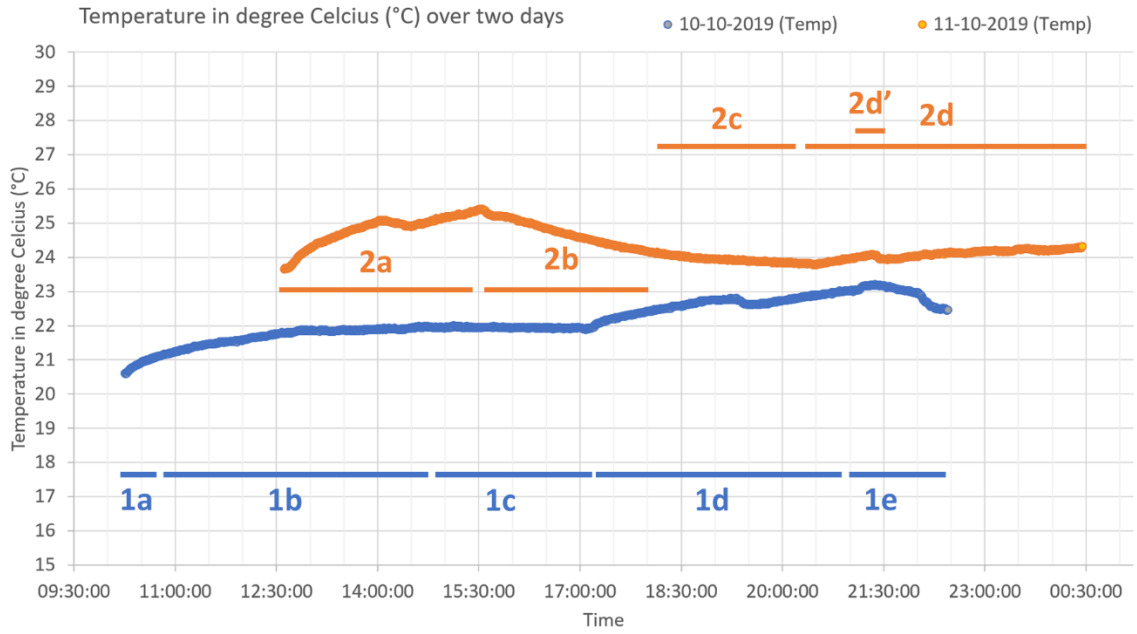
I returned to my room. It had stopped raining when I returned. The raise is bigger than expected, especially in comparison with 2a, when I was in my room as well. The dip could be when I was away to have dinner. I do not know why seven measurements are moving away from the line.

Minimum:	61,12722778	Range:	5,966186523	Variance:	2,311747106
Maximum:	67,09341431	Mean:	65,33102417	Standard Deviation:	1,520443063

https://www.buienradar.nl/nederland/neerslag/buienradar-terugkijken/archief/201910101500

1e

(21:00:35 - 22:27:19)



(GRAPH: TEMPERATURE IN DEGREE CELCIUS OVER TWO DAYS.
TEMPERATURE WAS ONLY REFERENCED TO FIND A CORRELATION WITH THE HEATING TURNING ON.)

I cannot explain why the humidity dropped. In hindsight it might had something to do with the heating turning off, since the temperature raised and dropped in sync with the temperature. I went to bed at the end of 1e.

Minimum:	59,88363647	Range:	7,263183594	Variance:	4,362871677
Maximum:	67,14682007	Mean:	64,75500488	Standard Deviation:	2,088748831

Day 2

(12:36:48 - 00:26:44)

The quantitative data for the second day:

Minimum:	60,92123413	Range:	8,491516113	Variance:	7,327951094
Maximum:	69,41275024	Mean:	63,48471069	Standard Deviation:	2,707018857

2a

(12:36:48 - 15:30:46)

I was in my room during this period, using the computer. There seems to be a lot of variation during this period, but the humidity does stay around an average of 62,26401.

Minimum:	60,92123	Range:	2,418518	Variance:	0,362922
Maximum:	63,33975	Mean:	62,26401	Standard Deviation:	0,60243

2b

(15:31:16 - 18:00:41)

I was away. I was working in the kitchen and would not return until the start of 2d. It looks like me not being in the room gave the humidity some time to settle. However, it did not drop like expected.

Minimum:	61,00516	Range:	2,174377	Variance:	0,252452
Maximum:	63,17953	Mean:	62,69125	Standard Deviation:	0,502446

2c

(18:01:11 - 20:26:05)

I cannot explain this raise. I was away and it was already raining. It actually cleared up during 2c.

Minimum:	62,88962	Range:	0,907898	Variance:	0,054675
Maximum:	63,79752	Mean:	63,6373	Standard Deviation:	0,233826

2d

(20:26:35 - 00:26:44)

I took a shower at the start of 2d, of which the humidity creeped to my room, I assume. Even then I find it strange that the humidity would be rising for several hours and not go down before the recording was terminated.

Minimum:	63,68307	Range:	5,729675	Variance:	2,337076
Maximum:	69,41275	Mean:	68,76425	Standard Deviation:	1,52875

2d’

(21:18:13 - 21:29:15)

I can’t explain the dip in the raise. I think it needs to be called out, because it is an anomaly in a straight line and it somewhat follows the line of the previous day. It also does not look like a mismeasurement, because the humidity quickly but steadily falls and shoots back up from the lowest point.

Minimum:	65,22421	Range:	1,800537	Variance:	0,35238
Maximum:	67,02475	Mean:	66,23892	Standard Deviation:	0,593616

Discussion

It is still not certain that me being in the room does influence the humidity in the room. Going from the results of day one, it would seem like I influence the humidity in the room, but the data from day two contradict this.

This could be explained by other influences raising or lowering the humidity in the room.

This experiment would have been better if it would have been done over more days. Unfortunately, this was made difficult due to a nearly daily changing personal schedule.

The causes of the influences are a lot of guess work. It is known when I entered and left the room, but it is not known what the other influences are. For a next experiment I would log when the shower is used, whether the heating is turned on, the weather outside, maybe even what I was doing at every moment of the day.

To test the hypotheses of 1e, another experiment would be necessary with the heating turned on and off, which would also had been a great idea to log when doing the experiment and to cross the humidity data with the temperature data

Conclusion

It is still not certain that me being in the room does influence the humidity in the room. It seems like there is too much interference from other influences. A longer test with more logging would be necessary to give a more definitive answer.

Appendix

1. Code

Can also be found on https://github.com/stefanvp/research_design

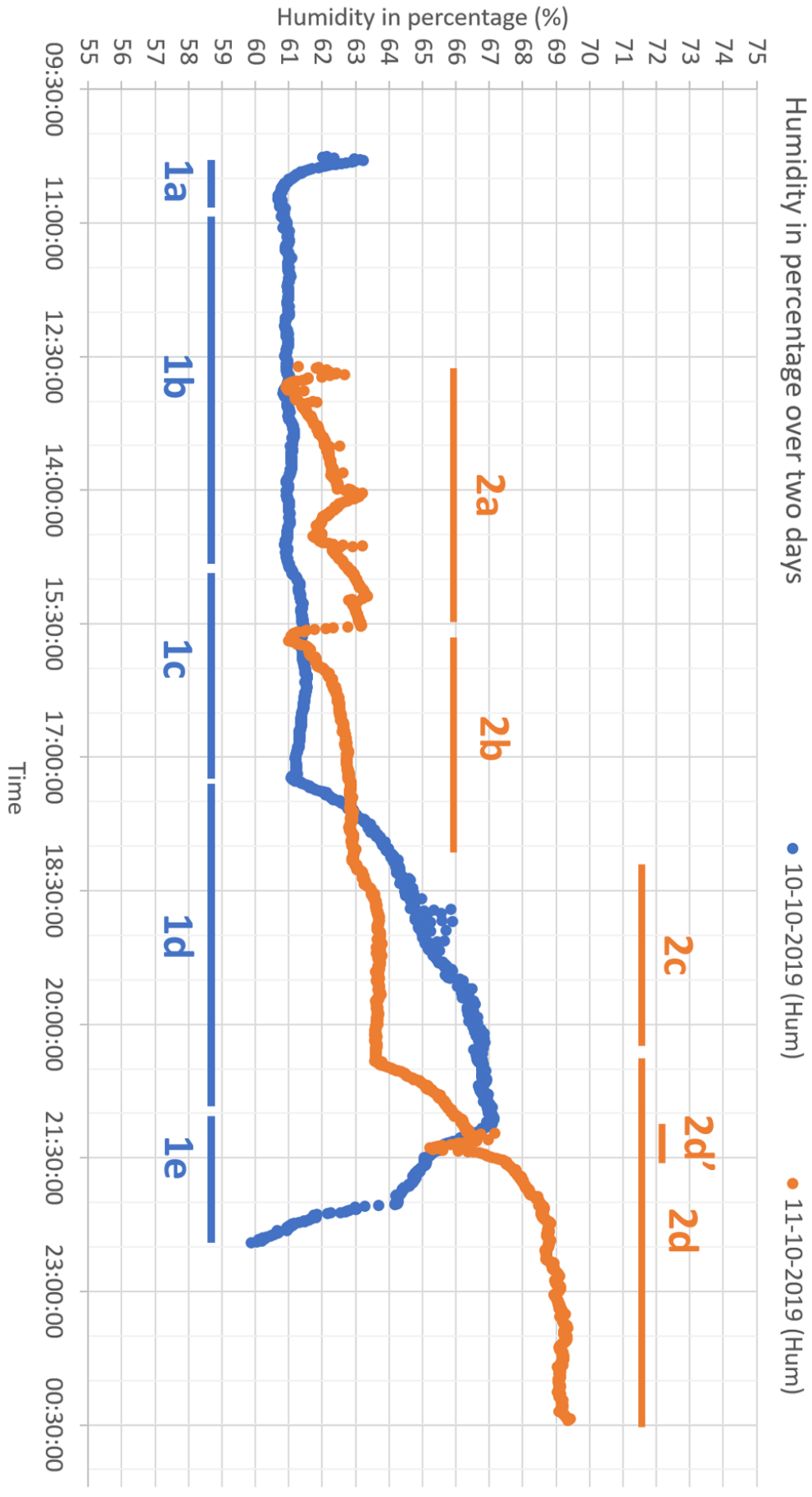
```
const Si7021 = require('si7021-sensor');
const fs = require('fs');

const si7021 = new Si7021({ i2cBusNo : 1 });

const readSensorData = () => {
  si7021.readSensorData()
    .then((data) => {
        data.now = Date.now();
        fs.appendFile('data.csv',
`${data.now},${data.humidity},${data.temperature_C}\n`, err => { if
(err) throw err });
      setTimeout(readSensorData, 30000);
    })
    .catch((err) => {
      console.log(`Si7021 read error: ${err}`);
      setTimeout(readSensorData, 2000);
    });
};

si7021.reset()
  .then((result) => readSensorData())
  .catch((err) => console.error(`Si7021 reset failed: ${err} `));
```

2. Data in graph Humidity



3. Data in graph Temperature