Test i2c humidity sensors

Project Goal

To create Arduino based device to compare data for as many t/RH sensors as possible (without manual sensor switch), optionally with data logging for further analysis.

Preparation

Use of the same sensor on i2c usually limited by 1 or 2 (using ALT i2c address) of the same type. And SHT20, SHT21, SHT25, HTU21 is actually the same type, so to be able to compare measurement there is a need to use i2c multiplexer. In the case of 8 line multiplexer, there is a possibility to have 8-16 sensor at the same time to be connected with Arduino.

Sensor i2c addresses and voltages

to divide between multiplexers

Sensor	address	alt address	spec	Vmin-Vmax	Vtyp	1.8v	3.3v	5v**
AOSONG AHT10	0x38 (62)	0x39 (63)	*pdf	1.8-3.6v	3.3v	❓	✅	⛔
AOSONG AHT15	0x38 (62)		*pdf	1.8-3.6v	3.3v	❓	✅	⛔
Senserion SHT2x	0x40 (64)	0x41 (65)	20,21,25	2.1-3.6v	3v	⛔	✅	⛔
Senserion SHT3x	0x44 (68)	0x45 (69)	SHT3x	2.15-5.5v	3.3v	⛔	✅	✅
Senserion SHT8x	0x44 (68)		SHT85	2.15-5.5v	3.3v	⛔	✅	✅
Meas[1] HTU21D	0x40 (64)		HTU21D	1.5v-3.6v	3v	✅	✅	⛔
Silicon Labs Si7021	0x40 (64)		pdf	1.9v-3.6v	-	⛔	✅	⛔
Bosch[2] BMEx80	0x76 (118)	0x77 (119)	680	1.71v-3.6v	1.8v	✅	✅	⛔
Bosch[2] BME280	0x76 (118)	0x77 (119)	280	1.71v-3.6v	1.8v	✅	✅	⛔
Ti[3] HDC1080	0x40 (64)		pdf	2.7v-5.5v	3v	⛔	✅	✅

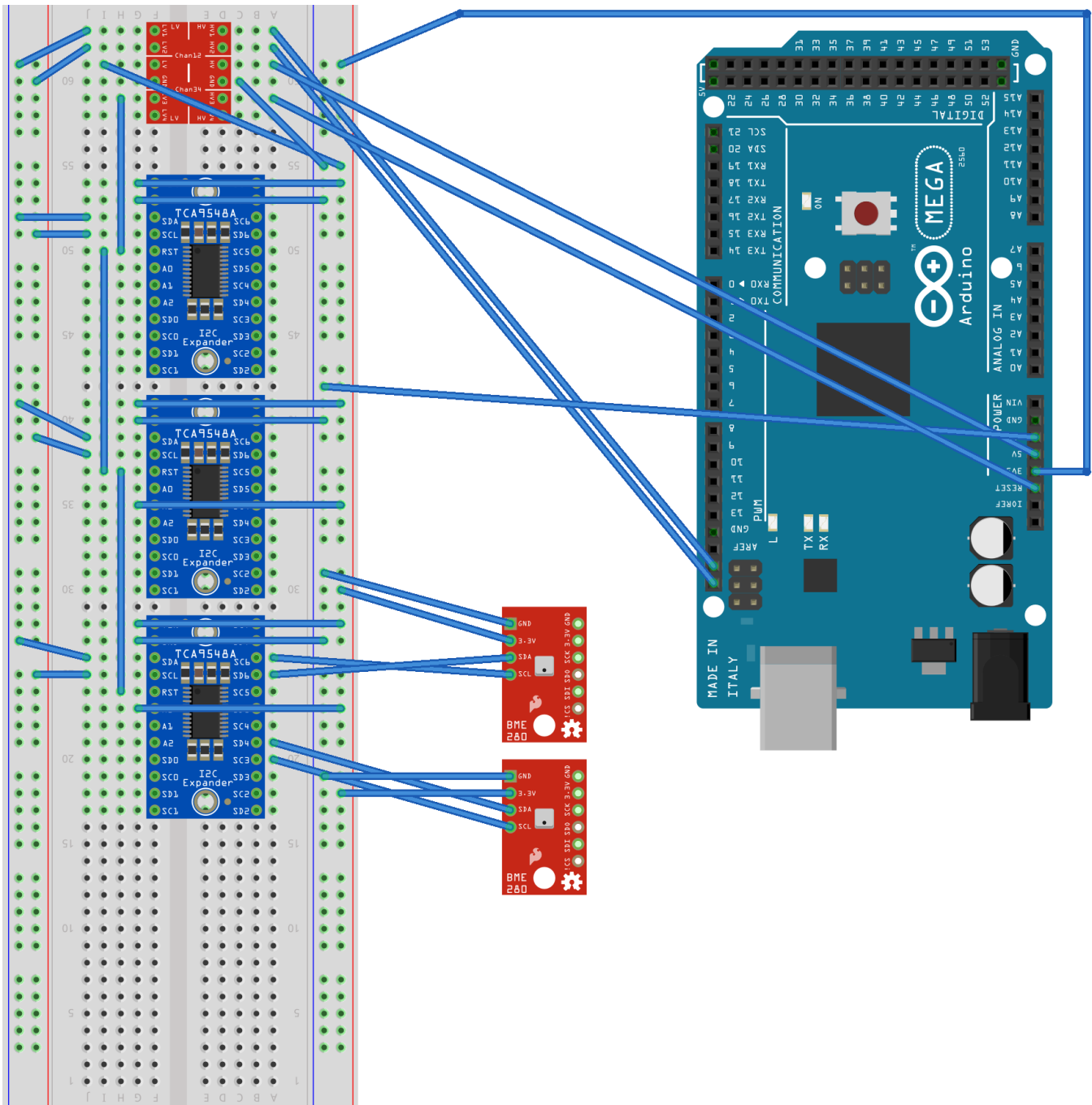| Ti[3] HDC2080	0x40 (64)	0x41 (65)	pdf	1.62v-3.6v	-	⛔	✅	⛔
AOSONG DHT12	0x5C (92)		*pdf	2.7-5.5v	5v	⛔	✅	✅
AOSONG AM2320	0x5C (92)		*pdf	3.1-5.5v	5v	⛔	⛔	✅

[1] TE Connectivity Measurement Specialties

[2] Bosch Sensortec

[3] Texas Instruments

** some sensors board have voltage regulators and level converter (and may support voltages above mentioned in sensor datasheet)

Draft schematic

Versions

v1

- Single multiplexer breadboard draft project with 26 Sensors

v2

- Use less wires and more soldering and connectors
- SD data logging (with filenames auto increment)
- Add more columns to the screen

v3

- Use 3+ multiplexers to include twice more sensors (incl. hdc1080 and Si7021, SHT85)
- Add more SHT85 sensors to see results repeatability (for the most expensive sensor)
- remove some libraries (multiplexor, sensor reading) not compatible with multiple mux projects
- substitute i2c scan every cycle with pre-defined array processing
- (Hardware) i2c 3.3v/5v level converter
- (Hardware) 2500mAh battery with related circuits
- (Hardware) New case,
- (Hardware) New 2m wire between the main unit and the board
- (Hardware) New plastic shields for connectors

v4 - failed

- AHT10 sensors (both wiring and code needed) - fail
- Change board wiring for new Adafruit sensors
- replace DHT12 with additional BME280
- Change board sensors (HDC1080 to HTU21d)

v5

- New board for both mux and sensors with fewer wires and connectors
- Wire new additional 5v sensor board with mux #4
- AM23020 5v sensors and code
- HDC1080 moved to 5v additional board
- Separate AHT10 to additional multiplexor (mux #5)

v6 - unstable

- AHT15 sensors (AHT10 code reuse)
- HDC2080 sensors and code
- connect and enable mux #6

v7 - unstable

- hardware RTC clock
- SD files with correct timestamps

v8 - unstable

- Updated Power circuit
- i2c voltage converter board and new wiring
- SHTC1 and SHTC3 sensors added
- mux #1 address changed (to solve i2c address conflict)
- 2x BME680 removed (to solve i2c address conflict)
- 1x BME280 removed (to solve i2c address conflict)
- DHT12 sensors added instead of three BMEx80 (8a)
- ChipCap Sensor added instead of DHT12 (8b)

v9 - current

- AHT20 instead of AHT10
- two HIH7120 added (code reused from CC2D33)
- 3 fan added

v10 - abandoned

- code optimization
- trend visualization
- hardware controls
- menu options (like format SD card)

- got some kind of home-made "calibration" tests with resolutions

v10-AHT

- New small density sensor boar
- AHT10, AHT20, AHT21, AHT25 sensors only
- exclude voltage conversion (that is why AHT15 is missing)
- a single sensor on one i2c multiplexer lane
- Single read for temperature and humidity data for AHT
- simplified code to support only AHT type of sensors