UNIVERSITY OF TWENTE.

ARDUINO & ELECTRONICS PRACTICAL

PRACTICAL SESSION 2

Part of SmartProducts

ARDUINO & ELECTRONICS PRACTICAL

PRACTICAL SESSION 2

- Using Arduino modules: display, sensors
- Communication (serial & Bluetooth)
- Arduino programming - part 2
- Assignment

Fjodor van Slooten
W241 *(Horst-wing West)*
f.vanslooten@utwente.nl

Assistants:
Thimo Willems, Lauren Schreurs, Joëlle de Looff,
Sjoerd de Jonge, Mariya Popnikolova, Kilian Buitenhuis

slides @ vanslooten.com/appdev

UNIVERSITY OF TWENTE.

LAST WEEK


Quite a lot of problems, like with uploading/connecting Arduino Nano, broken displays


Most of you were able to make progress and solve problems


Tutorial for today's assignment is on same level, but now you already have some experience

Tips:

- If you download an example, open it in Arduino IDE, then first do *File > Save As*, to save it in your Documents\Arduino folder
- Always disconnect power when connecting circuits
- Double-Check connected wires & pins before you connect the Arduino

BROKEN PARTS?

Possible solutions:

- Do assignment in a different way (ask us! or check forum)
- E.g. for a broken display, an alternative is offered
- Broken Nano? Use the other (there are 2 in the kit!)
- Buy a new part yourself, shop-links are in the checklist
- If you live in Enschede, collect a spare part from Fjodor (ask him)

PARTS FOR PROJECT…?

- The kit's content is rather limited
- *What if we need other/more components for the project?*
- Books & readers are no longer used (you save about €50 compared to previous years!)
- I think it is reasonable to ask you to buy parts yourself
- Think of a budget of €20 per student: as a group you can then spend 6 x 20 = €120

VIBRATION MODULE

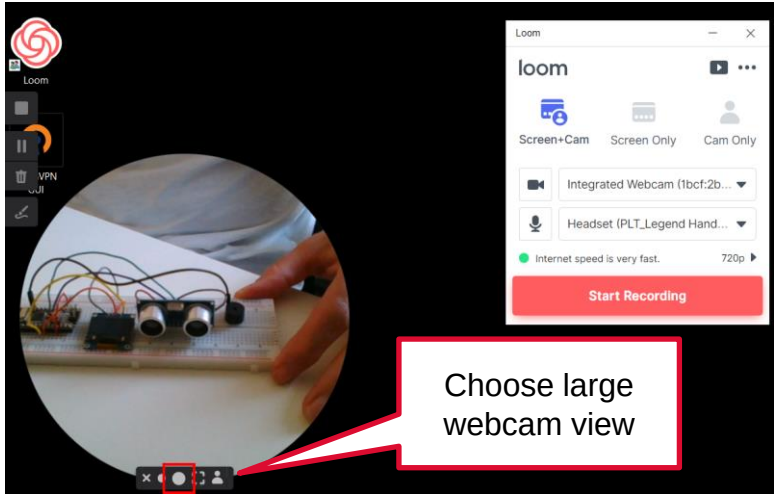
- Did not arrive on time: most kits do not have it… *they arrived this weekend*
- We will not use it for assignments
- You can use it for the project
- Contact Fjodor if you want one
  - Collect at his home address (Enschede)
  - Get it via mail (only if you really need it for the project)

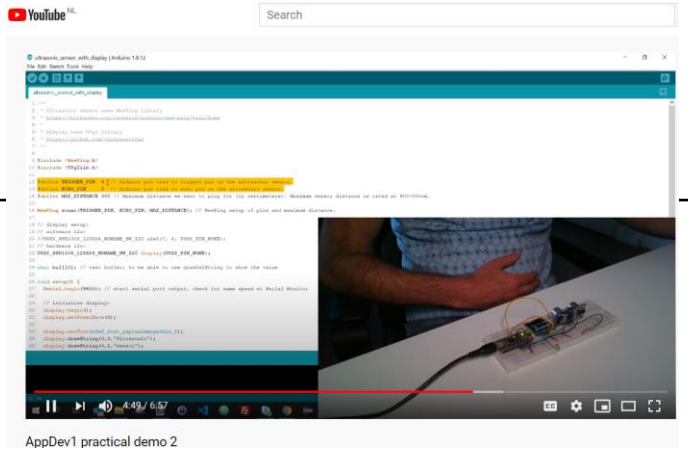
Info on how to use

RECORDING A VIDEO

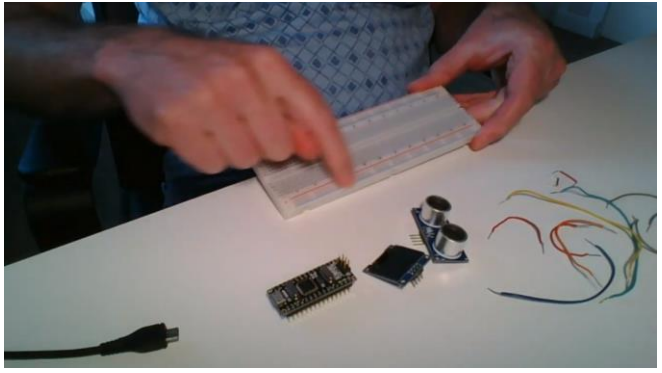
SHOW BREADBOARD PROPERLY

- Use bigger webcam window!
- OBS Studio:
  - Webcam view is resizable
  - Add a scene (with different size/views)
- Loom: Use largest webcam view:





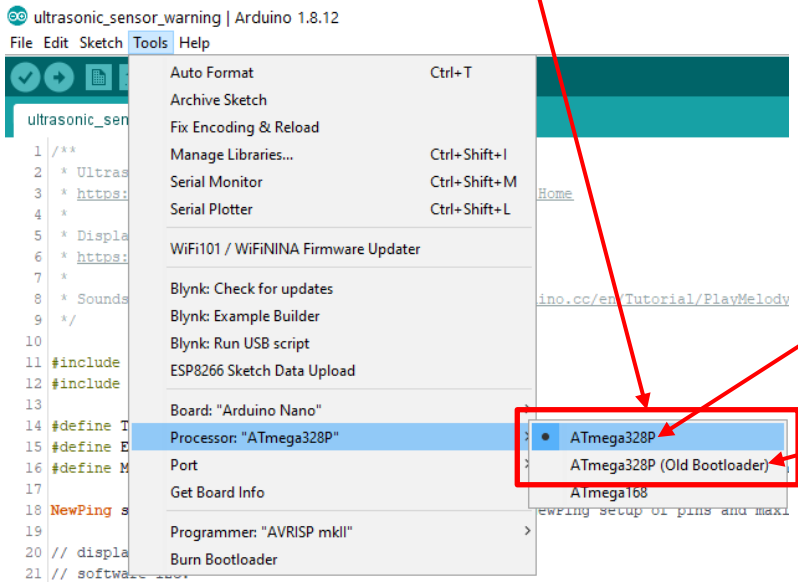
AppDev1 practical demo 2

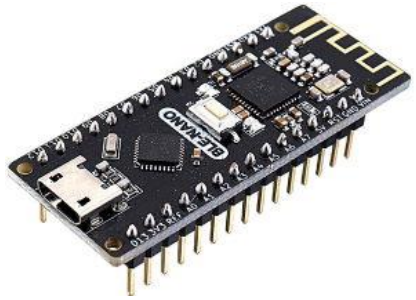


DIFFERENCE NANO AND BLE-NANO

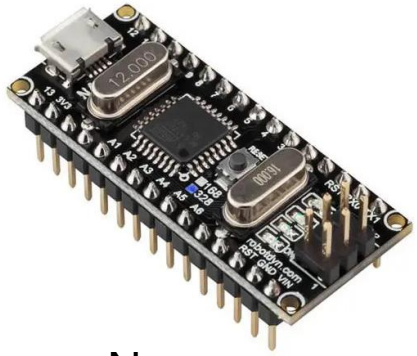
What is in the Electronics kit? Check it here

- Pins are the same
- Processor is different!!





BLE-Nano
with Bluetooth
Use programmer:
ATmega328P



Nano
(Robodyn)
Use programmer:
ATmega328P (Old Bootloader)

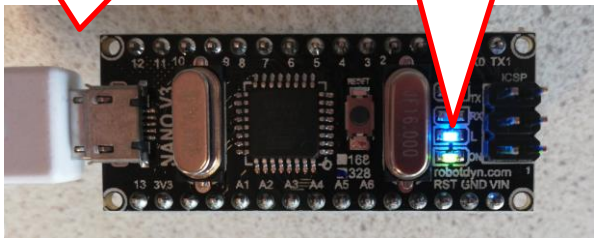
Need help? Look here first (forum)

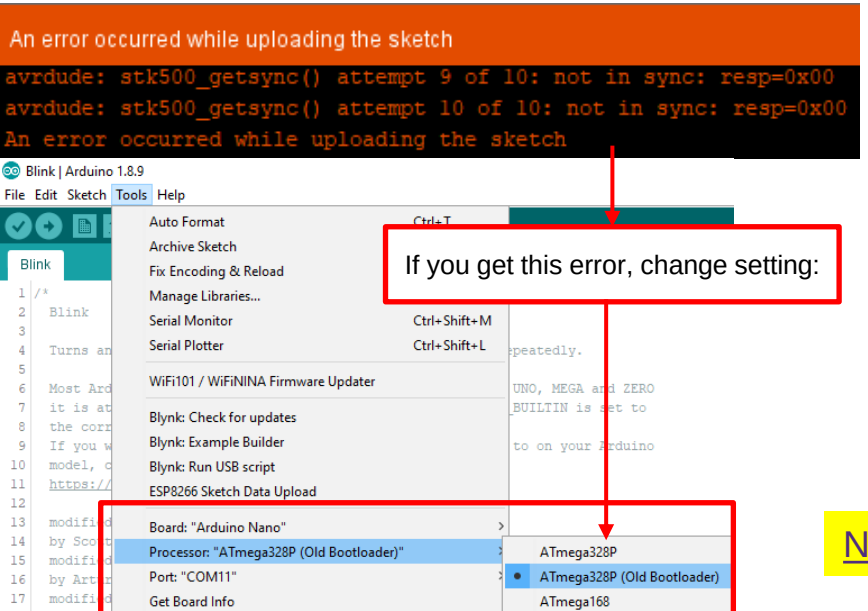
TROUBLESHOOTING

- Trouble connection/uploading sketch?
  Start with a basic sketch, e.g. Blink:
- Check connection settings

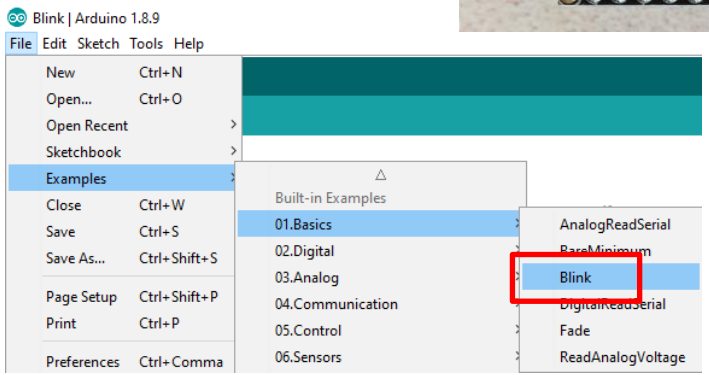
Remove Nano from breadboard, then test, e.g. with Blink example :

Blue LED is onboard led which should blink (in other models, can be other LED)



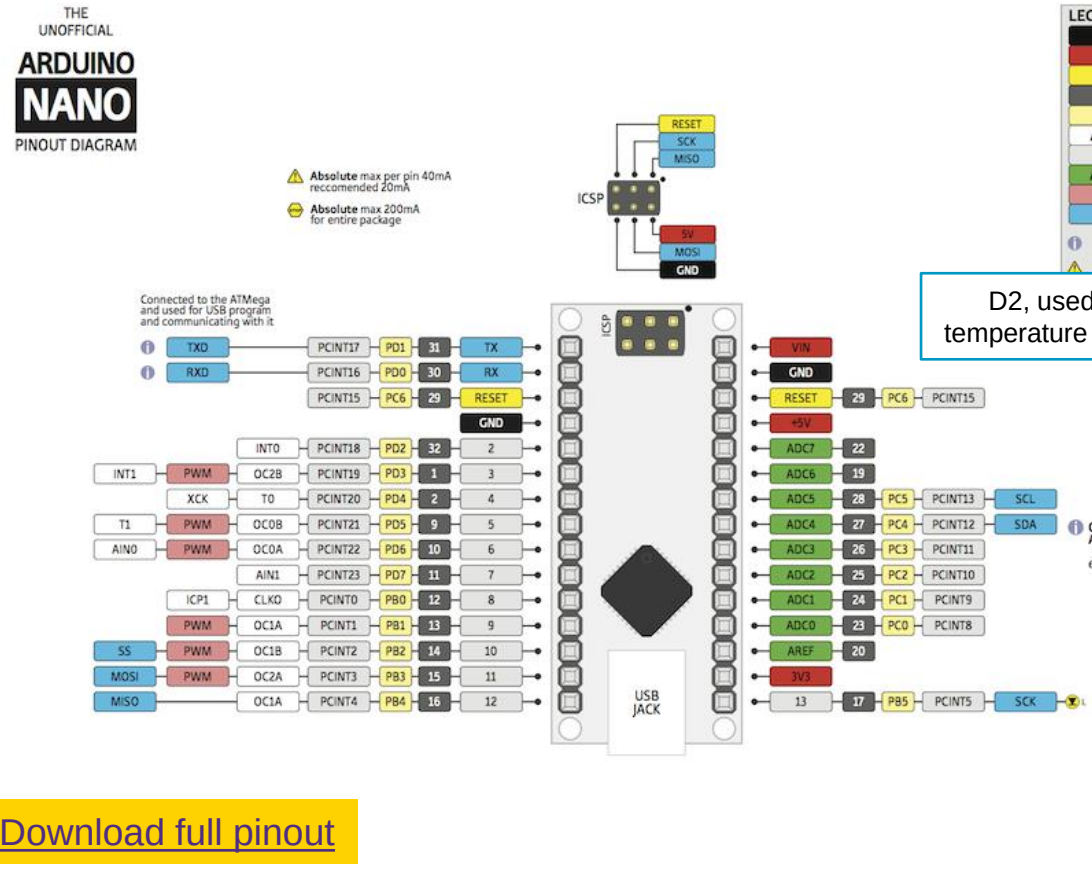


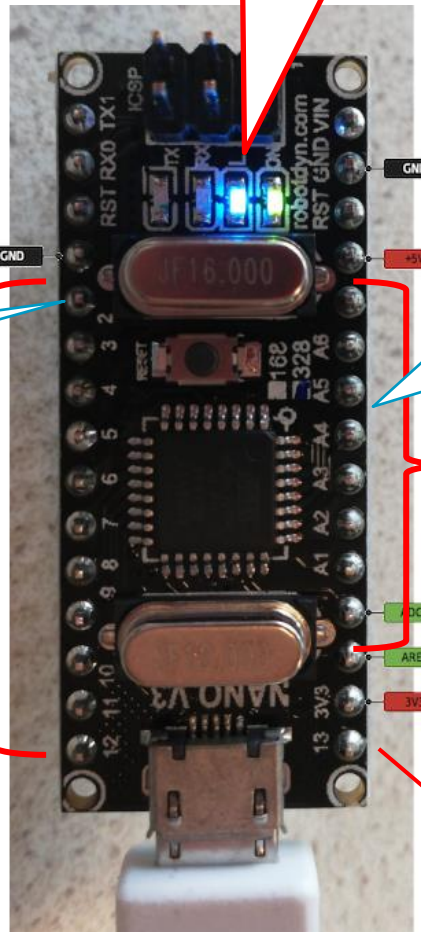
If you get this error, change setting:



Need help? Look here first (forum)

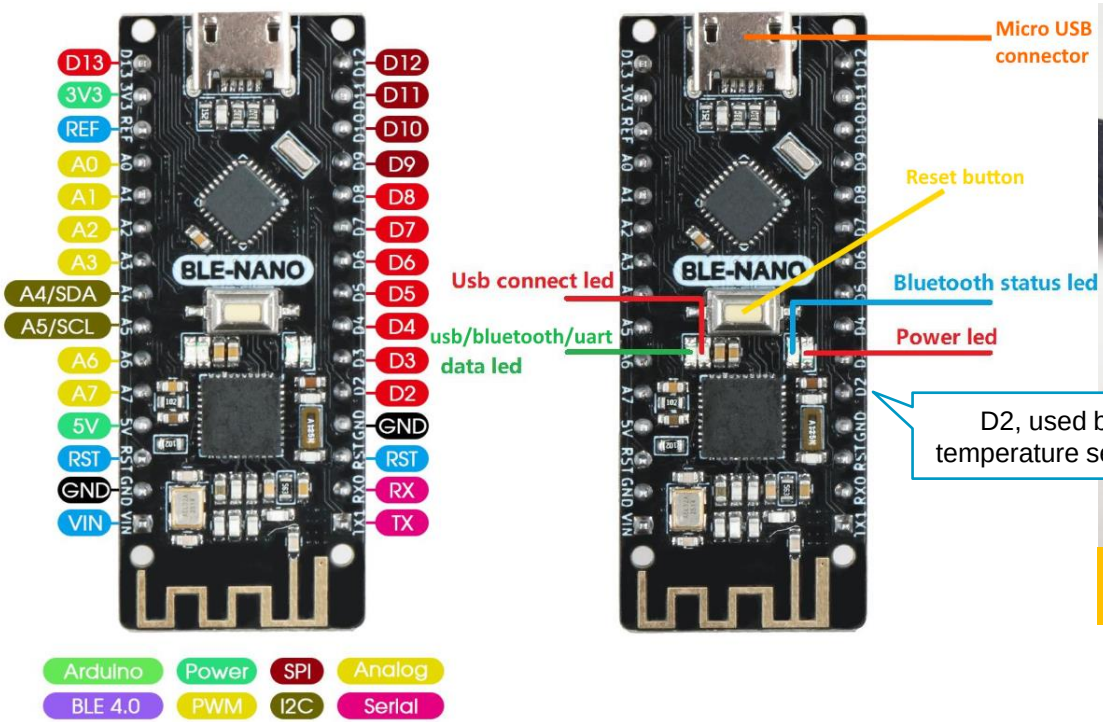
NANO PINOUT

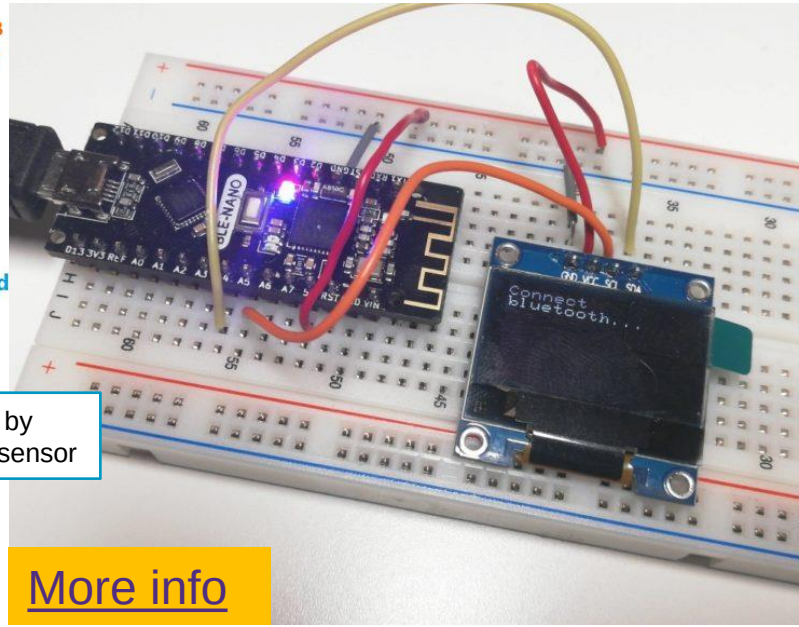




[Download full pinout]

BLE-NANO PINOUT





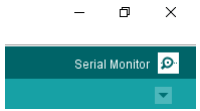
More info

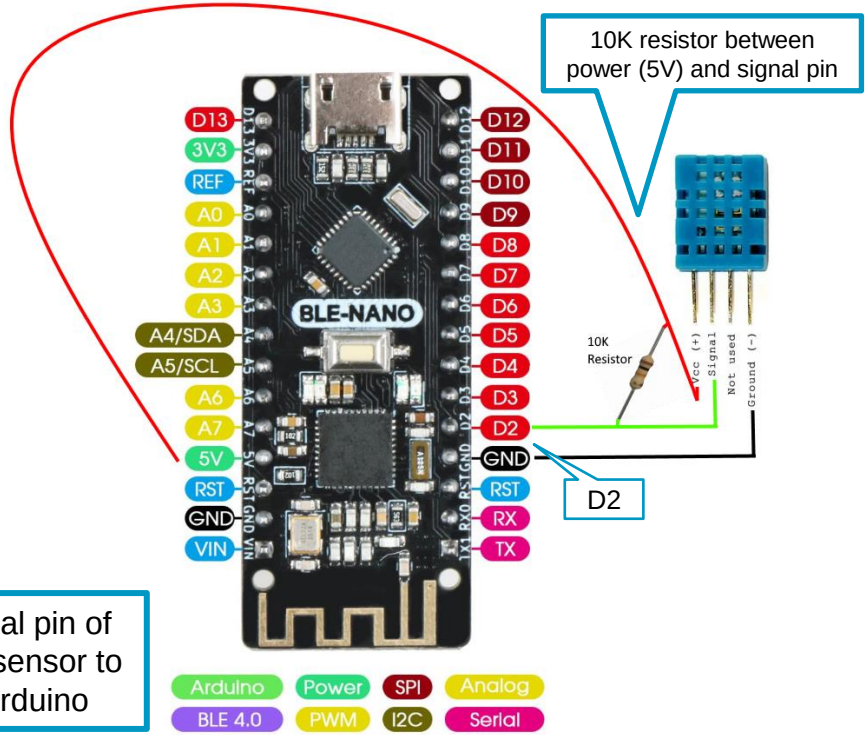
Arduino | Power | SPI | Analog
BLE 4.0 | PWM | I2C | Serial

TEMPERATURE & HUMIDITY

- DHT11 sensor
- If not installed yet, install 2 libraries: "Adafruit Unified Sensor" and "DHT library" (via *Sketch > Include Library*, search for the name)
- Example: *File > Examples > DHT sensor library*, "DHT_Unified_Sensor"

In example code, **set sensor type DHTTYPE to DHT11**, view output in Serial Monitor





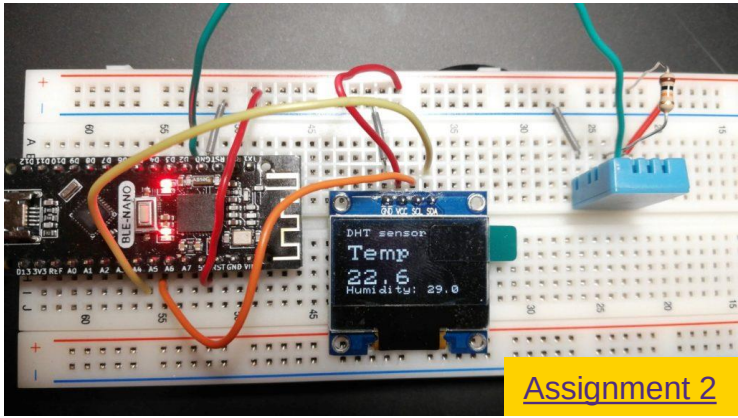
connect signal pin of temperature sensor to pin D2 of Arduino

TEMPERATURE & HUMIDITY

SHOW OUTPUT ON OLED DISPLAY

More on OLED display

- Start with example “DHT_Unified_Sensor” (*File > Examples > DHT sensor library)*
- Add display code:



Assignment 2

1) at top:

```
#include <U8g2lib.h>

// display setup:
U8X8_SSD1306_128X64_NONAME_HW_I2C display(U8X8_PIN_NONE);

char buf[10]; // text buffer; to be able to use draw2x2String to show value
```

2) in setup():

```
// initialize display:
display.begin();
display.setPowerSave(0);
display.setFont(u8x8_font_pxplusibmcgathin_f);

// show texts that do not change:
display.drawString(0,0,"DHT sensor");
display.draw2x2String(0,2,"Temp");
display.drawString(0,7,"Humidity:");
```

3) in loop():
find spot where temperature is printed, add:

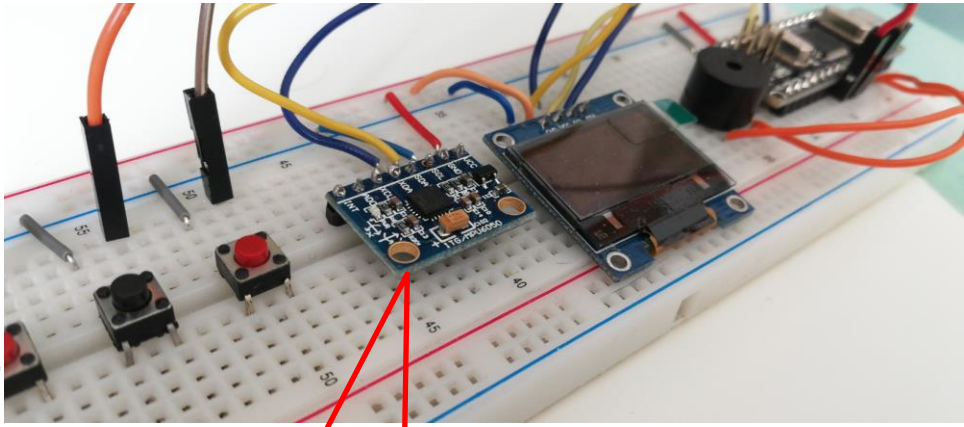
```
// display temperature on display:
dtostrf(event.temperature, 3, 1, buf); // print float like XXX.X
display.draw2x2String(0,5,buf);
```

… repeat last step for humidity

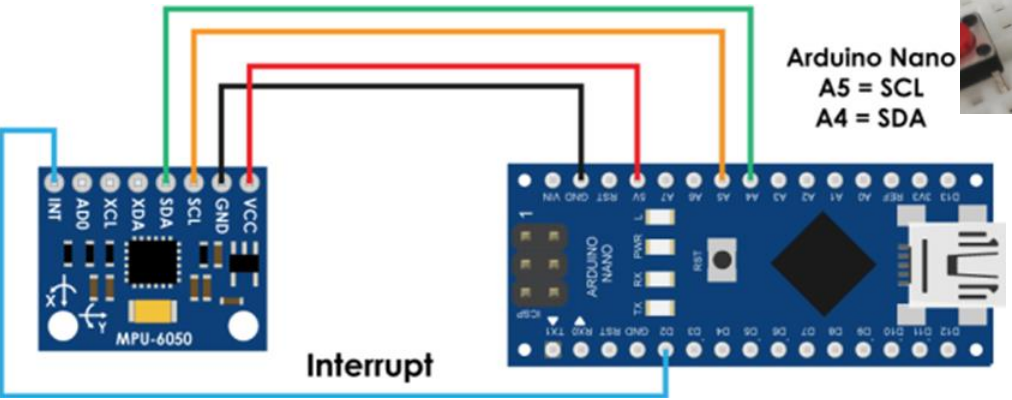
ACCELEROMETER & GYROSCOPE SENSOR

ITG/MPU6050

- Detects movements in 3d
- Example sketch: `mpu6050_basic_test.ino`
- Outputs movements to Serial Monitor, can for instance be the base of a Wii - style game controller



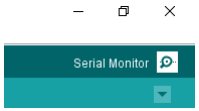
ITG/MPU6050
Accelerometer &
Gyroscope sensor



COMMUNICATION: SERIAL CONNECTION

Speed, can be 115200 or other

```
Serial.begin(9600);
Serial.print("Temperature: "); Serial.println(temp);
```

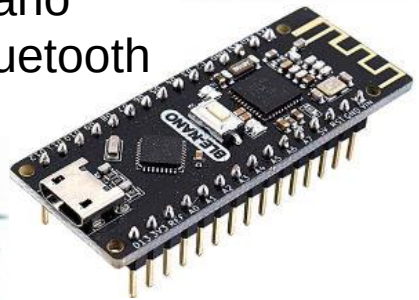


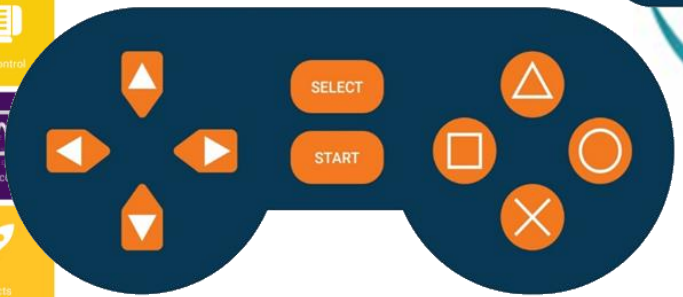
- USB cable
  - Serial Monitor in Arduino IDE
  - Another App, e.g. your own Java App: Example in alternative step 3 of assignment
- Wired (via pins) to another device (e.g. another Arduino, Bluetooth module)
  - Using RX/TX pins (also used by USB!)
  - Using any other pins
- Wireless e.g. via Wifi or Bluetooth module

REMOTE CONTROL

- Bluetooth module built in BLE-Nano wireless communication for Arduino
- Dabble, Serial Bluetooth Terminal

BLE-Nano
with Bluetooth

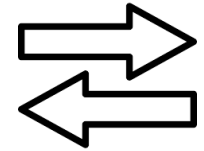




Getting started with Dabble + BLE-Nano

CONNECT TO AN APP: BLYNK

LIKE DABBLE BUT MORE FLEXIBLE USERINTERFACE BUILDER

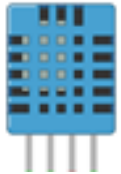


Two-way interaction

- Connect via Wifi or Bluetooth to an App
- Two-way connection
- Control your electronics and read sensors
- You can define the Userinterface of the App yourself

[Learn more: docs.blynk.cc](docs.blynk.cc)

Blynk

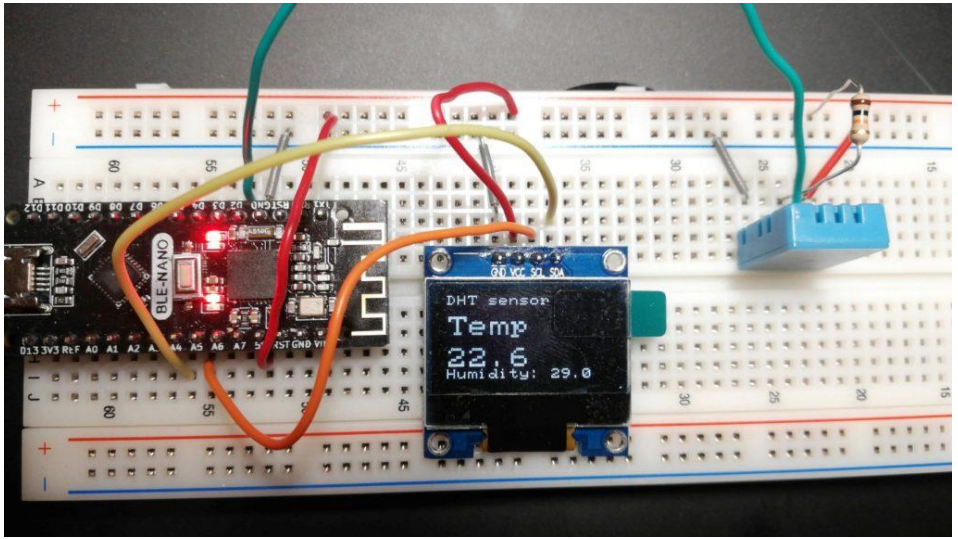


PRACTICAL ASSIGNMENT #2

FOR TODAY'S PRACTICAL SESSION

Chat service on most pages on website
to use, please login to the site, so we can see who you are

- Build a connected temperature & humidity sensor
- **Help?** Use Stackoverflow forum or the chat on the site
- You can do this assignment with both Arduino Nano's
- If you use the regular Nano, you can not do step 3 (as it has no Bluetooth). In that case, do the alternative that is provide there!
- Deadline 8 May (Friday next week)



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