Arduino Programming

UAV Workshop

Introduction to Arduino

- open-source electronics prototyping platform based on flexible, easy-to-use hardware and software (hw/sw platform for physical computing)
- can be used to implement self containing/ embedded applications/ setups or applications that communicate with a pc or other computer
- Components:
  - Arduino Board (comes in different variations)
  - Arduino Programming Language (based on Wiring / AVR Libc)
  - Arduino Programming Environment (based on Processing)

Arduino Programming Language

- core: functions for
  - digital/analog input/output
  - serial communication
  - Time
  - Interrupts
- libraries for
  - controlling stepper motors
  - reading and writing to EEPROM ("permanent" storage)
  - software implementation of serial protocol
  - controlling led matrices
- See the supported Libraries @
  - https://www.arduinolibraries.info/architectures/esp32

Installing the RMTT Board

Select the correct board

Testing the Installation

- Open the Arduino IDE
- Select your Board in **Tools** > **Board** menu (**ESP32 Wrover Core**)
- Select the Port (if you don't see the COM Port in your Arduino IDE, you need to install the ESP32 CP210x USB to UART Bridge VCP Drivers – windows only)
- Open the following example under **File** > **Examples** > **Digital > BlinkwoDelay**
- Press the **Upload** button in the Arduino IDE. Wait a few seconds while the code compiles and uploads to your board.
- If everything went as expected, you should see a "**Done uploading.**" message.
- Open the Arduino IDE Serial Monitor at a baud rate of 115200
- Press the ESP32 on-board **Enable** button and you should see the networks available near your ESP32.

Arduino Terminology

- "*sketch*" – a program you write to run on an Arduino board
- "*pin*" – an input or output connected to something.
  - e.g. output to an LED, input from a knob.
- "*digital*" – value is either HIGH or LOW.
  - (aka on/off, one/zero) e.g. switch state
- "*analog*" – value ranges, usually from 0-255.
  - e.g. LED brightness, motor speed, etc.

Arduino “Language”

- Language is standard C (but made easy)
- Lots of useful functions
  - `pinMode()` – set a pin as input or output
  - `digitalWrite()` – set a digital pin high/low
  - `digitalRead()` – read a digital pin’s state
  - `analogRead()` – read an analog pin
  - `analogWrite()` – write an “analog” value
  - `delay()` – wait an amount of time
  - `millis()` – get the current time
- And many others. And libraries add more.

Arduino Reference

- General Language Reference
  - https://www.arduino.cc/reference/en/
- List of 108 Esp Libraries
  - https://www.arduinolibraries.info/architectures/esp32

Programming using Scratch

- Mind+
  - https://mindplus.cc/en.html

- Programming the Tello RTT
  - https://mindplus.dfrobot.com/RMTT