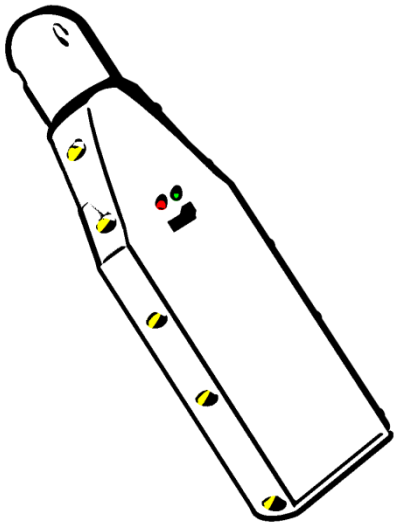


DIY Nitrox Analyzer

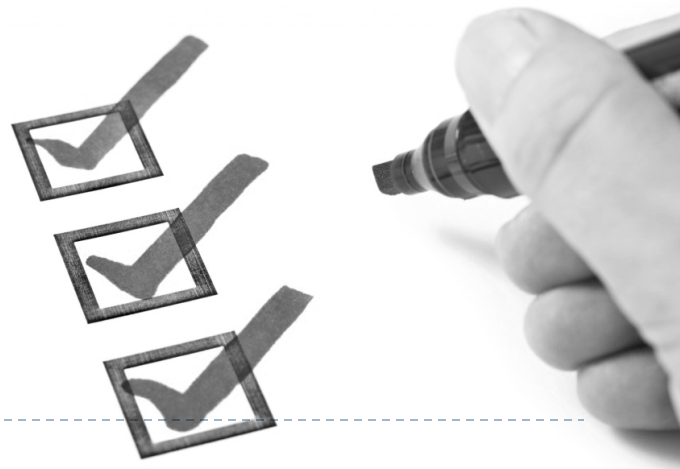
By Sergio Alves

Inception

- As a TEC scuba diver I often breath hyperoxic gases while decompressing (it accelerates decompression).
- To avoid entering into convulsions… and die… because of a too high ppO2, it's important to know the precise O2 % of the gas mix and then calc the MOD (maximum operating depth) => never breath it below MOD
- Commercial analyzers are simple boxes with an O2 cell and a kind of Multimeter (really simple devices) but very expensive > 200$

Project Goals

- Build a reliable DIY device
  - Precision per bit ~300 nV
  - Price < 100 CHF
  - Open source
- Demonstrate the capacity to
  - lead a project from an idea to a finite product
  - develop C++ firmware
  - develop UI for android
  - use a Bluetooth connection
  - model/design and print a complex container (box)

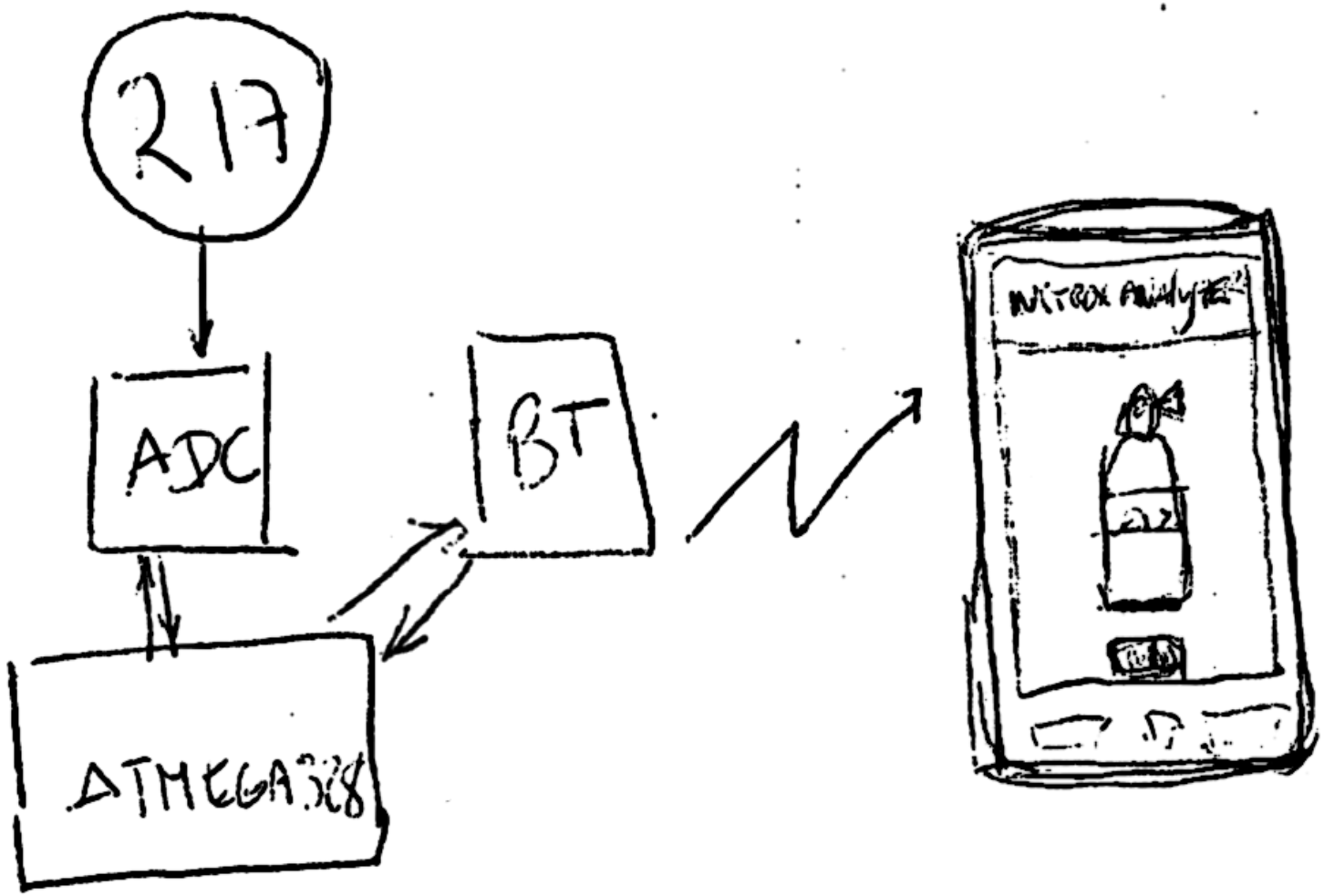


KISS
keep it simple ...

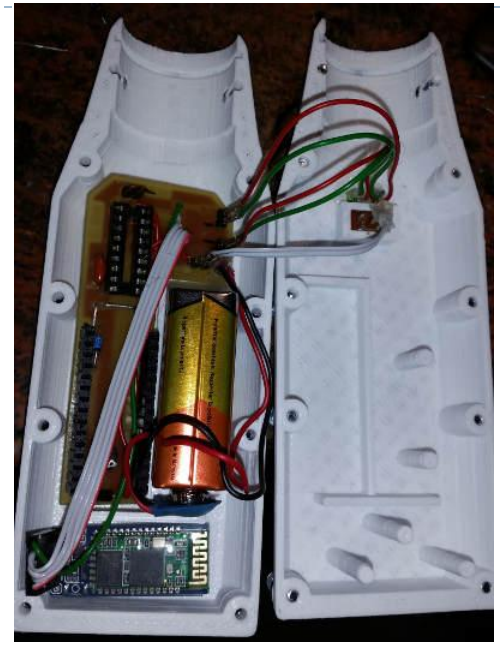
How should it work ?

- Switch Analyzer on
- Launch Android application
  - If not in auto connect mode click the connection button
- After successful connection the device will enter in auto calibration mode (to get the O2 cell value for the current gaz (air ~ 20.9 % O2)
- After calibration the controller will read continuously the sensor at a rate of 1S/s (sample/second) and the application will display the O2 value

How to integrate?



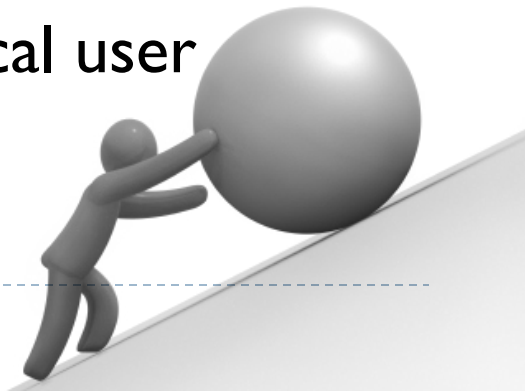
Components



- Hardware
  - A 3D printed box
  - An Arduino Nano for device control
  - A Bluetooth serial module
  - A 24 bits ADC for a high signal measurement accuracy
  - R17 Medical O2 Oxygen cell sensor
- Software
  - C++ Firmware embedded in Atmega328
    - 16MHz controller with 2 Kb Ram, 32 Kb Rom (limited resources)
  - Java mobile application running on Android OS

Challenges

- Software
  - Create an easily upgradable protocol handler in both firmware and mobile application and make them communicate
  - Create a driver to "drive" the ADS1210 chip
- Hardware
  - Develop the smallest box able to hold a R17 cell, a Nano board, a 9V battery and a Bluetooth module
- Create something precise enough to be confident using it and that runs straight forward
- Develop a device without any kind of physical user interaction (buttons, screen, audio)



Some time later…

How to improve?

- Features
  - connection to a Bluetooth analyzer
  - auto calibration
  - continuous o2 measurement
  - displaying o2 cell dates (install, validity)

- Wanted features
  - update install validity dates
  - display progress bar to help to know when a measure is valid
  - keep a track of read values
  - creates a more TEC view with higher precision
  - allow to have 2 O2 cells to have a duplicate measure. This will render the device very safe and avoid wrong measures

Because I belive in Open Source

- All files, schemas, images, source codes are available and licensed under GNU GPL3 on

https://github.com/sergio-alves/NitroxAnalyzer

Live demo

Lets see how KISS is it !!!