A Barometric Altimeter using BMP180

A pressure sensor can be used to measure elevation difference, which is the standard technique used in aviation. This measurement can be extended to the measurement of absolute elevation, if the pressure at a known elevation is provided. We would like to design an altimeter to reveal the elevation from sea level using a BMP180 digital pressure sensor. The altimeter should be able to receive QNH (Question Nil Height - sea level pressure) from the host computer so that it can calculate absolute elevation.

Once finished, your software (and the associated hardware components) are expected to

1. Receive QNH data through the USB UART.

2. Measure temperature and pressure.

3. Calculate and display elevation in meters.

You will be provided with a BMP180 pressure sensor breakout board which incorporates the additional components required to establish communications through the I²C protocol. You are also provided with a template project *alitmeter.zip* which, when compiled an uploaded, can use the BMP180 to measure and display temperature.

The bmp180 library provided in the template project does the majority of the tasks except measuring pressure. The sensor contains pre-measured calibration data which is required in making temperature and pressure calculations. These data are read from the sensor by the *BMP180readC()* function. You need to write the *BMP180readP()* following the instructions provided in the BMP180 datasheet (and inspecting the *BMP180readT()* function.) Again, some coding is required in *main.c* to calculate the true pressure by applying the formula provided in the datasheet. You may inspect the part that does this for temperature. You will also need to add the part for UART communications through the USB port.

QNH data for Istanbul Sabiha Gökçen International Airport (SAW/LFTJ) can be retrieved from various Meteorological Aerodrome Report (METAR) sites such as:

    https://metar-taf.com/LTFJ

This information will be sent to the altimeter circuit from the host computer using a USB UART software, such as CoolTerm, or the serial monitor tool of the Arduino IDE, or by simply typing

    In Windows : echo 1009 > COM5
    In Linux   : echo 1009 > /dev/ttyUSB0

from the command prompt for a QNH value of 1009 hPa. Your software may take this value only once at startup.

You may work with your laboratory partner. On the demo day, we will measure the elevation of the 1ᵗʰ floor, and then will walk to other floors to see the elevation difference.

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