# Hoogtemeting - TO BE UPDATED BY TATEV

For the measurement of the height of the ping-pong ball is made of a Time-Of-Flight Sensor. This document is the operation and use of the sensor discussed .

This sensor is located on the PCB of the ping pong tower. For information you also have here

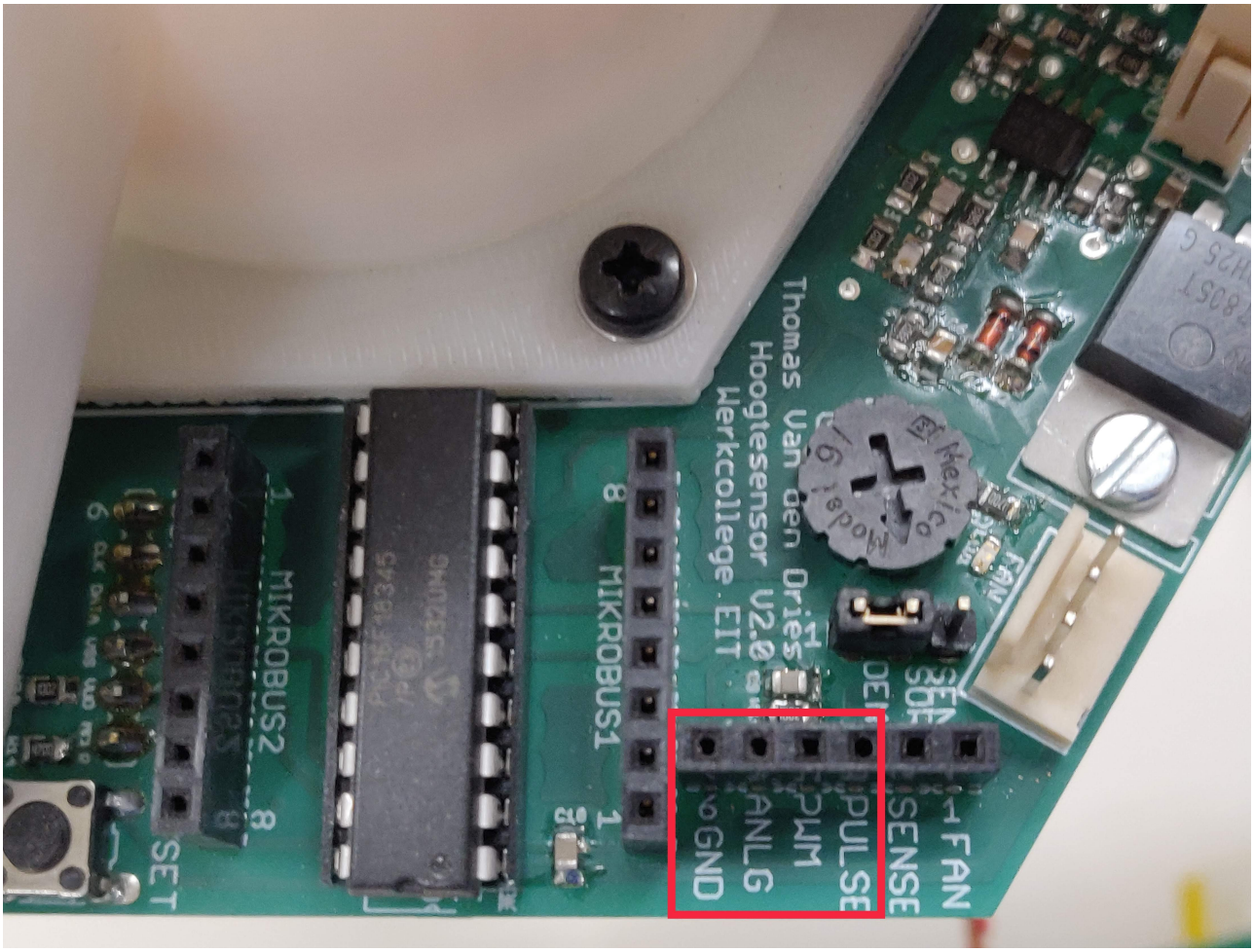
- **The complete circuit diagram of the PCB (https://canvas.vub.be/courses/20138/files/540026/download?wrap=1)** ⬇ **(https://canvas.vub.be/courses/20138/files/540026/download?download_frd=1)** .
- **The layout of the PCB (https://canvas.vub.be/courses/20138/files/540132/download?wrap=1)** ⬇ **(https://canvas.vub.be/courses/20138/files/540132/download?download_frd=1)**

## the operation

The operation of the altitude sensor is based on the use of a Time-Of-Flight sensor. **(https://canvas.vub.be/courses/20138/pages/hoogtemeting-calibratie)**

## Height sensor outputs

The height sensor returns the height in four ways, so there are several options for processing the data. These outputs can be found on the PCB of the tower (don't forget to connect the ground as well). Make sure the red switch is on SENSOR when using the height sensor!




**1. Square wave (PWM)** Another output is a PWM that has a duty cycle proportional to height . A duty cycle of 100% corresponds to the ball at the top of the tube. (Yellow graph in Figure 3 right)

**2. Analog Voltage (ANLG)** The PWM is also filtered to generate an analog voltage. A voltage of 5 V corresponds to the ball at the top of the tube. (Blue graph in Figure 3 right)

**3** . **Digital (UART)** An extra UART to USB module can be clicked on the board to read the height in java. A height of 255 here corresponds to the ball at its highest position.

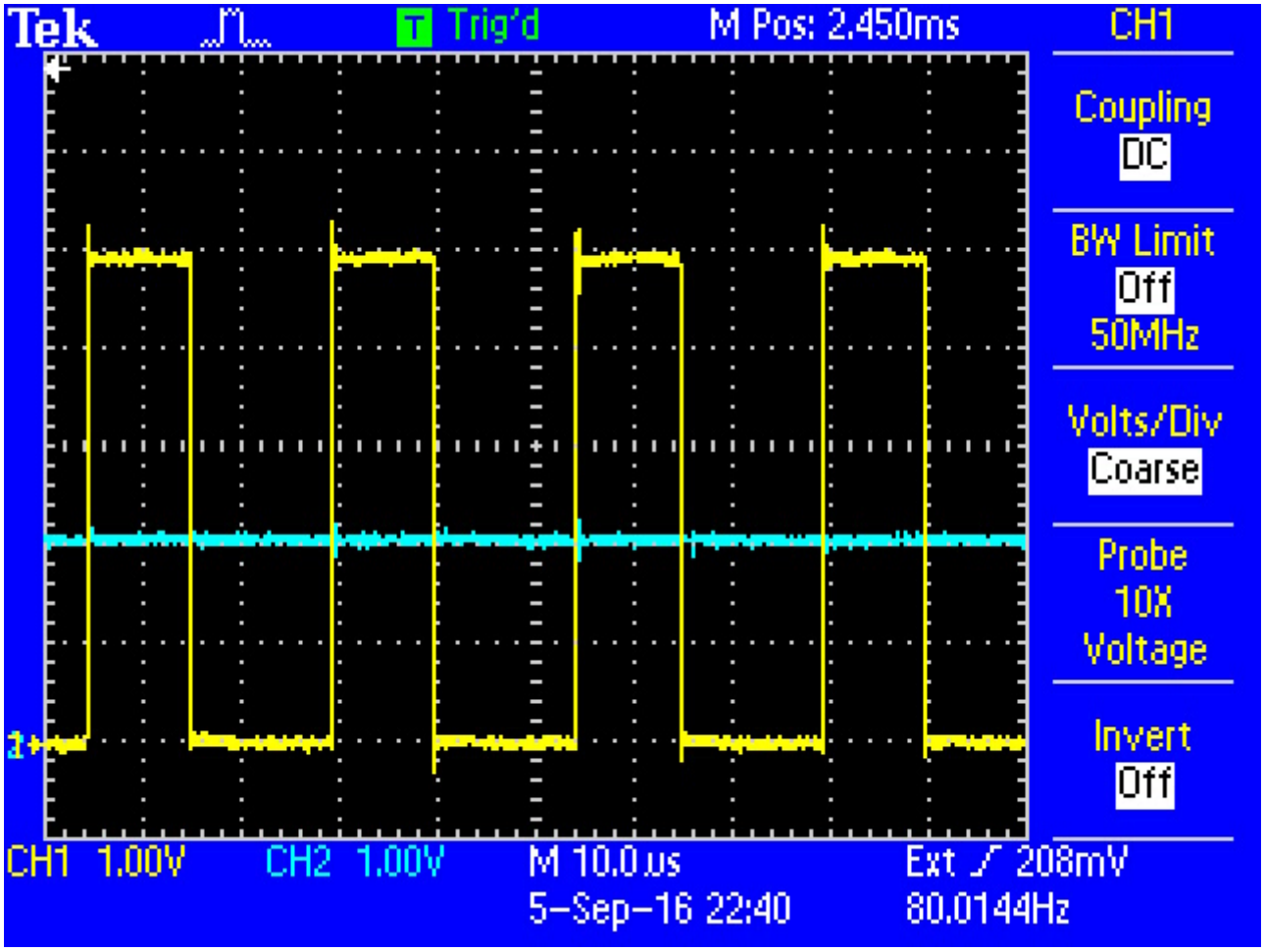



Figure 3: (left) PULSE output (yellow) (right) PWM output (blue) and corresponding analog voltage (yellow)

# Conclusion

You now know how the height measurement works. You also have 3 signals available that are proportional to the height of the ball, they are the output of our system.
We can use this to build a control system together with the input (speed of the fan).