

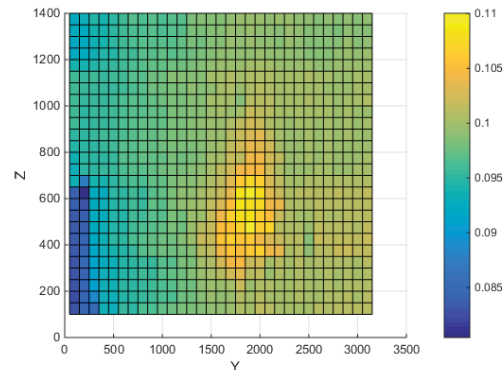
Studying the impact of the propeller of a quadrotor on gas concentration measurements using a fast chemical sensor (miniPID)

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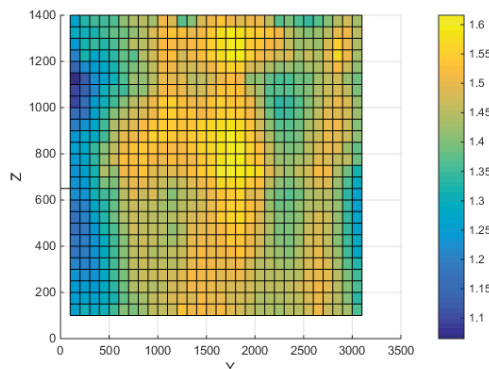
Environmental monitoring, chemical leak detection, pollution monitoring, inspection of landfills, and search and rescue operations are the main applications of gas distribution mapping with autonomous systems. Quadrotors seem to be promising platforms for gas distribution mapping tasks since they are able to freely navigate in all three dimensions. However, the propeller of these platforms generate a non-negligible air-flow which may locally change the distribution of chemical gases and thus the concentration measurements. In this project we will study the impact of the propeller of an AscTec Hummingbird quadrotor in the readings of different sensors, including a fast response miniature photoionization (miniPID) detector inside the DISAL's wind tunnel. Furthermore, the wind tunnel has been renovated in 2015 and since then no test has been performed on the wind flow inside the tunnel. Hence additional tests of the empty wind tunnel have been performed to measure the wind speed distribution. Those tests highlights, in addition to the wind distribution, the relationship between the rotation speed of the fan generating the wind flow and the actual wind speed inside the wind tunnel.

This first image shows the distribution of the wind speed inside the tunnel. As we can see the speed is significantly lower on the edge of the wind tunnel, near the walls than in the middle.



Gas concentration inside the wind tunnel

The second image shows the concentration of the acetone measured with the miniPID. The volatile organic compound source is set 15 meters upwind with a wind speed of 1.5 m/s. As we can expect the distribution does have a high concentration where the source is but did spread out during the time the wind carried it away.



Wind speed distribution inside the wind tunnel