UAS Captures 20cm-Resolution Data for 3D Model of Matterhorn

Engineers from senseFly have marked a new milestone in the history of surveying techniques by demonstrating that minidrone mapping technology is capable of producing a digital 3D model of the Matterhorn, one of the iconic peaks of the Swiss Alps, in 20cm resolution.

The data was aquired during a total of 11 flights by several eBee minidrones flying concurrently and collecting over 2,200 images within just a few hours. In cooperation with partner Pix4D and through eBee's image processing software Postflight Terra 3D-EB, a high-definition 3D point cloud was created made of 300 million points and covering an area of over 2,800 hectares with an average resolution of 20cm. 3D mission planning based on elevation data and multi-drone operation, two features recently released in senseFly's ground control software eMotion 2, were instrumental in the success of this mission and the unprecedented quality of the dataset.

The project was realised in cooperation with Drone Adventures (planning and logistics), Pix4D (data post-processing) and Mapbox (online visualisation).

History of Matterhorn Surveying

In the early 20th century, optical triangulation was used to measure the altitude of the Matterhorn. It was measured as 4,477.50m and recorded in geographic maps as 4,478m. In September 1999 geology professor Giorgio Poretti took for the first time a precision GPS (Leica GPS500) to the summit and confirmed the altitude as 4,477.54m. Surveying insiders familiar with surveying history saw in this Matterhorn surveying a symbolic moment of technological breakthrough. In May 2011 researchers from the DLR (Deutsche Zentrum für Luft- und Raumfahrt) created a 3D model of the Matterhorn with a maximum resolution of 50cm using optical satellite data, in cooperation with DigitalGlobe and 3D Reality Maps.

Ultralight Technology and 3D Flight Planning

The small weight and transportability of these ultralight drones enabled the team to carry and launch them from three different remote locations and altitudes, thus fulfilling Swiss requirements of in-line-of-sight operations. One drone was carried by Team 1 in a backpack up to the summit of the Matterhorn. The challenge was to test take-off behaviour at high altitude and in mountain-typical turbulances. The ebee was launched at the summit of the Matterhorn (4,478m), climbing up to an maximum altitude of 4,707m before flying over the top of this epic mountain and mapping the west face.

At the same time Team 2 mapped the lower part in two phases with three more drones. Six flights started just above the Hörnlihütte at an altitude of 3,260 m and mapped the north and east faces of the mountain reaching altitudes as high as 50m above the summit of the Matterhorn. Four more flights were launched at a remote place underneath the Hörnlihütte at the north face of the Matterhorn.

The main challenges successfully overcome were to demonstrate the mapping capabilities of minidrones at a very high altitude and in mountainous terrain where 3D flight planning is essential, all the while coping with the turbulences typically encountered in mountainous environments.

Technology Transfer

Started out of the EPFL in 2009, senseFly was able to successfully transfer years of research into users' hands. The control algorithms of its minidrones are based on bioinspired autopilot technology developed at the Laboratory of Intelligent Systems at EPFL. senseFly recently went a step further and integrated multidrone operation and 3D flight planning for mapping in the latest release of its ground control software eMotion 2.

senseFly and Parrot joined forces in 2012 to lead the market of professional civil drones.

For further information and images please visit the senseFly website.

Watch the video documentation here.