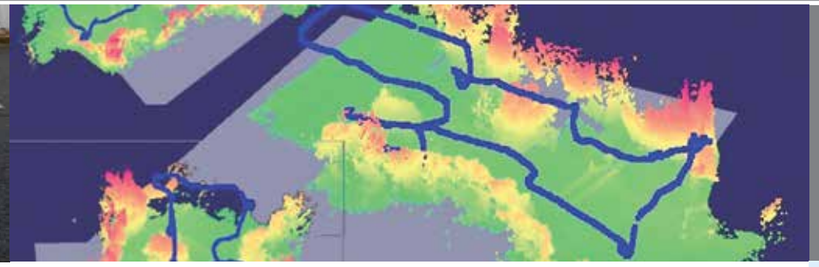
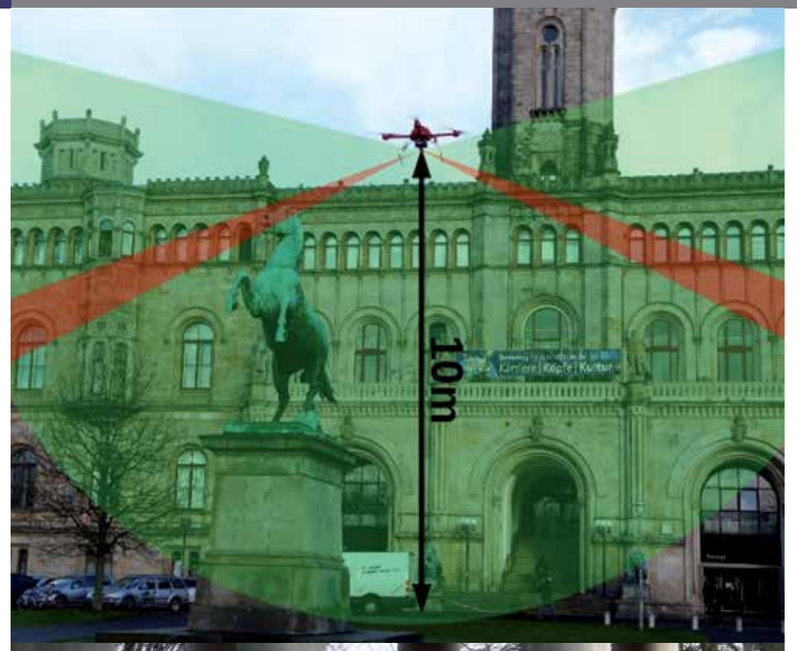


Ultra high precision 3D pose estimation for 3D landscape scanning by micro-UAVs

For some time the Institute of Real-Time Learning Systems uses unmanned aerial vehicles (UAV) for purpose of research. Prioritized was the flight control and the recording of photo- and video- material with quadrocopter systems. The goal of the project "Construction of 3D Environment Models by Fusing Ground and Aerial Lidar Point Cloud Data" was the extension of these two-dimensional visual data recordings with help of a 3D model. The economics ministry (BMWi) funded research project "Precise Positioning and Navigation" is in progress together with two industrial partners and is dedicated to develop a positioning system for the operation on lightweight UAVs.

Aerial photos known from google maps show two-dimensional images. The Institute of Real-Time Learning Systems investigated the generation of 3D-models with quadrocopters to increase the information content of these recordings. Therefore a lightweight laser scanner (lidar) was used that senses the area under the flight system in small angular steps. During a flight an entire 3D model was compounded by the integration of this data. Those single vehicle approaches are always afflicted by partial occlusion of the environment and those arise in areas that the sensor cannot detect like the sector below a treetop or a bridge. For reaching these areas, the project was done in a cooperation with the University of Hannover and the outdoor robot Hanna. With this ground vehicle three-dimensional recordings were made at the same time. The fusion of the airborne and ground-based data results in an extended 3D environment model where occlusions caused by the exposure positions are compensated. These models can map landscapes or buildings in detail and give the opportunity to easily make measurements in it.

Especially the previously described airborne recordings pointed out that a more precise positioning of UAVs is needed. Such a system is developed in the project "Precise Positioning and Navigation". In addition to the absolute position that is determined by a differential Global Navigation Satellite System (GNSS), the platform is equipped with surrounding sensors. These assist the pilot in flights next to buildings, walls or other objects and prevent collisions with them. An important application for this system is the inspection of wind power plants. Difficult wind conditions occur in the environment of the UAV and make a complete human control of the flight system complicated.



Quelle: EZLS

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