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Enabling Small Scale UAS Measurements by using the new AMOR Platform

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Human health is strongly affected by microclimate and chemical composition of the lower biosphere. The monitoring of the microclimate and chemical components of the air in urban areas is mainly accomplished by immobile data acquisition systems. UAVs are a suitable tool to collect location based data sets in 3D, but data acquisition in urban areas gives rise to some new challenges. It means flying in urban canyons or directly above buildings which requires, e.g., precise information on position, level above ground and orientation of sensor and frame. Off-the-shelf autopilots are not suitable for this application area. We therefore present the new Advanced Mission and Operation Research (AMOR) platform which extends the classical autopilot approach by several modules and enhances the accuracy of the position and the sensor data. The AMOR platform consists of several levels: the ground control station software and the air borne modules for high level mission control, which consist of separate units, the sensor-level, which includes various sensor channels for fast and accurate data acquisition and an AHRS (attitude heading reference system) for attitude sensing, The control-level, which provides a telemetry downlink to the ground control station, stores the acquired data on a common mass storage and is capable of controlling different kinds of payload, e.g. cameras and the high level-layer, which integrates low-cost and small scale SoC (system on chip) computers, which are capable of running state of the art operating systems (e.g. Linux). The high level layer enables the platform to perform complex calculations, e.g. GPS data accuracy improvements, the inclusion of position and orientation sensor data for the acquisition and correction of payload sensor data or even on board image processing and georeferencing.
The AMOR platform also provides mechanisms to integrate a common autopilot, for example Mavionics, Paparazzi, Micropilot or AttoPilot, by an abstract communication interface, which enables the aircraft to adapt its flight pattern dynamically on sensor data or events and to make use of the corrected GPS position data.
In this talk we will present the architecture of the AMOR platform and one of the key modules. The AMOC (Airborne Meteorological On-Board Computer) module consists of a controller and a sensor board, a set of computer interfaces and a high precision, high data acquisition rate multichannel AD-Chip (16-Channels, >1kHz sample rate, up to 24bit resolution). It has been developed in collaboration with the Center of Applied Geoscience of the University of Tübingen. The Sensors used in combination with the AMOR platform will be part of a seperate talk given by Norman Wildmann (University of Tübingen).