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Using quadrotor IMU data to estimate wind velocity MEGAN MAZZATENTA, DARIUS CARTER, DANIEL QUINN, University of Virginia — Due to their hovering ability and light frame, Micro Aerial Vehicles (MAVs) have the potential to conduct cheaper wind measurements with greater spatial resolution than weather balloons. However, wind sensors increase MAV payload and therefore increase cost and decrease endurance. To avoid a mounted sensor, wind velocity estimation models have been constructed using on-board Inertial Measurement Unit (IMU) data collected during flight. Existing models are able to relate IMU data to wind velocity, but they rely on calibrations and physical assumptions that limit measurement accuracy. To improve the accuracy of velocity measurements, we used a quadrotor to collect IMU data while surveying the surrounding flow using Particle Image Velocimetry (PIV). We compared IMU and PIV data for a quadrotor in still air, in the wake of another quadrotor, and in a vortex. We then evaluated how well existing models could determine velocity and turbulence intensity based on IMU data alone. Using IMU data in place of a mounted anemometer could reduce payload and allow low-cost tracking of gas plumes, pollution, and weather patterns.

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