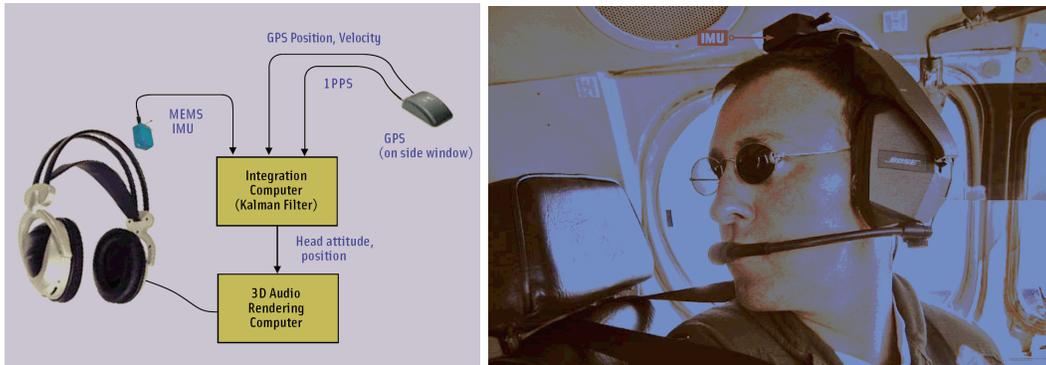


Head Tracking for 3-D Audio

PI: John F. Raquet, Air Force Institute of Technology

Sponsor: Air Force Research Laboratory (AFRL)



The Air Force Research Laboratory and others have developed audio systems that use headphones to project 3D sound, in which the brain perceives the sounds as coming from a particular direction. Potential applications for this technology exist in both military and general aviation, such as projecting tower transmissions in the direction of the tower or providing an audio orientation cue for visual flight rule (VFR) pilots who find themselves in emergency zero-visibility conditions. In order to be effective, 3D audio systems require real-time knowledge of a pilot's head orientation. The Advanced Navigation Technology (ANT) Center at AFIT has developed and tested an integrated inertial measurement unit (IMU)/GPS system that determines real-time head orientation for use by a 3D audio system. The system incorporates a low-cost micro-electro-mechanical system (MEMS) IMU combined with a single-frequency GPS receiver. Real-time data from both of these systems flows into a real-time Kalman filter which solves for position, velocity, and attitude. The attitude information was then sent to a 3D audio system for sound direction rendering. The system has been successfully flight tested by the USAF Test Pilot School and by NASA, demonstrating the ability to provide meaningful audio cues to the pilot for such tasks as identifying the direction of a transmission or flying from waypoint to waypoint by following a 3D audio signal.

For more information see Joffrion, Raquet, and Brungart, "Sonic Boon: Head Tracking for 3D Audio Using a GPS Aided MEMS IMU," *Inside GNSS*, Jan/Feb 2006, pp. 33-41.

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