Ears in the Sky-Airborne Acoustic Testbed (#6985)

An airborne acoustic testbed that consists of a self-contained acoustic sensing payload installed on an Unmanned Air Vehicle (UAV)

David Alvord and Alessio Medda from GTRI at Georgia Tech have developed an airborne acoustic testbed that consists of a self-contained acoustic sensing payload installed on an Unmanned Air Vehicle (UAV). The acoustic payload can be integrated with any type of UAV and used with additional data streams such as EO/IR or telemetry data. Using the developed signal processing suite, noise sources including self-generated UAV noise, wind, or environmental noise can be removed from the acquired acoustic signal of interest. Future capabilities of the AATB will include live voice acquisition, source localization, or acoustic fingerprinting.

The algorithm suite includes digital signal processing algorithms and post-processing functionality to filter the signal, account for flight operations, and process data from distributed microphones (both onboard as an acoustic phased array or across multiple UAVs). Future capabilities that can be developed using distributed acoustic phased arrays across multiple UAVs include speech detection, phased-array beamforming for complex ground source localization, synthetic apertures for infrasonic measurements, and aerial arrays for 3D acoustic environmental source characterization.

Benefits/Advantages

- Overcomes limitations of ground-based acoustic signal acquisition of flight vehicles by minimizing the effect of ground reflections
- Can be deployed on an UAV swarm to acquire data simultaneously from multiple aircraft to map an acoustic environment of interest
- Can use acoustic beamforming for ground target identification and localization
- Capable of acquiring acoustic signature data for a wider range of flight/ground vehicle maneuvers
- Can be used for adaptive autonomous flight control based on localizing a signal of interest

Potential Commercial Applications

This invention creates an “ear-in-the-sky” capability, being able to fly an UAV to a designated position and listen. Further possible applications include acquiring acoustic characterization data for a specified vehicle from in flight, acquiring ground based speech, Intel/Surveillance/Recon (ISR) capabilities, detecting and localizing where a sound source of interest is located, detecting search and rescue targets, and increasing situational awareness and information.

Background/Context for This Invention

Flight vehicle in-situ aeroacoustic noise measurements are primarily obtained by flying an aircraft above ground based microphone arrays, or, by using pole-mounted linear arrays. This classic approach limits the altitude and variety of maneuvers for which these measurements can be obtained as well as contaminates the data with unwanted ground reflections. A novel approach is needed to acquire this and other flight and ground based vehicle acoustic signatures.

David Alvord

Dr. Alessio Medda
Senior Research Engineer - Georgia Tech Research Institute

More Information

Publications

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/ears-sky-airborne-acoustic-testbed

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot