Novel audio telescope heeds call of the wild... birds

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Researchers at the National Institute of Standards and Technology (NIST), Intelligent Automation, Inc. (Rockville, Md.) and the University of Missouri-Columbia have modified a NIST-designed microphone array to make an "audio telescope" that could help airports more efficiently avoid costly and hazardous bird-aircraft collisions by locating and identifying birds by their calls. The prototype system was described in a recent paper.*

From chirps to trills, bird song usually is soothing and restful--unless you're a pilot. Collisions with birds in flight, called "bird strikes," caused over $2 billion worth of damage to aircraft in the United States or U.S. aircraft abroad, since 1990, according to statistics from the Federal Aviation Administration. Worldwide, wildlife strikes --mostly birds--have destroyed more than 163 aircraft and killed more than 194 people since 1988.

Airports fight back with X-band radar and infrared cameras to monitor birds, but neither technology can distinguish between different kinds of birds, particularly in bad weather. That's important because not all birds are equally hazardous to aircraft, and shutting down runways because of the proximity of unknown birds imposes its own costs in delays and increased aircraft congestion. The "audio telescope" proposed by NIST and IAI researchers is a one-meter-diameter concentric array of 192 microphones that would be mounted parallel to the ground to listen to the skies. By comparing the arrival time of sounds at different microphones, the array can determine the direction from which the

sound came, even distinguishing simultaneous sounds coming from different directions. The researchers adapted mathematical algorithms designed to allow speech recognition systems to identify different speakers in order to distinguish different species by their calls. The system can tell a Canada goose from a gull or a hawk within a couple of seconds.

The acoustic bird monitor is an extension of the NIST Mark-III Microphone array, a high-performance, directional, audio signal processing system developed as a test platform for speech-recognition computing systems in complex sound environments, such as meeting rooms. Development of the prototype was funded by the Air Force Office of Scientific Research.

* C. Kwan, K.C. Ho, G. Mei, Y. Li, Z. Ren, R. Xu, Y. Zhang, D. Lao, M Stevenson, V. Stanford, C. Rochet. An automated acoustic system to monitor and classify birds. EURASIP Journal on Applied Signal Processing. Vol. 2006.

Source: NIST