

Study on Acoustic Source Detection Performance Improvement of Microphone Array Installed on Drones Using Blind Source Separation

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Abstract : Most drones that currently have surveillance/reconnaissance missions are basically equipped with optical equipment, but we also need to use a microphone array to estimate the location of the acoustic source. This can provide additional information in the absence of optical equipment. The purpose of this study is to estimate Direction of Arrival (DOA) based on Time Difference of Arrival (TDOA) estimation of the acoustic source in the drone. The problem is that it is impossible to measure the clear target acoustic source because of the drone noise. To overcome this problem is to separate the drone noise and the target acoustic source using Blind Source Separation(BSS) based on Independent Component Analysis(ICA). ICA can be performed assuming that the drone noise and target acoustic source are independent and each signal has non-gaussianity. For maximized non-gaussianity each signal, we use Negentropy and Kurtosis based on probability theory. As a result, we can improve TDOA estimation and DOA estimation of the target source in the noisy environment. We simulated the performance of the DOA algorithm applying BSS algorithm, and demonstrated the simulation through experiment at the anechoic wind tunnel.

Keywords : aeroacoustics, acoustic source detection, time difference of arrival, direction of arrival, blind source separation, independent component analysis, drone

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