Processing and Recognition of Small Unmanned Vehicles Sound Signals

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Abstract. Information characteristics of small unmanned aerial vehicles (UAVs) sound signals are analyzed and their descriptions for a quadcopter and monoplane are presented. The difference between signals of UAVs themselves and a noisy background becomes noticeable in the frequency domain. Research shows that signals energy spectra have a significant region of broadband noise and harmonic components with frequencies that are multiples of a rotational propellers speed. Even with averaging spectral estimates over ensemble of samples, harmonics are confidently observed. With the difference in modes of quadcopter engines the spectral maxima are divided into some portions, this can be one of the most important factors for UAV detection and classification systems. To provide their operation more close to a real time the fast algorithm is suggested. It includes the stage of forming primary recognition signs on the base of broadband sound signals spectra with harmonics and a specific noise. This description is compressed by the orthogonal transformation of its covariance matrix. Recognition of UAVs sound signals is according to the Dice similarity criteria in the compressed signal domain on using a small number of covariance matrix eigenvectors.