

STRUCTURE FUNCTION AND EMPIRICAL MODE DECOMPOSITION BASED FEATURE EXTRACTION METHOD FOR RADAR PULSE SEQUENCES

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Abstract: Modern electronic warfare faces complex and dense pulses environments, which brings a severe challenge to radar signal sorting. A new feature extraction method for radar pulse sequences was presented based on structure function and empirical mode decomposition in this paper. The 2- dimension feature information was constituted with radio frequency and time-of- arrival in this method, which analyzes the feature of radar pulse sequences for the very first time by employing structure function and empirical mode decomposition. The experiment result shows that the method can extract efficiently the frequency that of the period-change radio frequency signal in the complex pulses environment and find out a new feature for the signal sorting of interleaved radar pulse sequences. This paper provides a total new ideal to extract the new sorting feature of radar signals. Radar signal sorting is a vital part of electronic intelligence system (ELINT) and electronic support measures (ESM) processing. We can analyze and extract the parameters of radar emitte signals only based on sorting. Therefore, signal sorting is a key technology to electronic countermeasures. With all kinds of complex-systems radars emerging and pulse's density increasing, the current low-efficiency method (e.g. histogram[1-4], clustering[5-7], etc.) based on five parameters which include time-of-arrival (TOA), radio frequency (RF) , pulse width (PW), direction of arrival (DOA) and pulse amplitude (PA) cannot adapt to the complex-variety and high-density pulses environment in modern electronic warfare. It urgently demands use of the current instantaneous pulse parameters to look for the new sorting feature so that we can obtain a new sorting way. According to variant characteristics of instantaneous pulse parameters for radar emitte signals, a feature extraction method for the radar pulse serial signal based on structure function and empirical mode decomposition (EMD) was presented. It can extract agile frequency of the period-change RF signal (e.g. sine regulation) from radar pulse sequences containing complex-variety feature. Thus, the sorting of this kind of signals is possible. The validity of the feature extraction method was demonstrated by simulation experiment.

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