

This paper considers track-before-detect algorithms that can be applied to modeling and tracking of dynamic time-frequency spectra where the number of spectral components is allowed to vary in time. The algorithms are the adaptive Dirichlet process mixture model-based Rao-Blackwellised particle filter (ADPM-RBPF) and the histogram probabilistic multi-hypothesis tracker with random matrices (H-PMHT-RM). The ADPM-RBPF uses a time-varying nonparametric Bayesian method based on the Dirichlet process prior to model spectral densities as mixtures of normal distributions with an unknown number of components. This approach estimates the time-varying mean and variance of each spectral mixture component and allows for the inclusion of outliers or clutter measurements. The H-PMHT-RM models each spectrum as a histogram observation of a mixture process. It uses a randomly evolving matrix to estimate the spread of each spectral component and a track management model that enables automated track initiation and termination. The algorithms are compared using simulated and experimental data.