DATA STORAGE TECHNIQUES FOR USE IN CORRELATION-BASED EARLY-TIME RADAR TARGET DISCRIMINATION

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Several radar target discrimination techniques have been devised which use the early-time temporal response. Of these, probably the most straightforward are correlation-based schemes. The early-time responses of the expected targets are stored for a range of aspect angles, and the measured response of an unknown target is correlated with each stored response. The stored pattern which produces the maximal correlation is associated with the unknown target, and thus the target identified.

The difficulty with this approach is the rapid variation of early-time response with aspect angle, necessitating the storage of an enormous number of potential patterns. This paper describes three techniques for reducing the data storage through either a physical interpretation of early-time scattering, or through the use of an efficient signal representation algorithm.

Since the early-time response is dominated by specular reflections from target scattering centers, the response can be represented as a series of pulse responses. In this case it is only necessary to store the temporal positions of the scattering events and a limited amount of information about the scattering center impulse response. This information can be obtained either in the time domain, by fitting time-shifted pulses to the measured response, or in the frequency domain where the spectrum of the measured response can be modeled as a sum of complex exponentials. The arguments of the exponentials are related to the specular time positions and can be extracted using the E-pulse technique. An alternative technique uses wavelet basis functions to represent the measured data. It is found that only a small subset of the wavelet coefficients are needed to perform accurate target discrimination.

Discrimination among five different aircraft models will be demonstrated using each of the techniques for data storage. A "discrimination range" will be introduced to describe the range of aspect angles over which a correct decision is possible. This helps to determine the aspect angle discretization required for data storage.