

Thesis Title

INVESTIGATION ON VARIOUS ASPECTS OF MIMO RADAR

SHORT ABSTRACT

Multiple input multiple output (MIMO) radar uses multiple antennas at input and output. It processes the signals from these multiple antennas jointly to yield target detection and information on other parameters of the target. It contrasts itself from traditional radar wherein single antenna is used for transmission of signal and reception of the same. Though there are bistatic and multistatic radar configurations studied in literature but MIMO as a unified stream of research in the field of radar has emerged only recently. There are multiple configurations of MIMO radar based on the arrangement of antennas and the processing performed. Thus, under the gamut of MIMO, various configurations are studied. Depending on the application area of MIMO radar, the configuration and the processing scheme changes. The current research work aims at investigating various aspects of MIMO radar. This thesis provides the work carried out on the same. We have carried out work on virtual array for planar antenna and performance comparison of different configurations of colocated MIMO radar. The effectiveness of the proposed configuration of the same is compared with monostatic uniform linear array (ULA). A metric to ascertain the goodness of antenna configuration from the perspective of virtual array is also proposed. We have investigated enhanced range resolution based on stepped frequency across transmit subapertures. The ambiguity function for the proposed technique and the doppler tolerance is also brought out. We have proposed design of a primitive scheduler for MIMO which takes advantages of transmit subarraying in accomplishing multiple tasks simultaneously. This has obtained superior results when the load on the radar is high for tracking of targets. Waveform design is an important aspect which requires detailed study. We proposed design of orthogonal waveforms based on hyperbolic frequency hopping sequence. Some aspects of distributed MIMO have already been studied under the gamut of multistatic radar in literature. We have proposed a configuration of MIMO radar under distributed class wherein the transmitters will be capable of monopulse. This class of distributed MIMO radar has definite advantages which are brought out in detail in this thesis.