INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

During the last few decades, Stealth technology has proven to be one of the most effective approaches to hiding the target from radar systems. The basic concept of low observable is mainly the reduction of Radar Cross Section (RCS) in direction of the receiver. So, for detecting such targets, concepts of bistatic and multi-static radar attracted substantial attention. However more challenges lie when radar platforms are mobile or airborne. The geometrical structures are studied with different spacing of radars, it is one of the parameters for Bi-static Radar (Baseline distance between transmitter and receiver) to extend the detection coverage over the mono-static radar. The simulation is also made to extend further for multi-dynamic scenarios. Transmitted waveform identification is very important to know the info about the waveform to processing the returned signal accordingly. The simulation is made for transmitter identity based on augmented BPSK/BASK based waveform ID tailored with standard LFM. However, another way of Transmitter ID info is simulated using IFF Mode-S waveform so that IFF waveform can be utilized for waveform ID of the radar.

In a radar system, the proper choice of waveforms directly affects the performance parameters of the system like signal to noise ratio (SNR), range resolution, Doppler resolution, and ambiguities in range, Doppler, and side-lobe levels. Waveform design and ambiguity function are the essential tools for the performance analysis of multi-dynamic radar systems in the presence of additive noise and ambiguities in range and velocity measurements. The ambiguity function properties of a signal depend on the transmitted signal and the geometrical structure of the radar system. The simulation is made towards the OFDM-LFM based waveform to define ambiguity function for multi-dynamic radar.

Multi-dynamic radar (MDR) operational requirement is brought out which includes the essential requirement of time and phase synchronization across the airborne platform for various transmitters and receivers mounted over air-crafts or UAVs. The phase and time synchronization methodology are brought as a design approach for the phase-time synchronization unit (PTSU) to exploit spatial diversity and other features of MDR by processing the target echo across various airborne receivers. The design approach is brought out such that the dependency of GPS signal may not be required, during strategic scenarios the GPS signal from Global Positioning Signal satellites may not be available to keep the all systems across airborne platforms in sync and as well as due to the low update rate of GPS signal, it is difficult to achieve short interval pulse to pulse time-phase stability requirement for radar waveforms.