

Detection of Micro-Unmanned Ariel Vehicles Using a Multiple-Input Multiple-Output Digital Array Radar

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Abstract : The usage of micro-Unmanned Ariel Vehicles (UAVs) has witnessed an enormous increase recently. Detection of such drones became a necessity nowadays to prevent any harmful activities. Typically, such targets have low velocity and low Radar Cross Section (RCS), making them indistinguishable from clutter and phase noise. Multiple-Input Multiple-Output (MIMO) Radars have many potentials; it increases the degrees of freedom on both transmit and receive ends. Such architecture allows for flexibility in operation, through utilizing the direct access to every element in the transmit/ receive array. MIMO systems allow for several array processing techniques, permitting the system to stare at targets for longer times, which improves the Doppler resolution. In this paper, a 2×2 MIMO radar prototype is developed using Software Defined Radio (SDR) technology, and its performance is evaluated against a slow-moving low radar cross section micro-UAV used by hobbyists. Radar cross section simulations were carried out using FEKO simulator, achieving an average of -14.42 dBsm at S-band. The developed prototype was experimentally evaluated achieving more than 300 meters of detection range for a DJI Mavic pro-drone

Keywords : digital beamforming, drone detection, micro-UAV, MIMO, phased array

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