

应用  
SAR回波模拟中回波信号多普勒相位计算方法在FPGA上的实现

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摘要:

多普勒相位作为被测目标信息获取的重要来源,其计算精度成为基于FPGA实现合成孔径雷达实时回波模拟技术的关键要素。本文针对多普勒相位计算过程中存在的数值开方运算以及FPGA中专用开方器件的缺失性问题,在保证原始数据的仿真精度以及满足大位宽数据的仿真需求基础上,以Xilinx Virtex6 sx315t为硬件平台,使用两种FPGA常用的近似方法---泰勒级数展开和CORDIC算法,对于多普勒相位的定点求解进行了程序设计与实现,并将仿真结果与MATLAB双精度数据进行对比,验证了精度的有效性。

关键词: 合成孔径雷达; 回波模拟; 多普勒相位; 泰勒级数展开

Implementation of Echo Signal Doppler Phase's Calculation Method in SAR Echo Simulation on FPGA

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Abstract:

As an important source to obtain the information included in measured targets, the calculation accuracy in the Doppler phase became the key element to achieve real-time Synthetic Aperture Radar echo simulation technology based on FPGA. In the process of Doppler phase calculation, against the issues on the numerical root operation and the missing of specific prescribing devices in FPGA, to guarantee the simulation accuracy in the original data and meet the simulation need in bit-wide data, this paper considered Xilinx Virtex6 sx315t as the hardware platform, and adopted two common approximation method on Doppler phase calculation----- Taylor series expansion and CORDIC algorithm, then showed the corresponding program design and implementation for the Doppler phase fixed-point solving. In the meantime, this paper compared the simulation results from two method with MATLAB double-precision Theoretical data. Finally, the compared results proved the validity of accuracy in both Taylor series expansion and CORDIC algorithm.

Keywords: Synthetic Aperture Radar Echo simulation Doppler phase Taylor series expansion

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