

通信与网络

基于同时扰动的单通道接收阵列天线跟踪方法

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摘要:

针对车载卫星移动通信系统的波束指向跟踪问题, 提出一种基于同时扰动的单通道接收阵列天线跟踪方法。由于无法获得目标函数的准确梯度, 所提方法对控制变量采用无差别的随机扰动, 实现了单通道接收阵列波束指向的精确对准; 通过分析移相器对波束指向的影响, 提出了改进的同时扰动跟踪方法, 加快了跟踪过程的收敛速度, 为实现车载相控阵天线的精确、快速跟踪提供了一种新思路。与现有跟踪方法相比, 所提方法直接扰动移相器而不是波束指向, 减小了移相器参数变化和系统误差对跟踪结果的影响, 提高了波束跟踪的稳定性, 降低了天线设计的硬件要求。

关键词: 相控阵天线 跟踪系统 单通道接收 同时扰动

Tracking method for the single-port phased-array antenna based on simultaneous perturbation

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Abstract:

A tracking method based on simultaneous perturbation for single-port phased array antenna in satellite communication on-the-move system is proposed. Due to the difficulty of obtaining the gradient of the target function, the proposed method disturbs all the variables in the same way to estimate the gradient for the single-port receiver. After analyzing the impact of phase shifter located at different positions on the beam direction, an improved tracking method based on simultaneous perturbation is proposed to increase the speed of the tracking convergence. A new concept to carry out the accurate and fast satellite tracking for the vehicle-mounted phased array antenna is given. Compared with the existing methods, the proposed algorithm disturbs the set of phase shifters simultaneously rather than the beam pointing. In this case, the parameters changes of phase shifters and various system errors have little influence on the tracking convergence, which may enhance the stability of tracking and relax the hardware restrictions in the phased-array antenna design.

Keywords: phased-array antenna tracking system single-channel receiver simultaneous perturbation

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