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具有互耦補償及干擾訊號抑制之衛星定位空時自調式混合濾波電路研究

張仲良;盧建余;蔡循恒

摘要

本計劃擬研究在全球衛星導航系統(GNSS)中，同時具有天線互耦效應補償以及干擾抑制之空間−時間(空時)自調式訊號處理電路以增進 GNSS 接收機偵測與干擾抑制之能力。本計畫之工作著重於天線互耦效應之分析、空時自調式混合濾波演算法則模擬與驗證、實測電路之製作與干擾抑制效益分析與評估。雖然在前期研究中採用傳統的空時訊號處理技術可提升干擾抑制自由度、克服時變系統、且同時可對付窄頻與寬頻干擾，但由於該技術常遭受到天線彼此間所產生的互耦效應以及接收機本身在硬體製作過程時，其增益與相位的不一致導致其訊號估測方位角以及波束指向的偏差進而影響 GNSS 訊號接收的品質。天線互耦現象的發生乃在於天線在接收訊號時彼此之間所產生的相互干擾，主要因素在於天線本身的特性、擺放位置以及天線彼此間的距離有關。故本研究將利用一個空時自調式混合濾波電路來進行天線互耦補償與校正，並同時能維持良好的干擾抑制能力，計畫將藉由

訊號處理電路實驗平台研製以建立具體之天線互耦補償以及干擾抑制技術，進而改善 GNSS 接收機定位性能，並嘗試利用此實驗平台驗證對於實際接收訊號，可有效補償天線互耦效應以及干擾抑制，提升訊號接收品質。

關鍵字: 陣列天線;衛星導航系統;干擾抑制

Spatial-Temporal Self-Turning Synthesis Filter for Gnss Antenna Array with Mutual Coupling and Interference

張仲良;盧建余;蔡循恒

Abstract

This project aims to utilize a spatial-temporal self-turning synthesis filter capable of mutual coupling compensation and interference mitigation to improve the detection performance of global navigation satellite system (GNSS) receiver and mitigate interference. The focus of this project is on the analysis of mutual coupling, simulation and verification of the proposed technique, establishment of experiment platform and analysis and assessment of interference mitigation technique. Though traditional spatial-temporal signal processing technique can enhance the freedom of interference mitigation, overcome time-vary system and deal with narrowband and wideband interference, this technique is susceptible to mutual coupling phenomenon between antennas and the fact that not each gain and phase is the same in hardware manufacture process of receiver, which causes the error of estimated arrival of angle and influences the quality of GNSS signal reception. Mutual coupling is caused by the interaction between antennas in receiving signals. The main factors lie in the characterisics of antenna itself, location of antenna array and the spacing between antennas. This research adopts a spatial-temporal self-turning synthesis filter to conduct mutual coupling compensation and correction and also maintain well-functioned interference mitigation. This project will implement realistic mutual coupling compensation and interference mitigation techniques by means of establishment of experiment platform so as to enhance the postitioning performance of GNSS receiver. Besides, it also utilize real data to verify the performance of proposed technique to effectively compensate for mutual coupling and enhance the performance of receiver better quality of signal reception.

Key words: Antenna array;Global navigation satellite system (GNSS);
Anti-jamtechniques