

论文

## 基于四元数的姿态变换关系在SAR运动补偿中的应用

郭春梅<sup>①②</sup>, 王岩飞<sup>①</sup>

<sup>①</sup>中国科学院电子学研究所 北京 100080;

<sup>②</sup>中国科学院研究生院 北京 100039

收稿日期 2006-9-28 修回日期 2007-2-16 网络版发布日期 2008-6-10 接受日期

摘要

SAR运动补偿技术是SAR系统获得高质量图像的关键。当雷达载体发生横滚角、俯仰角和偏航角运动时, 天线平台需要得到实时的姿态角以稳定天线的指向, 而捷联惯导系统能满足这一要求。捷联矩阵的实时修正是捷联系统姿态解算的主要任务, 考虑到系统实时性和稳定性的要求, 用一种新的方法推导了四元数与姿态角的变换关系, 并根据此关系分析了载机角运动误差对SAR成像的影响。基于四元数的方法能减少SAR运动补偿中复杂的三角函数运算, 提高了运算效率, 增强了系统的实时性。

关键词 [SAR](#) [捷联惯性导航](#) [角运动误差](#) [四元数](#) [方向余弦矩阵](#) [运动补偿](#)

分类号 [TN958](#)

## The Application of Transformation Relationship between Quaternion and Attitudes to SAR Motion Compensation

Guo Chun-mei<sup>①②</sup>, Wang Yan-fei<sup>①</sup>

<sup>①</sup>Institute of Electronics, Chinese Academy of Sciences, Beijing 100080, China;

<sup>②</sup>The Graduate University of Chinese Academy of Sciences, Beijing 100039, China

Abstract

Since factors such as turbulence and pilot error make it impossible for an aircraft to flight along the nominal straight flight path, SAR motion compensation technology is crucial to acquiring high quality image. When the aircraft changes in the roll, pitch or heading, it is necessary to track the real time attitudes to stabilize the antenna pointing. While the strapdown inertial navigation system can fulfill the requirement. The instant attitude updating is one of the main tasks of attitude measurement for strapdown system. Consideration of the real time ability and stable performance, a new derivation method of the transformation equations between quaternion and attitudes is proposed. The influence of angle motion in airplane on SAR imaging is analyzed based on the derived equations. The method given in the paper can highly reduce the operation of triangle function and improve the efficiency of the system.

Key words [SAR](#) [Strapdown inertial navigation](#) [Angle motion error](#) [Quaternion](#) [Direction cosine matrix](#) [Motion compensation](#)

DOI:

通讯作者

作者个人主页 郭春梅<sup>①②</sup>; 王岩飞<sup>①</sup>

### 扩展功能

本文信息

▶ [Supporting info](#)

▶ [PDF \(202KB\)](#)

▶ [\[HTML全文\]\(OKB\)](#)

▶ [参考文献\[PDF\]](#)

▶ [参考文献](#)

服务与反馈

▶ [把本文推荐给朋友](#)

▶ [加入我的书架](#)

▶ [加入引用管理器](#)

▶ [复制索引](#)

▶ [Email Alert](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

相关信息

▶ [本刊中 包含“SAR”的 相关文章](#)

▶ 本文作者相关文章

• [郭春梅](#)

• [王岩飞](#)