信号处理 2010, 26(11) 1677-1682 DOI: ISSN: 1003-0530 CN: 11-2406/TN

算法研究

一种局部参考坐标系下的三站时差定位算法

曾芳玲,曾辉,杨景曙

黄山路460号702，安徽合肥

摘要：

论文针对三站时差定位计算过程中，会出现多解及选解模糊的情况，对一种通过低空基准平台对海地面或近地目标进行探测定位的三站无源时差定位算法进行研究。基于高精度的WGS-84地球模型，提出建立一种基于空中基准站覆盖区域的局部参考坐标系。在该坐标系下，通过坐标变换和近似处理，降低了时差方程中目标点在三维直角坐标系下未知坐标的维数，从而可按照一般三个基准站计算二维坐标的定位算法完成对目标点的三维定位，求解与判断较为容易，保证了计算结果的稳定性。然后通过迭代运算，进一步提高计算结果的精度。通过坐标反变换（线性变换），可得到目标点在大地坐标系下的定位结果。仿真结果显示，对于我们所关心的目标区域，该算法因为避免了求解四次方程，并且运算过程中各坐标分量的几何意义明显，易于选解，从而解决了三站时差定位计算中常存在的定位模糊问题。该方法无需辅助其它测量信息（如测方位角等），仿真运算中不存在选解错误的情况，其定位精度满足应用需求。

关键词： 三站时差定位；坐标变换；WGS-84模型

An Algorithm for the Tri-Station TDOA Location Based on local reference Coordinate System

ZENG Fang-Ling, ZENG Hui, YANG Jing-Shu

460 Huangshan Road,Hefei,Anhui

Abstract:

This paper aim at the situation of many solutions and selection ambiguity in the calculation process of traditional algorithm for tri-station TDOA (time difference of arrival) three-dimensional location. The algorithm of tri-station TDOA three-dimensional location for sea level or near earth targets using aerial base platforms is studied. Based on the high precision WGS-84 earth ellipsoid model, building a local reference coordinate system based on the coverage area of the aerial base stations is presented. In this coordinate system, the unknown coordinate dimension of target in three-dimensional rectangular coordinate system in the TDOA equation is reduced by coordinate conversion and approximate process. As a result, the tri-station TDOA three-dimensional location of target can be accomplished according to the traditional TDOA location algorithm for two-dimensional target using two base stations. And the solving, judge and solution selection in this algorithm is easier compare with the traditional algorithm for tri-station TDOA three-dimensional location. Besides, the consistency of the calculation results in this algorithm can be guaranteed. And then the precision of the location calculation results can be further improved by iteration operation. The location results of target in the geocentric coordinate system can be obtained by coordinate inverse conversion (linear conversion). The problem of many solutions and selection ambiguity existing frequently in calculation process of traditional algorithm for tri-station TDOA three-dimensional location can be resolved for the target area which we concerned, owing to that solving quartic equation can be avoided in this algorithm, the geometric meaning of each coordinate component is obvious and solution selection is quite easy. Besides, this method does not need other auxiliary measurement information such as measuring azimuth. The situation of errors in solution selection does not exist in the simulation operation. And the simulation results also show that the algorithm can satisfy the demand of application.

Keywords: Tri-station TDOA location coordinate system;WGS-84 ellipsoid model

收稿日期 2010-04-19 修回日期 2010-07-19 网络版发布日期 2010-11-25

DOI:

基金项目:

本论文得到省部级预研项目经费的资助

通讯作者:

作者简介:

作者Email: zella@ustc.edu

参考文献：

本刊中的类似文章

文章评论

反馈人		邮箱地址	
反馈标题		验证码	3675