

Novel Attitude Determination Algorithm Using Single Frequency L1 GPS/GLONASS Receivers

Wenrui JIN, *Institute of Aerospace Science and Technology, Shanghai Jiao Tong University*
Chuanrun ZHAI, *Institute of Aerospace Science and Technology, Shanghai Jiao Tong University*
Yanhua ZHANG, *Institute of Aerospace Science & Technology, Shanghai Jiao Tong University*
Xingqun ZHAN, *Institute of Aerospace Science and Technology, Shanghai Jiao Tong University*

ABSTRACT

When the receivers of GPS, GLONASS and other such systems are equipped with multiple antennas, they can also give attitude information. In this research, two works are highlighted. Firstly, based on the single differencing (SD) carrier phase equations established in local level frame (LLF), a new algorithm is presented to resolve vehicle attitude determination problems in real-time. Secondly, presumed that the cycle integer ambiguity is known, the measurement equations have attitude analytical resolutions by simultaneous single difference equations of two navigation satellites in-view.

In addition, the algorithm is capable of reducing the search integer space into countable 2D discrete points and the ambiguity function method (AFM) resolves the adaptive function within the analytical solutions space. Therefore the procedures have very low computation and time is saved greatly. The hardware platform has been realized using multiple NovAtel GPS/GLONASS OEM boards. The proposed algorithm for analytical resolution attitude determination is validated using many static and dynamic ground tests. The experimental results have demonstrated that the proposed approach is effective and can satisfy the requirement of real-time application in cases of GPS and combined GPS and GLONASS.

INTRODUCTION

PROPOSED AF ALGORITHM

A. Measurement Equation

B. Geometric Interpretation of Analytical resolution

C. Attitude Solution

HARDWARE PLATFORM

EXPERIMENTAL RESULT

A. Static Experiment

B. Kinematic Experiment

C. Combined GPS and GLONASS Experiment

CONCLUSIONS AND FUTURE WORK

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