



Electronic Track Map Building for Satellite-based High Integrity Railway Train Positioning

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Submitted: Feb. 12, 2013

Accepted: Mar. 27, 2013

Published: Apr. 10, 2013

Abstract- The concept of electronic track map has been introduced and researched in many satellite-based railway train positioning and location-based railway systems. It should characterize the railway tracks and their key objects and facilities with a satisfied accuracy and completeness. Based on the application requirements, design and building of the electronic track maps should be in accordance with the map matching approach, and moreover, considering the integrity effect that is decisive to safety. This paper introduces a paradigm for electronic track map design and generation. According to the satellite-base train positioning scheme, the architecture of the electronic track map and its coupling in the train-borne systems is investigated. Detailed track map generation method is summarized as a five-step process, including raw measurement collection, rejection of abnormal measurement, feature points extraction, track interpolation, and topographic

property supplement. Following this approach, the map matching with high integrity is discussed where the statistics of matching residual is adopted to improve the direct error analysis. Practical measurements and field test results demonstrate the capability of the presented track map building and integrity monitoring approaches. That provides great potential to implementation of satellite navigation in railway applications and services.

Index terms: Electronic track map, railway train positioning, Global Navigation Satellite System (GNSS), multi-sensor integration, high integrity.