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CYCLE SLIP DETECTION IN KINEMATIC GPS WITH A JERK MODEL FOR LAND VEHICLES

Toshiyuki Aoki[1], Yutaka Shimogaki[2], Tomokazu Ikki[3], Makoto Tanikawara[4]
Sueo Sugimoto[5], Yukihiro Kubo[5] and Koji Fujimoto[6]

[1]Hitachi Research Laboratory
Hitachi, Ltd.
1-1, Omika-cho 7-chome, Hitachi-shi, Ibaraki 319-1292, Japan
toshiyuki.aoki.gh@hitachi.com

[2]Information & Telecommunication Systems
Hitachi, Ltd.
27-18, Minamioi 6-chome, Shinagawa-ku, Tokyo 140-8572, Japan

[3]Information & Telecommunication Systems
Hitachi, Ltd.
890, Kashimada, Saiwai-ku, Kawasaki-shi, Kanagawa 212-8567, Japan

[4]Business Development Center
Hitachi Industrial Equipment Systems Co., Ltd.
1-1, Higashinarashino 7-chome, Narashino-shi, Chiba 275-8611, Japan

[5]Department of Electrical and Electronic Engineering
Ritsumeikan University
1-1, Nojihigashi 1-chome, Kusatsu-shi, Shiga 525-8577, Japan

[6]National Institute for Land and Infrastructure Management
Ministry of Land, Infrastructure and Transport
1, Asahi, Tsukuba-shi, Ibaraki 305-0804, Japan

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Abstract. *Kinematic Global Positioning System (GPS) is a positioning method that uses carrier phase data to output a highly precise position. In kinematic GPS, the position accuracy might be degraded significantly by a cycle slip, i.e., a sudden jump in the carrier phase observation by an integer number of cycles. Methods for detecting a cycle slip include a method that uses statistical tests of carrier phase innovations. This method has the merit that the noise of the innovation is small and does not affect the detection performance; however, it has the disadvantage that the movement of the land vehicle degrades the detection performance and causes either undetection and mis-detection. In this study, a dynamic model that includes jerk (i.e., the rate of change of acceleration) is proposed, and based on this model, a cycle slip detection method that corresponds to the movement of a land vehicle is then developed. This method precisely predicts the position of a land vehicle, even when it accelerates and decelerates, and improves the performance of the cycle slip detection. Moreover, the performance of this method is experimentally evaluated using observation data collected with a car.*
Keywords: Kinematic GPS, Cycle slip detection, Statistical test, Innovation, Jerk, Dynamical model

1. **Introduction.** The information system using Global Positioning System (GPS) of the United States is widely used for car navigation [1], portable terminals, cellular phones, and so on. In these fields, single point positioning, whereby the receiver tracks the C/A (coarse and access) codes from GPS satellites, measures the distances from the satellites