

Improve the Accuracy of the RTKLIB Software through Upgrade the Friendliness of the Interface and Mitigate the Satellite Cycle Slips

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Loss of signal reception is a critical issue in Global Navigation Satellite Systems (GNSS) that can lead to degraded positioning accuracy. Satellite signal blockage, jammers, and continuous cycle slip (CS) detection are some of the primary reasons for signal loss. In this research, we focused on detecting the effects of CS on GNSS observations at ISM Diyathalawa, a location with a clear sky view. Atmospheric conditions are the primary cause of CS, which can lead to sudden changes in carrier phase measurements, resulting in errors in positioning solutions. The research aimed to achieve two major objectives: (1) enhancing the accuracy of the open-source software RTKLIB, and (2) approaching the accuracy of commercial software such as Leica Infinity. Although most commercial software can detect cycle slip, their prices are typically expensive. Thus, the study focused on using RTKLIB to enhance positioning accuracy when continuous cycle slip results in satellite signal loss. To accomplish the research objectives, the team added a new feature that includes the satellite vehicle number for GPS satellites, called "RTKLIB New," which is also user-friendly. The methodology of the research involved removing satellites which are consisted longer period signal lost due to the cycle slip, through precise point processing (ppp) and evaluating the accuracy changes in RTKLIB 2.4.2 and RTKLIB New. Based on the ISM Point known coordinate, RTKLIB New fulfilled the aims and provided a 54% positional accuracy improvement compared to RTKLIB 2.4.2. Furthermore, 24-hour observations showed that the RTKLIB New accuracy was comparable to that of Leica Infinity positional accuracy. These findings can be useful in improving the accuracy of GNSS positioning in areas prone to continuous cycle slip and clear sky areas.

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