

Low-Cost GNSS Receiver Systems for Disaster Management, Dynamic Air-Quality Monitoring, and Gateless Toll Gate

Manandhar Dinesh (Japan)

Key words: GNSS/GPS; Keyword 1; Keyword 2; Keyword 3

SUMMARY

Low-cost GNSS (GPS, GLONASS, Galileo, BeiDou, QZSS, NavIC) receivers that cost only a few hundred dollars are getting powerful in terms of the signal processing capabilities of multiple satellites and signals. Dual-frequency or triple-frequency low-cost GNSS receivers are available as COTS (Commercial-Off-The-Shelf) products. However, such low-cost devices are generally available as evaluation kits or modules. Thus, it may require system integration on the user side. We have done system integration of COTS GNSS modules to develop a low-cost GNSS receiver system for high-accuracy positioning using RTK and MADOCA-PPP. The receiver is also capable of receiving disaster related Early Warning Message (EWM) from QZSS that can be used for disaster management and planning. It can also be used for dynamic air quality monitoring by integrating the receiver with environment sensors like PM sensors, CO/CO₂ sensors, and harmful gas sensors. If this device is set on public transport vehicles, it will help in air-quality monitoring of urban areas in near-real time. This will also help to measure the pollution due to traffic congestion that is related to carbon monitoring. The low-cost GNSS receiver system can also be used as “Gateless Toll Gate” by setting the device on vehicles. Construction of toll gates as well as its operation and maintenance are quite expensive. It also requires space on the roadside for construction which may not be available in many cases. Toll gates may cause traffic congestion if the system does not operate smoothly. Thus, we are proposing the use of GNSS receivers for toll gates. However, once GNSS based toll system is implemented, issues like interference, jamming and spoofing attacks may occur. To counter these attacks a proper receiver must be selected and it should have an anti-spoofing function such as signal authentication. In this paper, we present how a low-cost GNSS receiver system can be used for high-accuracy surveying, early warning message, dynamic air quality monitoring, and gateless toll gate.

Low-Cost GNSS Receiver Systems for Disaster Management, Dynamic Air-Quality Monitoring, and Gateless Toll Gate
(12959)

Manandhar Dinesh (Japan)

FIG Regional Conference 2024 - Nepal

Climate Responsive Land Governance and Disaster Resilience: Safeguarding Land Rights

Kathmandu, Nepal, 14–16 November 2024