計畫名稱: 智慧型手機GNSS相位觀測量運用於管線圖資更新測量之研析

計畫編號: MOST 110-2121-M-231-001

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關鍵字: 智慧型手機、GNSS相位觀測量、後處理動態定位、管線圖資更新

摘要

安裝有Android操作系統的部分行動設備，已可透過所搭載之特別晶片，進行GNSS衛星雙頻(含L1/L5)載波相位觀測量之獲取與紀錄。而運用此類型之手機，若可達成較高精度之GNSS動態定位解算，將可有效降低GNSS接收與通訊裝置之成本。在應用端，則期能滿足地下管線在辦理圖資更新測量時，所要求之20公分定位誤差標準。針對此一目標，本研究使用可提供GNSS相位觀測量之智慧型手機（以Mi8為主），做為前端資料接收工具，並採後處理動態定位(Post-Processing Kinematic, PPK)模式進行解算，另透過接收信號品質檢視、不同款型手機比對、零基線率定、星曆運用、移動接收、多時段定位及改良信號產製等測試程序，來進行其操作性、精確性及改良性之完整檢核。經測試可知，Mi8手機相位觀測量並不適用於移動式定位，也不宜使用廣播星曆進行解算，另在不同時段之定位表現也不穩定。而本研究利用GNSS信號轉發套件配合遮罩方式所接收之改良信號，其定位平均誤差可優於16公分，且可較原始信號之定位誤差至少提升30%。

Abstract

Some mobile devices with Android operating system can already obtain GNSS satellite dual-frequency (including L1/L5) carrier phase observations with records through a special chip. Using this type of mobile phone, if a high-precision GNSS dynamic positioning solution can be achieved, the cost of GNSS receiving and communication devices can be effectively reduced. On the application side, it is expected to meet the 20 cm positioning error standard required by the underground pipeline when the map is updated and surveyed. Aiming at this goal, this research will use a smartphone (mainly Mi8) that can provide GNSS phase observations as a front-end data receiving tool for Post-Processing Kinematic (PPK) satellite post-processing. Test procedures such as determination, ephemeris application, moving operation, and signal improved and operation, etc., conduct a complete inspection of the accuracy of positioning results, so as to deeply understand the operability, accuracy and improvement of smart phones in GNSS high-precision positioning. Based on the test results, it can be seen that the phase observation of Mi8 is not suitable for mobile positioning, and it is not suitable to use broadcast ephemeris for calculation, and the positioning performance in different time periods is also unstable. In this study, the GNSS signal re-radiator kit is used with the mask receiving to gain improved signal, that has an average error of 16 cm and considerable improvement of at least 30% compared to the original signal.