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ACCURACY ASESSMENT OF GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) POSITIONING SUBJECT TO THE UNDER-CANOPY AND BUILDING OBSTRUCTIONS

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DECLARATION

I declare that the work on this project/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA (UiTM). This project/dissertation is original and it is the result of my work, unless otherwise indicated or acknowledged as referenced work.

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ABSTRACT

Research and development in Global Navigation Satellite Systems (GNSS) have significantly advanced the geomatics profession, providing solutions for challenging conditions like canopy cover and building obstructions. However, satellite signal interference remains a concern, potentially affecting positioning accuracy. This study examines the effects of under-canopy and building obstructions on 3D positioning, focusing on the reliability of Conventional RTK (CRTK) and Network RTK (NRTK) solutions, and the significant impact on Network Static (NS) solutions. The concern revolves around understanding how varying levels of obstruction specifically at 25%, 50%, 75%, and 100% impact GNSS performance. Results indicate that RTKC provides reliable horizontal measurements but struggles with vertical accuracy under dense canopy, improving in less obstructed environments and remaining stable against building interference. NRTK outperforms RTKC and NS in vertical measurements under canopy but is sensitive to partial obstructions, while performing better than NS in building-obstructed environments. NS demonstrates resilience in moderately dense and reduced canopy environments but suffers significantly in dense canopy and building obstructions, leading to the highest displacement differences. These findings indicate that GNSS methodology should be chosen based on specific environmental conditions and the need for measurement accuracy. RTKC and NRTK are versatile and reliable across various conditions, while NS requires careful consideration due to its higher sensitivity to obstructions. This study provides valuable insights for selecting suitable GNSS methodologies for accurate positioning in challenging environments.

Keywords: Global Navigation Satellite System (GNSS), Conventional Real-Time Kinematic (CRTK), Network Real-Time Kinematic (NRTK), Network Static (NS), Under-Canopy and Building Obstructions.

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