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A NEW HYBRID GEOID MODEL OVER PERLIS REGION

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SCHOOL OF GEOMATICS SCIENCE AND NATURAL RESOURCES

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Thesis submitted to the Universiti Teknologi MARA Malaysia
in partial fulfilment for the award of the degree of the
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JULY 2024

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

A hybrid geoid model can be defined as a geoid that combines the geometrical geoid derived from GNSS leveling with the gravimetric geoid to improve its accuracy and resolution for a specific region. The accuracy of a hybrid geoid model primarily depends on the corrective surface between the geoid and the leveling datum, which is derived using GNSS leveling points and the gravimetric geoid. Although Malaysia has developed a hybrid geoid model known as MyGEOID, the limited number of GNSS leveling points over the Perlis region used in the MyGEOID modeling process could affect the model's accuracy in this region. Furthermore, the accuracy of a hybrid geoid also depends on the parametric models applied to model the corrective surface.Therefore, this study has developed a new hybrid geoid model for the Perlis region using a new gravimetric geoid model derived using the KTH method and new GNSS leveling points. Three distinct parametric models were used in the hybrid geoid model development to identify the optimum model: the 2nd polynomial, the 3rd polynomial, and the 4-parameter datum shift.Each geoid was compared with the gravimetric geoid using 38 GNSS leveling points, showing that the geoid accuracy produced in this study is approximately ±0.0379 m. Meanwhile, the hybrid geoid derived in this study, known as UITM Perlis Hybrid Geoid 2024 (UITM-PGH24), was evaluated using 21 GNSS leveling points. Based on the comparison, the accuracy of UITM-PGH24 is approximately ±0.055 m, which is 2 cm better than the accuracy of the existing hybrid geoid, MyGEOID. The results generally show that UITM-PGH24 could be a useful substitute for the present modern height system applied in hybrid geoid applications for surveying and mapping in the Perlis region.

TABLE OF CONTENTS