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RELIABILITY ASSESSMENT OF LOCALIZING DIFFERENT SUBSURFACE UTILITIES USING GEOPHYSICS MEASUREMENT

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BACHELORS IN SURVEYING SCIENCE AND GEOMATICS (HONOURS) - AP220

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Thesis submitted in fulfilment
of the requirements for the degree of
Bachelors in Surveying Science and Geomatics (Honours)

College of Built Environment, CBE.

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Under - Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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Date	:	11/08/2023

ABSTRACT

Uncertain depths of underground utility services necessitate the application of competent geophysical techniques to the mapping of underground utilities. However, the accuracy of this geophysical measurement is contingent upon the utility substance and soil characteristics with varying soil moisture. Thus, the aim of this study is to ensure that this geophysical device is capable of identifying a variety of utility substances with an appropriate level of accuracy under quality A. While the objective of the study is to localize multiple subsurface utilities in soils with varying moisture contents using geophysical approaches and to evaluate the accuracy of utility detection utilizing geophysical methods by employing alternative techniques compared to standard hyperbola fitting. In order to reach the objective, a simulation test facility for underground utility services has been established. A series of geophysical detection employing an Electromagnetic Locator (EML) and Ground Penetrating Radar (GPR) for varying percentages of moisture have been performed. Several processing and accuracy evaluations, including velocity determination and dielectric calculation, have been performed for GPR measurement, in contrast to the hyperbola fitting method. Root Mean Square Error (RMSE) was computed to identify the optimal method. A velocity estimate via dielectric calculation using Topp's formula for GPR detection exhibits a better accuracy analysis than typical hyperbola fitting with RMSEs of 0.05 and 0.08. The RMSE value for EML detection using the Direct Induction method is 0.25 for 0% soil moisture and 0.28 for 7.74% soil moisture, while the RMSE value for the direct connection method is 0.43 for 7.74% and 0% soil moisture. Direct Induction more effective detection than direct connection.

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