Predicting (Nk) factor of (CPT) test using (GP): Comparative Study of MEPX & GN7

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Abstract

Static cone penetration test (CPT) is a broadly satisfactory and dependable geotechnical in-situ apparatus that gives brisk and honest substantial measure of data about soil classification, stratification and properties. Un-drained shear strength of clay (cu) is one of the principle soil parameters that could be sensibly evaluated from the (CPT) results, as it is specifically connected to the tip resistance through the experimental cone factor (Nk). Earlier researches showed that (Nk) value depends on type of soil, nature and stress history conditions and many other variables. Construction development in some locations with thick deposits of soft to very soft clays motivates extensive researches to define the reasonable value of the (Nk) factor for such types of clay. The performed study concentrated on utilizing the genetic programming technique (GP) to predict (Nk) value of clay using the consistency limits that can be easily determined in the laboratory. A set of 102 records were gathered from the CPT site investigations and corresponding consistency limits and other physical properties experiments, were divided into training set of 72 records and validation set of 30 records. Both (GN7) & (MEPX) software were used to apply (GP) on the available data. Four trials for each software with different chromosome lengths were performed to correlate the (Nk) factor with the clay consistency limits, water content (wc) and unit weight (ɔ) using training data set, then, the produced relations were tested using the validation data set. The four generated formulas using (GN7) showed accuracies ranging between 93% and 97% and coefficient of determination (R2) ranging between 0.7 and 0.9, while the other four formulas form (MEPX) showed accuracy not exceeding 95% and coefficient of determination (R2) ranging between 0.45 and 0.75.

International Journal of Scientific & Engineering Research 2019, March