

Optimal design of prefabricated vertical drain-improved soft ground considering uncertainties of soil parameters

Key words: Robust geotechnical design; Consolidation; PVD arrangement; Ground improvement

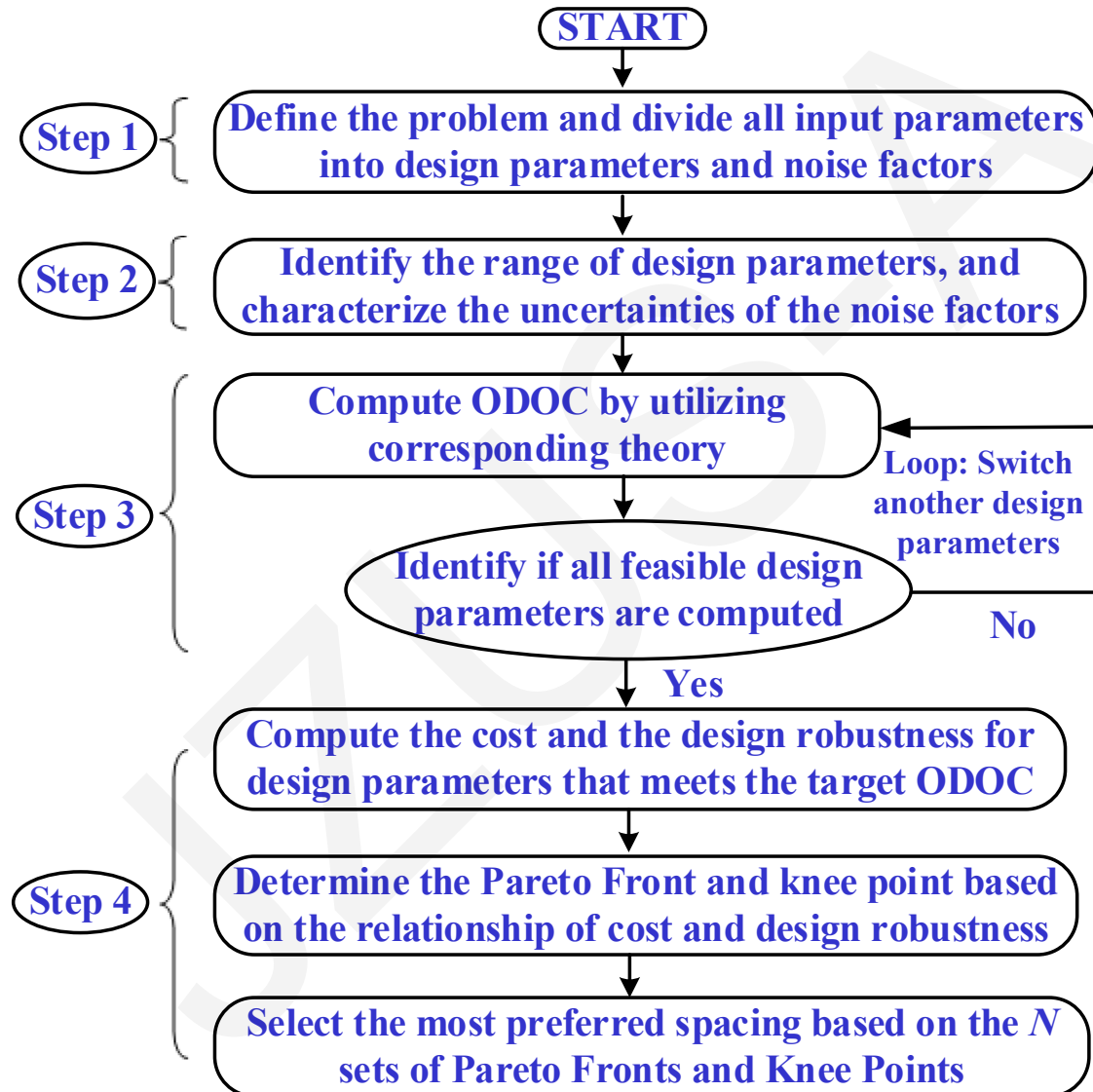
Cite this as: Hong-yue Sun, Jun Wang, Dong-fei Wang, Yang Yu, Zhen-lei Wei, 2020. Optimal design of prefabricated vertical drain-improved soft ground considering uncertainties of soil parameters. *Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)*, 21(1):15-28.

<https://doi.org/10.1631/jzus.A1900268>

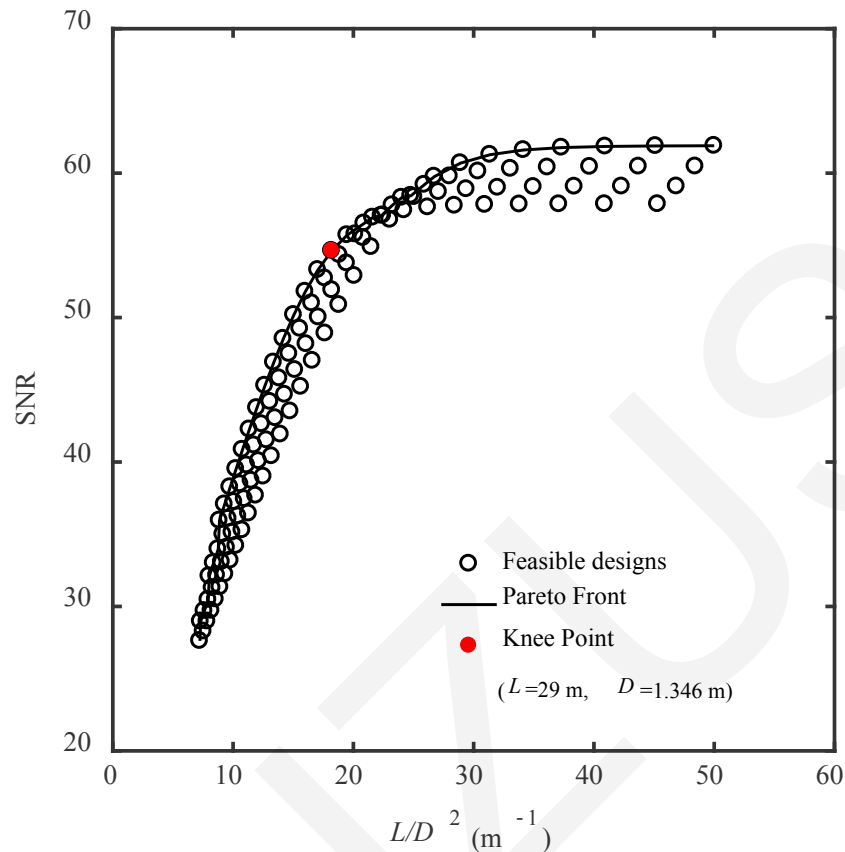
Highlights

- The optimal design of PVDs is determined accounting for the uncertainties of soil parameters based on the concept of robust geotechnical design.
- The design robustness is evaluated by the signal-to-noise ratio of the overall degree of consolidation.
- The factors affecting the optimal PVD arrangement are discussed.

Methods



Results



■ The cost of the most preferred PVD design (L/D^2) in RGD is higher than that obtained using the deterministic method.

■ More expense should be incurred to address the uncertainties of the soil parameters.

Fig. 1. The feasible designs, Pareto Front and Knee Point of the illustrative example

Conclusions

- A framework was established based on the optimal procedure and illustrated with an example.
- The target overall DOC, elapsed time, and PVD arrangement pattern affected the optimal PVD design when the cost was in a lower range. Higher costs can guarantee the design robustness of PVD-improved soft clay ground.
- If the COVs of certain noise factors are underestimated, the cost of the most preferred PVD design will be underestimated.