

Identification of 'Soil-structure-groundwater' Interaction and Development of Sustainable Geotechnical Drainage System

This project is interdisciplinary research combining geotechnical and electronic engineering. It aims to identify the soil-structure-ground water interaction and to develop the sustainable SMART Geo-drainage system which is controlled automatically with using wireless sensor network technology. To achieve these goals, civil engineers and electronic engineers team up and cooperate together. The civil engineering group does following researches to identify the combined structural and hydraulic interaction and develop smart Geo-drainage monitoring system.

1. Identification of the soil-structure-ground water interaction

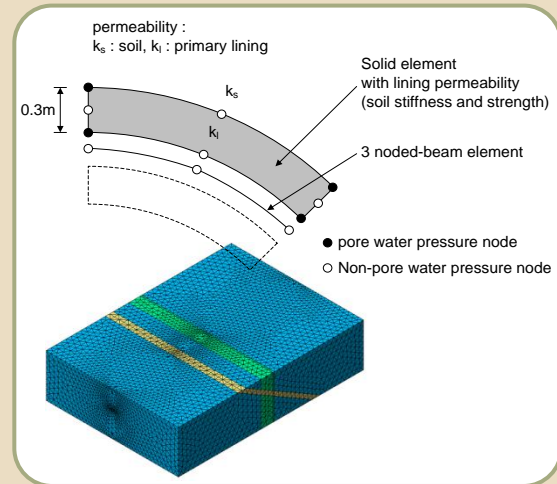
- evaluation of influencing hydraulic factors
- analysis of structural and hydraulic behavior mechanism based on lab tests

2. Development of the prediction model for the interaction

- devise and test of model system
- development of physical and numerical prediction model

3. Establishment of the sustainable drainage mechanism

- model tests for combined influencing factors
- establishment of sustainability principle in Geo-drainage system
- tests for the monitoring system and relevant facilities



The electronic engineering group develops network protocols and software programs to enable civil engineers to analyze the information and estimate the state of geo-drainage.

1. Development of network protocols

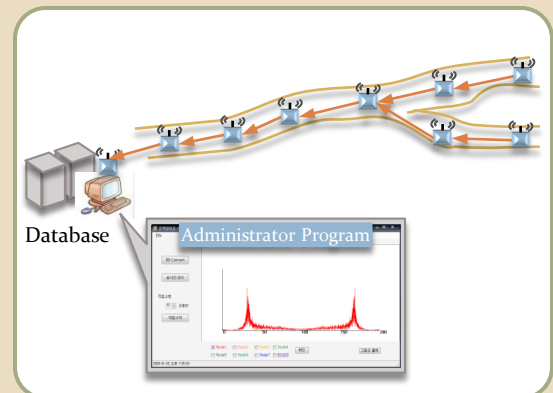
- traffic and situation-aware adaptive duty cycling scheme
- energy efficient TCP mechanism for linear topology

2. Development of hardware

- sensor boards for vibration, water pressure, and etc
- shield method to survive in geo-drainage environment

3. Development of software

- database management
- automatic signal processing, analyzing and warning system
- tests for the monitoring system and relevant facilities



We expect that this project will be contributable to not only academics and but also industries as follows.

1. Academic aspects

- academic contribution by identifying interaction theory and problem solving using interdisciplinary research
- training human resources with advanced technologies

2. Technological and industrial aspects

- significant reduction in maintenance cost of subsurface structures
- minimization of Life Cycle Cost by introducing sustainable drainage system
- economic construction of non-circular tunnels
- creation of manufacturing industry producing new equipments