RESEARCH PROJECT TACR

Probabilistic evaluation of a ground input parameters and reliability analysis of underground constructions using numerical methods

Project designation:	**TA01011816**
Supplier:	**Technology Agency of the Czech Republic (TACR)**
Period:	**2011 – 2013**
Recipient (leader):	**3G Consulting Engineers s.r.o. (doc. Ing. Matouš Hilar, Ph.D.)**
Co-recipient (co-leader):	**Czech Technical University in Prague (doc. Dr. Ing. Jan Pruška)**

Project description:

Objective and comprehensive evaluation of rock and soil massive quality is one of the most important problems in any analysis of underground construction. Every high-quality numerical analysis should be based on appropriate constitutive model being able to capture real ground-construction system behavior and adequate material parameters. Uncertainties corresponding with parameters determination leads to result uncertainty of entire geomechanical problem to be solved. Character of random continuous variable defined by a density probability function, therefore, is suitable to express material parameters.

In Czech Republic a Monte Carlo probabilistic method is commonly used for statistical assessment of parameter influence on numerical simulation results. This method, however, is time-consuming to achieve a required accuracy (error of result estimate). The aim of this research project is a verification and evaluation of Latin Hypercube Sampling method (LHS), the efficient variance reduction method for lower statistical moment estimates. LHS requires significantly lower number of simulations to preserve required accuracy of estimates and takes into consideration correlation of parameters. Another problem is unavailability of unified guideline on numerical simulation of underground construction in CZ, which causing ineffectiveness of preliminary design and construction process of tunnels. Preparation of such a guideline is a further task of the project. Probabilistic analysis based on LHS method will partially eliminate inaccuracies in numerical simulations at preliminary design and guideline developed for geological conditions in Czech Republic will help to assess a risk of construction failure.