

Hierarchical stochastic model of terrain subsidence during tunnel excavation

Tomáš Janda¹, Jiří Šejnoha¹ and Michal Šejnoha¹

¹Czech Technical University in Prague, Faculty of Civil Engineering, Department of Mechanics, Thákurova 7/2077, 166 29 Praha 6, Czech Republic

E-mail: tomas.janda@fsv.cvut.cz

Abstract. In this contribution the Bayesian statistical method is applied to assess the expected probability distribution of the terrain subsidence in the course of tunnel excavation. The approach utilizes a number of simplifying assumptions regarding the system kinematics to arrive at a very simple model with just a few degrees of freedom. This deterministic model together with the intrinsic uncertainties of its parameters and measurement inaccuracies are used to formulate the stochastic model which defines a distribution of the predicted values of terrain subsidence. Assuming the measured data to be fixed, the stochastic model thus defines the likelihood function of the model parameters which is directly used for updating their prior distribution. This way the model parameters can be incrementally updated with each excavation step and the prediction of the model refined.