

## **Heterogeneity in forest vegetation monitoring with remote sensing**

### **Abstract**

The main aim of this diploma thesis is to examine the suitability of various classification approaches for forest vegetation categorization using Landsat 8 satellite imagery. Two satellite images acquired during vegetative period (8th March, 27th July 2013) were chosen. The overall goal of the study is to explore the potential of using statistical methods to obtain information about forest heterogeneity in a given territory. Chosen study sites are defined by administrative boundaries of selected municipalities from South and Central Bohemia located within following municipalities with extended powers - Blatná, Milevsko, Písek, Příbram and Sedlčany. Supervised and unsupervised classifications were used based on obtained training areas and orthophoto. The definition of chosen classes (coniferous forests, mixed forests, ecotones, structurally homogeneous deciduous forests and structurally heterogeneous deciduous forests) was identical with the categories used in "Project MT 11425-5/2010 The Mapping of Natural Zoonoses Focal Points, Transferable on Humans in the Czech Republic and Their Changes Affected by the Modification of Climate". Due to large amount of training datasets obtained from field survey, orthophoto and spectral analysis, significant number of training pixels was available as input to supervised classification. The accuracies of the classifications were assessed using error matrix. The best results were obtained using supervised classification of the first eight spectral bands from both satellite images and Maximum Likelihood algorithm. The heterogeneity was assessed for each municipality separately using two different methods of statistical analysis. Spatial autocorrelation was computed by using Moran index and Getis-Ord General G analysis – on the global as well as on the local level. In this analysis the comparison of forest vegetation areas was made in each class separately. Furthermore, the spatial autocorrelation of Shannon's Index was calculated. In this method the spatial autocorrelation showed only very low positive values on global level. On local level localities with clusters of similar values were found. These localities proved that the analysis can be used for such research. Getis - Ord General G analysis showed there are multiple areas with similar values in the model area. Shannon Biodiversity Index captured the diversity and evenness in each municipality. All classes were inserted into the evaluation. The highest value of Shannon's Index was observed in the municipality Kožlí and the lowest one in the municipality Bratronice. Spatial autocorrelation of Shannon's index showed the areas which have homogeneous and heterogeneous character. Based on the results, the forest situated in the southern part of the municipality with extended powers Písek is significantly heterogeneous. Conversely homogeneous area is situated in the municipalities with extended powers Příbram and Brdy where coniferous forest is dominant.

**Keywords :** Landsat, Classification, Forest canopy, multispectral data, Shannon's Index, Spatial autocorrelation