



## Historical maps georeferencing and examination the development of Ljubljana

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Historical maps comprise a lot of inherent information on natural environmental and anthropogenic changes. They are commonly the most important base for various spatial analyses of the land use in last centuries as well as for historical landscapes, past urban development, influences of the economy development, toponyms changes, etc. Common spatially oriented numerical studies within geographical information system (GIS) uses contemporary georeferenced data sets recorded in layers. Our intention is equivalently apply the historical maps to GIS as well. The most important and complex part for using historical spatial data is its acquisition, including spatial, temporal and positional homogenisation, and the analysis itself. Major drawbacks are uncommon map legends, different cartography techniques, and poor knowledge of projections used. Methods for effective georeferencing of the maps from 17th century are proposed and described, as well as quality control techniques.

The applicability of the georeferenced historical maps is explored with the principles of time series analysis in comparison to contemporary spatial data sets. The studied applications for the urban area of Ljubljana, Slovenia case study were changing of the river course of Ljubljanica River, and observing the changes due to developing of railways. The results show generally a high quality of the historical maps in contrast to contemporary data sets, and high value of their applicability for the urban studies. The proposed results can be used for a more effective planning and development of our society.