Automatic Georeferencing of Land Consolidation Maps with AI

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SUMMARY

The cartographic heritage preserved within historical cadastral maps represents a valuable source of geospatial data that offers insights into the past the evolution of land. Historical cadastral maps are widely recognized as a crucial component of any comprehensive land information system. While a significant portion of these maps has been digitized, and are accessible in a high-resolution digital raster format, certain maps lack essential coordinate information. This information is particularly critical when comparing old cadastral maps with contemporary geospatial data.

The integration of historical maps into modern Geographic Information Systems (GIS) relies heavily on georeferencing. Achieving this for extensive sets of land consolidation maps can be a time-consuming manual process. Control points on the map must be manually collected, either by following an existing coordinate grid to collect the tie points or by identifying tie points on the base map following non-changing natural or human built objects including rivers, lakes, roads and churches. These tie points facilitate the transformation process required to align the historical map within a coordinate reference system.

Previous research has mostly focused on content-based georeferencing, neglecting solutions for automated georeferencing. Recent studies in computer vision and artificial intelligence have achieved remarkable achievements in image segmentation. We believe that similar methodologies can be adapted to the task of georeferencing. Our objective is to investigate the potential of AI-driven automated georeferencing for land consolidation maps, with a primary focus on automating the process of identifying tie points on the base map.

Machine learning algorithms excel at aligning images through learnable features obtained from image segmentation. Automated georeferencing with artificial intelligence focusing mostly on the

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identification of tie points on the base map would solve many challenges and could potentially improve the Norwegian cadastre and contribute to greater digitization.