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Building a GIS-Based Place Name Dictionary: Advancing Spatial Humanities with MapKurator and Historical Topographic Maps of Japan

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Abstract:

1. Background: The Spatial Turn in the Digital Humanities

The digital humanities is an interdisciplinary field that integrates computer-based information and communication technologies (ICT) into humanities research. Initially referred to as humanities computing, the field has experienced exponential growth over the past four decades (Schreibman et al., 2016). Early developments focused on creating digital tools, archives, and databases for texts, artworks, and other materials. With advances in computing capabilities, the focus expanded to include more sophisticated methods for processing and retrieving digitized cultural resources through internet technologies.

The digital humanities draw insights from linguistics, literature, history, geography, music, media and communication, computer science, and information science, integrating these diverse approaches into a unified framework. Recently, the field has also embraced critical digital studies and engineering disciplines, including machine learning, data science, and artificial intelligence (AI) (Berry & Fagerjord, 2017).

Geography has actively engaged with digital humanities, particularly through Geographic Information Systems (GIS). In recent years, the field has witnessed a "spatial turn," giving rise to disciplines such as geo-humanities and spatial humanities (Bodenhamer et al., 2010; Bol, 2011). This shift has been fueled by the widespread adoption of GIS methods and the rapid digitization of geospatial resources, including historical maps, photographs, films, and texts, as well as the creation of digital archives and databases.

To link diverse digital archives effectively, integrating place names from historical maps and texts is essential. A comprehensive dictionary that connects historical and contemporary place names (including their geographic coordinates for GIS compatibility) is critical for this purpose. Such a GIS-based place name dictionary will further advance the spatial turn in digital humanities.

For example, the AI tool MapKurator (https://github.com/knowledge-computing/mapkurator-system) has been applied to 60,000 historical maps in the David Rumsey Map Collection, indexing over 100 million place names on the website (https://www.davidrumsey.com/). In this study, we aim to apply MapKurator to pre-war Japanese topographic maps to create a place name dictionary. This process involves collecting digital images of historical topographic maps and assigning georeferencing information to them.

2. Collecting Digital Images of Historical Topographic Maps

In Japan, the production of topographic maps using modern surveying methods began in the late 19th century. These maps, known as old edition topographic maps, are currently managed by the Geospatial Information Authority of Japan. However, digitized versions are not distributed and are only available for viewing. To address this, independent efforts have scanned paper-based old edition maps and published them online. For information on old Japanese topographical maps confiscated after World War II, please refer to Kobayashi (2017).

Notable examples include:

Time Series Topographic Map Viewer of Japan (*Konjaku* Maps) (https://ktgis.net/kjmapw/)

Japan Map Warper (https://mapwarper.h-gis.jp/?locale=en)

Gaihozu Digital Archive (https://gaihozu-tohokugeo.hub.arcgis.com/)

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Gaihozu: Japanese Imperial Maps (Stanford University, https://earthworks.stanford.edu/catalog/stanford-ch237ht4777)

AMS Topographic Maps of Japan (University of Texas at Austin, https://maps.lib.utexas.edu/maps/ams/japan/).

While some of these resources offer downloadable images in formats like IIIF, georeferencing is required to overlay them on modern maps and identify the latitude and longitude of place names.

3. Georeferencing

Digitized old edition topographic maps can be converted into GeoTIFF images using the georeferencing functionalities of tools like ArcGIS or QGIS. Control points, such as the four corners of map grids marked with latitude and longitude, are used for accurate georeferencing.

Additionally, a Japanese version of MapWarper has been developed, enabling web-based georeferencing. This platform primarily supports old 1:50,000 topographic maps covering Japan (published by Stanford University), which can be downloaded as GeoTIFF images or used as map tiles.

4. Applications of MapKurator

MapKurator leverages AI to extract place names from digitized maps, generate polygons around these names, and convert them into text. Developed by Dr Yao-Yi Chiang's research group at the University of Minnesota (Li *et al.*, 2024), MapKurator is available on GitHub and supports multiple languages. However, languages like Japanese, which use a large number of characters (including kanji), require extensive training data.

In this study, training data was created using Recogito (https://recogito.pelagios.org/), an online annotation tool. Approximately 5,000 place names from 13 topographic maps were annotated as training data.

To evaluate MapKurator's accuracy, it will be applied to:

1) Pre-war 1:50,000 topographic maps with Japanese place names (Figure 1).

2) AMS 1:50,000 topographic maps from 1944 onwards with Romanized place names (Figure 2).

5. Future Challenges

By constructing a comprehensive dictionary of historical Japanese place names, this research will enable the mapping of place names mentioned in classical texts, magazines, and newspapers. This advancement will accelerate data-driven research in digital humanities, fostering new opportunities for interdisciplinary study.

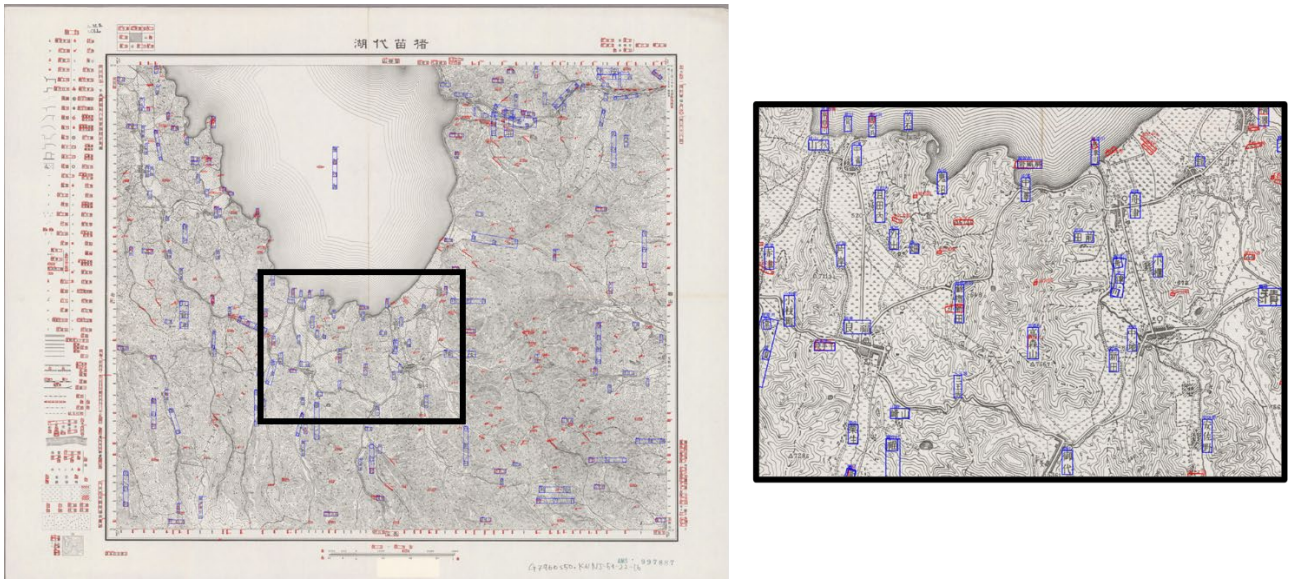

Figure 1. MapKurator application examples for old edition topographic maps.

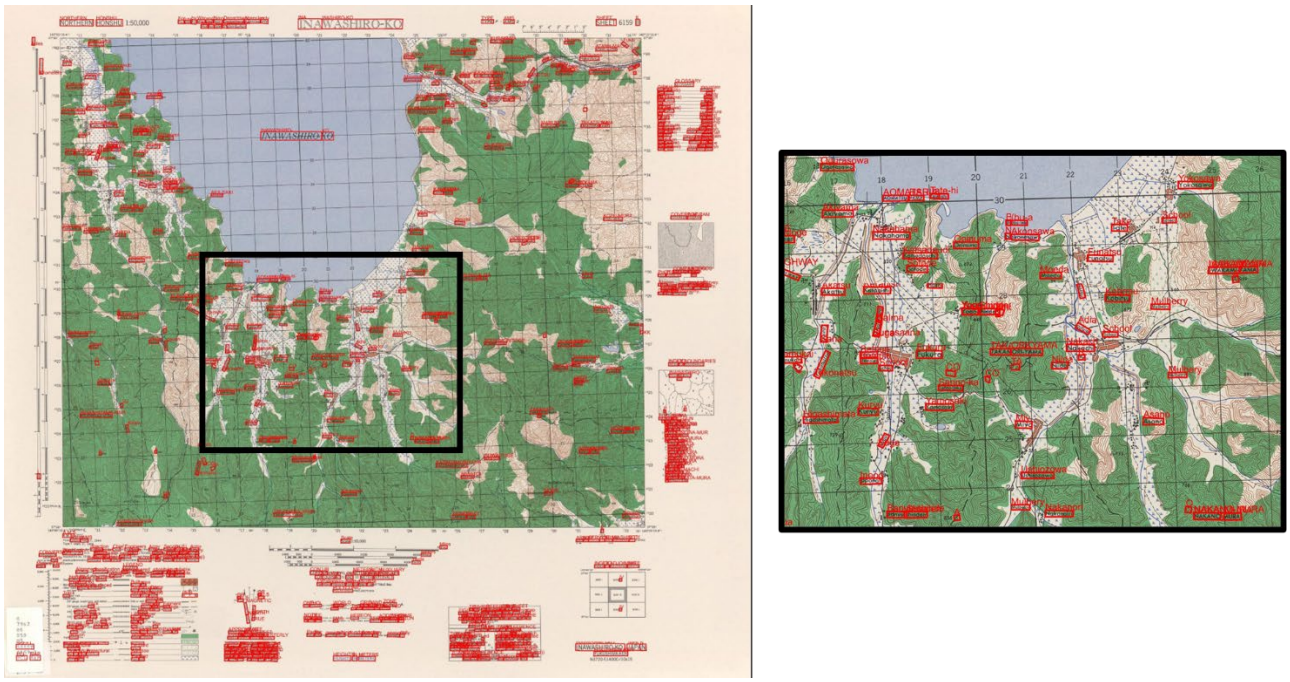

Figure 2. MapKurator application examples for AMS topographic maps.

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References

Berry, D. M. and Fagerjord, A., 2017. *Digital Humanities: Knowledge and Critique in a Digital Age*, Wiley.

Bodenhamer, D. J., Corrigan, J. and Harris, T. M., 2010. *The Spatial Humanities: GIS and the Future of Humanities Scholarship*, Indiana University Press.

Bol, P., 2011. What do humanists want? What do humanists need? What might humanists get? Dear, M., Ketchum, J., Luria, S. and Richardson, D. (eds): *GeoHumanities: Art, History, Text at the Edge of Place*, Routledge.

Kobayashi, S. (ed.) 2017. *Collection of Overseas Geographical Information and Early Military Maps in Modern Japan,* Osaka University Press.

Li, Z., Lin, Y., Chiang, Y.-Y., Weinman, J., Tual, S., Chazalon, J., Perret, J., Duménieu, B. and Abadie, N., 2024 ICDAR 2024 competition on historical map text detection, recognition, and linking. *International Conference on Document Analysis and Recognition,* Springer Nature Switzerland.

Schreibman, S., Siemens, R. and Unsworth, J., 2016. *A New Companion to Digital Humanities*, Wiley-Blackwell.