Transforming Cadastral Maps: Assessing the Feasibility of Segment Anything Model (SAM) and SAM-2 for Digitizing Historical Cadastral Maps□

Sanjeevan Shrestha and Tina Baidar (Nepal)

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SUMMARY

Up-to-date cadastral maps with detailed land ownership, boundaries, and values, are crucial in ensuring the integrity of legal property boundaries and providing accurate land use information. In Nepal, where land holds paramount importance for development, precise cadastral data is indispensable. Given the challenges associated with updating cadastral mapping, there is a pressing need to digitize existing maps to establish an up-to-date cadastral database. The digitization of old cadastral maps faces challenges like inconsistent skill levels, human errors, and data quality issues, making the process time-consuming and prone to inaccuracies. Hence, automating the process is essential to create an accurate and up-to-date cadastral database.□□This study builds upon initial experiments utilizing the Segment Anything Model (SAM) for automating the digitization of historical cadastral maps, with a primary focus on land parcel boundary extraction in Nepal. The initial experiments leveraged SAM's zero-shot segmentation capabilities, specifically bounding box and multi-point prompts. However, these approaches revealed several limitations, including challenges in segmenting noisy or unclear boundaries, misclassifications in complex parcel configurations, and persistent false positives between segmented parcels. Additionally, increasing the scanning resolution did not significantly improve segmentation accuracy.□□To address these limitations, this study proposes exploring the potential of one-shot segmentation with SAM and leveraging the complete functionality of the SAM-2 model. By incorporating advanced segmentation techniques, the study aims to enhance the accuracy and reliability of boundary extraction. The research evaluates segmentation performance across all scenarios explored in the previous study, analyzing which approach yields the most accurate results for diverse cadastral map conditions. Findings from this study will provide critical insights into optimizing segmentation algorithms for cadastral digitization, contributing to more efficient and accurate land administration systems in disaster-prone regions like Nepal.
