Type: Bachelor Thesis

Title: Optimizing Fragment Placing for Improved Digital Pathology

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Keywords: Digital pathology, Pathology, Tissue preparation, Tissue detection, Efficiency, Image Processing

Objective

To analyze the tissue amount on digital whole slide images (WSI) with respect to area scanned, scanning time, and file size. To identify and estimate optimization points in the tissue fragment placement in order to save time and space for WSI digitization.

Problem

TUM's institute of Pathology digitizes approx. 200k glass slides per year, with an average file size of 1.8 GB/slide. Each slide requires approx. 3 min to be scanned at 40x magnification (0.25µm/px) with the Leica GT450Dx scanner.

However, the size of the dataset and the time to digitize slides is a hurdle for us and many other pathology departments. Tissue fragment placement and scan margin greatly influence the scanned area and thus time and space needed for digitization (Figure 1). It has been reported*(1)* that these bottlenecks can be limited by optimizing the placement of tissue on the glass slide and the scan margin in order to require less time and space to digitize smaller regions.

Goal

This work quantify tissue and background on our image data and analyze the potential of alternative tissue fragment placement for an improved digital workflow. Additionally, the scanner setting of the area margin should be investigated as potential resource saving parameter.

Key steps in this journey are:

- Quantify tissue and background area on our WSI (thumbnail images, using existing tissue detectors). Existing tissue detection methods can be used.
- Correlate these quantitative data with WSI scanning time and WSI size.
- Identify groups of slides which are "optimally" and "less optimally" placed.
- Identify scanning area margin to tissue.
- Experiment with smaller scanner margin settings on the scanner to reduce scanned area.

Data

The TUM Institute of Pathology processes 200k slides per year since 2022. All data can be used.

Computing Resources

The student will use the clinical terminal server to read-access our image database. If computing is needed, the LRZ compute cluster and/or the group internal compute cluster can be used.

Requirements

Knowledge in or interest in learning of: digital pathology, image processing and analysis, debugging, visualization, technical understanding, analytical thinking.

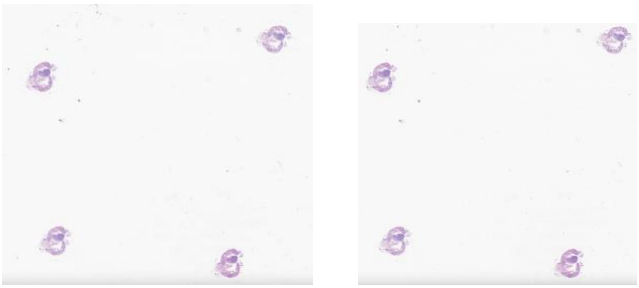

Figure 1: Tissue fragment placement influences the scanning area and thus scanning time and space. Left: Large area margin. Right: Smaller area margin.

References

1. D. Montezuma, A. Monteiro, J. Fraga, L. Ribeiro, S. Gonçalves, A. Tavares, J. Monteiro, I. Macedo-Pinto, Digital Pathology Implementation in Private Practice: Specific Challenges and Opportunities. *Diagnostics* **12**, 529 (2022).

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