# Relating PLI Data Across Scales

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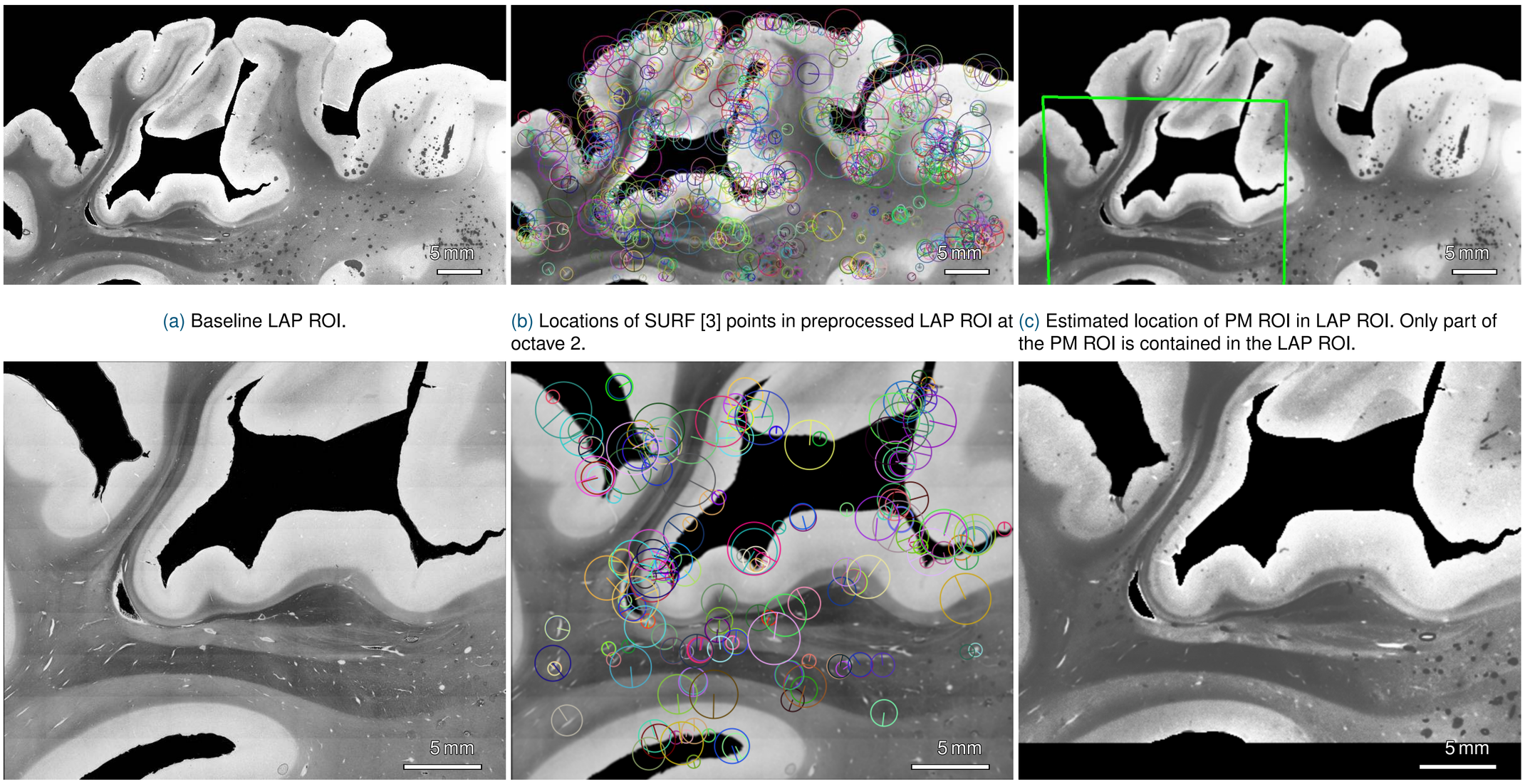
## Introduction

Polarized light imaging (PLI) [1, 2] enables scanning of individual histological human brain sections with two independent setups: a large-area polarimeter (LAP, object space resolution: 64 $\times$ 64 $\mu m^2$/px) and a polarizing microscope (PM, object space resolution: 1.6 $\times$ 1.6 $\mu m^2$/px). PM images are of high resolution (HR) containing complex information, whereas the LAP provides low resolution (LR) overview-like data. The information in an LR image constitutes a composition of the information contained in its HR equivalent [5]. Our goal is to directly relate measured HR to LR data of the same object, avoiding artificial intermediate steps.

## Material and Methods




(a) Baseline LAP ROI.

(b) Locations of SURF [3] points in preprocessed LAP ROI at octave 2.

(c) Estimated location of PM ROI in LAP ROI. Only part of the PM ROI is contained in the LAP ROI.

(d) Baseline PM ROI.

(e) Locations of SURF [3] points in preprocessed PM ROI at octave 7.

(f) Baseline LR data, corresponding to the green framed region in fig. (1c), transferred to HR.

Figure 1: All images show the average light intensity, that is transmitted through a thin brain slice [1, 2], and depict a region from the human occipital pole. The images were manually segmented. Figs. (1b), (1c) and (1e) are smoothed by a Gaussian kernel suitable for noise reduction and adapted to each resolution. Locating the PM ROI in the LAP ROI used a homography estimated by RANSAC [4] from feature point pairs matched by FLANN [6].

## Results and Discussion

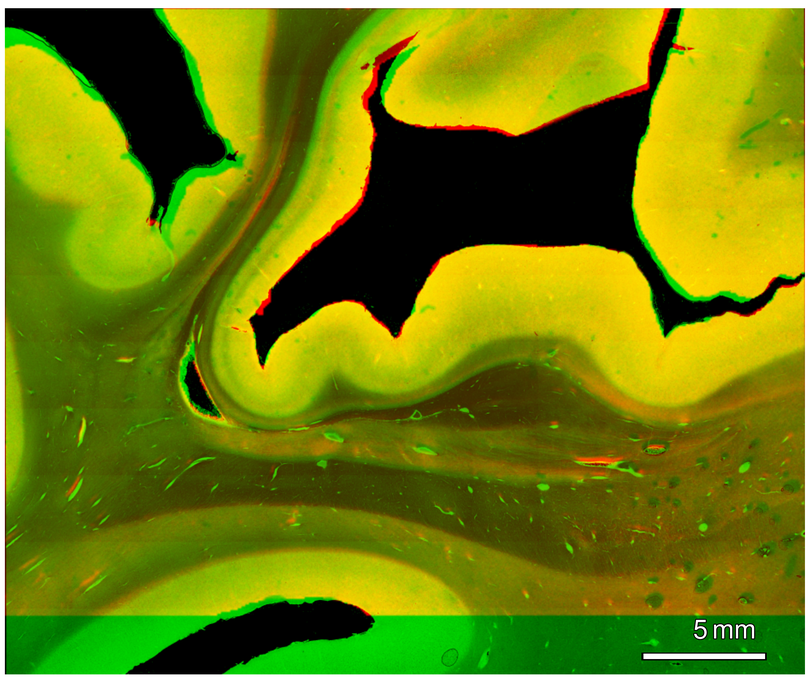



Figure 2: Sum image of normalized PM data (labeled green) and normalized transferred LAP data (labeled red).

The experiments were performed with one HR ROI (figure (1d)), one LAP ROI (figure (1a)) and one LAP image. Localization of the HR ROI in the LR ROI is plausible (figure (1c)), while localization of the HR ROI in the LAP image fails, because the matched feature point positions in HR and LR do not correspond. Numerical and feature point matching inaccuracies become evident in figure (2).
We plan to improve the algorithm and to obtain complete HR data sets for further exploration of the method's performance.

### References

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