CellQuant: compartment based automated IHC cell and tissue analysis

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Objective

The immunohistochemical (IHC) stains are widely used as diagnostic procedures in pathology. The IHC method can visualize the target proteins of malignant lesions having predictive or prognostic clinical roles. In this study we aimed to develop a new image segmentation algorithm for cell based IHC histological analysis in cancer tissue. The algorithm runs on digital slides so it enables effective quantification in digital pathology.

Results

The algorithm development was based on a digital slide collection.This slide set represented a wide range of IHC samples with different staining quality. The selected antibodies stained target proteins with different localizations (nuclei, cytoplasm membrane markers). The chromogen and fluorescent signals present in different cell compartments represented typical cases with different morphological characters. The image segmentation algorithm was developed to be applicable to each defined morphological case.

The algorithm uses different cell compartment specific modules in hierarchical relationship to each other. The detection and classification algorithms run on the cell nuclei, cytoplasm and membrane level in parallel and extract characteristic features of these objects.

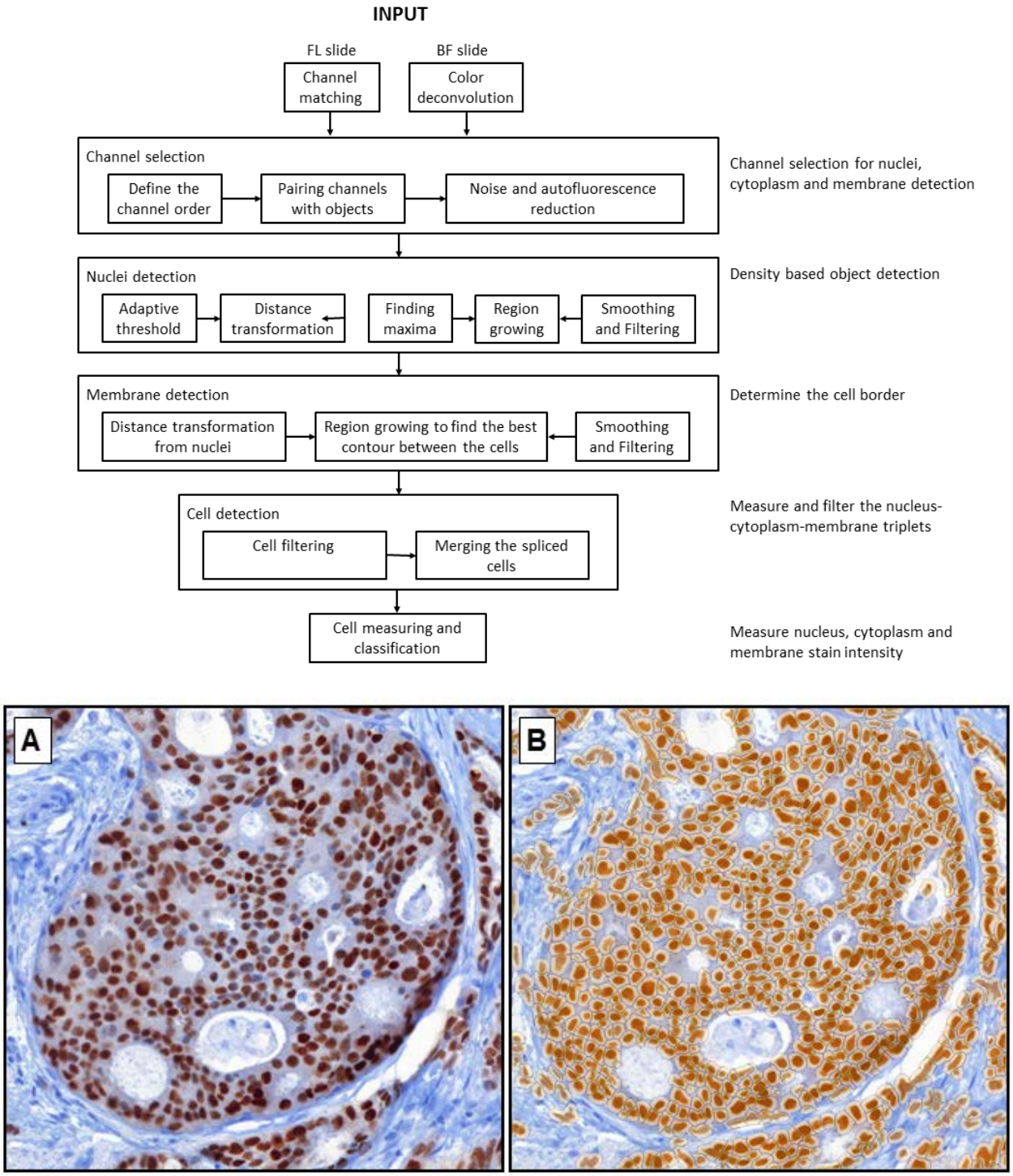

Fig.: A-B Positive and negative cell nuclei with unidentifiable membrane line (ER stain).

Conclusions

Our preliminary results show that the applied image segmentation procedure is suitable for IHC stained tissue quantification. The available input slide set seems sufficient to act as the basis of the development. As a result, we present a software solution which can be a help in pathological diagnostics, however, before the introduction into in vitro diagnostic processes further investigations and validation studies are needed.