A Client-Server Tool for Automatic Fast GPU-based Detection of Squamous Epithelium Tissue Regions in Histology Images

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PURPOSE

An essential step in diagnosis of cervical intraepithelial neoplasia (CIN) is identifying squamous epithelium tissue on histological slides. We have previously reported a method [1] for automatically and rapidly isolating such regions in multi-gigapixel digitized slide images. In this work, we report on our development of a networked tool that enables multiple users to simultaneously use server-based GPUs for the purpose.

METHOD AND MATERIALS

Our method for automatic epithelium tissue detection in cervical tissue images using GPU computing [1] is 1500 times faster than prior method. Additionally, in [1], we use image compression data and machine learning to achieve comparable accuracy at significantly high computational speedup. Our method is tested on 11 images. The disadvantage of the method is that it requires every user to have access to high-end computers with modern GPUs designed for general purpose computing, and the move large images (100s of MB in size) to their computers for processing. It also makes it hard to collaborate and discuss clinical results. To address these challenges, we report on a novel implementation of our method as a client-server software architecture that makes available server-based GPUs as a common computing resource thereby enabling simultaneous access to the method. We also developed an intuitive GUI for the purpose. Client-server high performance computation architecture for a critical clinical task addresses these challenges.

RESULTS

Our novel implementation of the fast algorithm allows multiple researchers to use the networked GPU-based image processing resource, avoid large image file transfers, and collaborate on clinical tasks.

CONCLUSION

We developed a client-server tool that uses GPUs to automatically segment epithelium tissues from digitized histology slides for CIN detection. No longer is it necessary for every user to be equipped with a high-end computing capability. REFERENCE: [1]

CLINICAL RELEVANCE/APPLICATION

A network-based tool that provides automatic and fast segmentation of squamous epithelium from multi-gigapixel digitized histology slides assists the detection of CIN.

REFERENCE

[1] Bryant B, Sari-Sarraf H, Wachtel M, Long LR, Antani SK. Fast GPU-based segmentation of H&E stained squamous epithelium from multi-gigapixel tiled virtual slides Proc. SPIE 8676, Medical Imaging 2013: Digital Pathology, 86760X (March 29, 2013)