Virtual Colonoscopy: Engineering a Deep Learning Algorithm for Bio-Imaging Colon Segmentation to Diagnose Colorectal Cancer

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In the western world, colorectal cancer is the second most common cause of cancer deaths when men and women are combined. Although conventional colonoscopy may detect a majority of colorectal cancers, it is (1) invasive, (2) inconvenient, and (3) uncomfortable. The Virtual Fly-Through is the most popular current method of virtual colonoscopy; however, the following limitations exist: (1) it is time consuming, (2) the camera's field of view is limited, and (3) the navigation is only completed in one direction. These limitations result in a lower surface coverage. With the use of mathematical computations, 3D modeling, quantitative validations, and medical expertise, the building blocks of the Virtual Fly-Cover navigation consists of four steps: (1) the centerline extraction, (2), the generation of rings, (3) the splitting of rings, (4) and the control of the split orientation. Based on a quantitative experimental design, the surface visibility of the colons was on average 99.52% ± 0.2. Due to the potentially visible cells being rendered at different levels of detail, rendering efficiency was improved with an averaged runtime of 13 minutes for each of the 100 validations. Due to the nature and effectiveness of the Fly-Cover navigation, there was a result in higher surface coverage and sensitivity. Due to repeated trials from the control of the split orientation, the Fly-Cover was not affected by perspective distortion. The Virtual Fly-Cover visualization technique may be used in a large-scale screening study or syndicated with other machines for efficient evaluation such as a CAD system.

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