Abstract: VirtualDSA++: Automated Segmentation, Vessel Labeling, Occlusion Detection and Graph Search on CT-Angiography Data

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Abstract. Computed Tomography Angiography (CTA) is one of the most commonly used modalities in the diagnosis of cerebrovascular diseases like ischemic strokes. Usually, the anatomy of interest in ischemic stroke cases is the Circle of Willis and its peripherals, the cerebral arteries, as these vessels are the most prominent candidates for occlusions. The diagnosis of occlusions in these vessels remains challenging, not only because of the large amount of surrounding vessels but also due to the large number of anatomical variants. Having a good overview of all important vessels, would therefore ease the diagnosis of such cases We propose a fully automated image processing and visualization pipeline, which provides a full segmentation and modelling of the cerebral arterial tree for CTA data. The model itself enables the interactive masking of unimportant vessel structures e.g. veins like the Sinus Sagittalis, and the interactive planning of shortest paths meant to be used to prepare further treatments like a mechanical thrombectomy. Additionally, the algorithm automatically labels the cerebral arteries (Middle Cerebral Artery left and right, Anterior Cerebral Artery, Posterior Cerebral Artery left and right) and detects occlusions or interruptions in these vessels. The proposed pipeline does not require a prior non-contrast CT scan and achieves a comparable segmentation appearance as in a Digital Subtraction Angiography (DSA) [1].

References

1. Thamm F, Jürgens M, Ditt H, et al. VirtualDSA++: Automated Segmentation, Vessel Labeling, Occlusion Detection and Graph Search on CT-Angiography Data. EG Workshop VCBM. 2020;.