Anatomical brain structures normalization for deep brain stimulation in movement disorders

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Speaker

Abstract: Deep brain stimulation (DBS) therapy requires extensive patient-specific planning prior to implantation to achieve optimal clinical outcomes. Collective analysis of patient's brain images is promising in order to provide more systematic planning assistance. In this paper the design of a normalization pipeline using a group specific multi-modality iterative template creation process is presented. The focus was to compare the performance of a selection of freely available registration tools and select the best combination. The workflow was applied on 19 DBS patients with T1 and WAIR modality images available. Non-linear registrations were computed with ANTS, FNIRT and DRAMMS, using several settings from the literature. Registration accuracy was measured using single-expert labels of thalamic and subthalamic structures and their agreement across the group. The best performance was provided by ANTS using the High Variance settings published elsewhere. Neither FNIRT nor DRAMMS reached the level of performance of ANTS. The resulting normalized definition of anatomical structures were used to propose an atlas of the diencephalon region defining 58 structures using data from 19 patients.

Keywords: Atlas; Deep brain stimulation (DBS); Group analysis; Image registration; Patient normalization; Template; Thalamus.

References: 1. Vogel D et al. (2020) Anatomical Brain Structures Normalization for Deep Brain Stimulation in Movement Disorders *NeuroImage-Clinical* **27**, 102271.

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