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INVESTIGATION OF FUNCTIONAL RELATIONSHIP OF TONGUE MUSCLES FOR MODEL CONTROL

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In this paper, we investigate the functional relationship of tongue muscles based on a faithful physiological articulatory model. It is found that (1) the function of muscle GGa, GGm, GGp, SG, and MH for the movement of both tongue tip and dorsum are consistent with the speculation based on the anatomical orientations; (2) the muscles (T, V, and SL) located in the superficial layer of the tongue contribute most to deformation of the tongue surface; (3) muscle pairs GGm-SL, GGm-HG, GGA-HG act as antagonist muscle pairs for tongue tip, while as agonist of tongue dorsum; (4) muscle pairs GGp-HG, GGp-SL, GGm-SG act as the antagonist muscle pairs for tongue dorsum while act as agonist pairs for tongue tip. The understanding of the function of individual tongue muscles helps to estimate activation patterns of tongue muscles in speech production, which are important for understanding how speech is controlled. Moreover, the understanding of co-contraction effects of muscle pair help us to understand coarticulation from speech motor point of view, and benefit developing an efficient control strategy for a physiological articulatory model.

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