

Assessment of Kinetic Trajectory of the Median Nerve from Wrist Ultrasound Images Using Two Dimensional Bayesian Speckle Tracking Technique

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Abstract : The kinetic trajectory of the median nerve (MN) in the wrist has shown to be capable of being applied to assess the carpal tunnel syndrome (CTS), and was found able to be detected by high-frequency ultrasound image via motion tracking technique. Yet, previous study may not quickly perform the measurement due to the use of a single element transducer for ultrasound image scanning. Therefore, previous system is not appropriate for being applied to clinical application. In the present study, B-mode ultrasound images of the wrist corresponding to movements of fingers from flexion to extension were acquired by clinical applicable real-time scanner. The kinetic trajectories of MN were off-line estimated utilizing two dimensional Bayesian speckle tracking (TDBST) technique. The experiments were carried out from ten volunteers by ultrasound scanner at 12 MHz frequency. Results verified from phantom experiments have demonstrated that TDBST technique is able to detect the movement of MN based on signals of the past and present information and then to reduce the computational complications associated with the effect of such image quality as the resolution and contrast variations. Moreover, TDBST technique tended to be more accurate than that of the normalized cross correlation tracking (NCCT) technique used in previous study to detect movements of the MN in the wrist. In response to fingers' flexion movement, the kinetic trajectory of the MN moved toward the ulnar-palmar direction, and then toward the radial-dorsal direction corresponding to the extensional movement. TDBST technique and the employed ultrasound image scanner have verified to be feasible to sensitively detect the kinetic trajectory and displacement of the MN. It thus could be further applied to diagnose CTS clinically and to improve the measurements to assess 3D trajectory of the MN.

Keywords : baysian speckle tracking, carpal tunnel syndrome, median nerve, motion tracking

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