CT 영상을 이용한 핸드 링크 시스템 형성

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Hand Linkage System Formation Using CT Images

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ABSTRACT

Objective: The aim of this study is to form a hand linkage system using computed tomography (CT) images. **Background:** A human hand linkage system is widely used in biomechanical modeling and ergonomic design to define hand segments and hand link lengths. However, an inappropriate linkage system is commonly constructed based on bone length data or bony lan dmark locations. **Method:** Hand skeletons of 15 male participants were reconstructed from CT images in 10 postures selected from a natural hand-closing motion. The wrist joint center was anatomically estimated as the intersection of the centerline of the metacarpal of the middle finger and the distal wrist crease. The remaining hand joint centers were kinematically estimated based on the relative motion between the distal bone segment and the proximal bone segment of a given joint. A hand linkage system was then formed by connecting the derived joint centers. **Results:** Fifteen hand linkage systems were generated with different hand sizes. Hand link lengths of different hand segments were calculated for each participant. Regression models for predicting hand link lengths using hand length as the independent variable were established. Furthermore, regression models for predicting the joint center coordinates of the thumb carpometacarpal (CMC) and the four finger metacarpophalangeal (MCP) joints using hand length or hand breadth were established. Our models showed higher R^2 values and lower maximum standard errors than the existing models. **Conclusion:** With the proposed regression models, practitioners can efficiently establish a hand linkage system, given the hand length and hand breadth. **Application:** The findings of the present study can be applied to hand models for ergonomic design and biomechanical modeling.

Keywords: Hand linkage system, Hand skeletons, Joint centers, Hand link lengths, CT images

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