

Preliminary results of the “four-dimensional six degrees-of-freedom” gait simulation system improvement

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Introduction/Purpose: Using computer-controlled electro-hydraulic servo technology, we studied the improved “four-dimensional six degrees-of-freedom” gait simulation system based on motor and hydraulic hybrid drive control and achieved the human body's normal gait cycle with fresh cadavers

Methods: Through the superimposed combination of a composite servo motor drive mechanism, a highly precise “four-dimensional six degrees-of-freedom” at the tibia could be achieved using fresh cadavers below the knee. At the same time, ten sets of independently controlled electro-hydraulic servo hydraulic cylinders were used to achieve the mechanical loading of the tendon and tibia to reproduce the dynamic and kinematic parameters of the normal gait cycle with the cadaver model

Results: The time for the system to complete a gait cycle was controlled at approximately three seconds. The coordinate motion curve of the tibia in the six degrees-of-freedom space was consistent with the M curve of the normal gait cycle, and the measurement results of plantar stress were similar to the measurement curves of the normal gait cycle.

Conclusion: The improved “four-dimensional six degrees-of-freedom” gait simulation system successfully reproduced a gait cycle that was the closest to the normal gait cycle among all existing research.

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