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Dynamic Analysis and Design of Lower Extremity Power-Assisted Exoskeleton

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Abstract : Lower extremity power-assisted exoskeleton (LEPEX) is a kind of wearable electromechanical integration intelligent system, walking in synchronization with the wearer, which can assist the wearer walk by means of the driver mounted in the exoskeleton on each joint. In this paper, dynamic analysis and design of the LEPEX are performed. First of all, human walking process is divided into single leg support phase, double legs support phase and ground collision model. The three kinds of dynamics modeling is established using the Lagrange method. Then, the flat walking and climbing stairs dynamic information such as torque and power of lower extremity joints is derived for loading 75kg according to scholar Stansfield measured data of flat walking and scholars R. Riener measured data of climbing stair respectively. On this basis, the joint drive way in the sagittal plane is determined, and the structure of LEPEX is designed. Finally, the designed LEPEX is simulated under ADAMS by using a person's joint sports information acquired under flat walking and climbing stairs. The simulation result effectively verified the correctness of the structure.

Keywords : kinematics, lower extremity exoskeleton, simulation, structure
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