Lower Limb Joint Range of Motion Considering Inter-joint Dependencies

Abstract:
A realistic simulation of joint range of motion is critical to a successful application of digital human models. However, current models lack the simulation of inter-joint dependencies. Numerous authors investigated joint range of motion regarding effects of age and gender and extensive data are available, but very few studies took inter-joint dependencies into account. This study aims to fill this gap by measuring active joint range of motion for hip, knee and ankle of 18 subjects using motion capture methods. Joint angles and degrees of freedom of adjacent joints are studied. Results show that there is a strong relation between hip and knee flexion angle for both flexion and extension and mathematical models are given. Other relations were found to be negligible. The results can be of direct use for the application of digital human models.