A dynamic similarity hypothesis for the gaits of quadrupedal mammals
The model consists of dynamic, physics-based simulations of six running mammals ranging in size from a chipmunk to a horse (0.115–676 kg). The 'virtual animals' are made up of rigid segments (head, trunk and four legs) linked by joints and are similar in morphology to particular species. In the model, each stance limb acts as a spring operating within a narrow range of stiffness, forward motion is powered and controlled by active hip and shoulder torques, and metabolic cost is predicted from the time course of supporting body weight. A dynamic similarity hypothesis for the gaits of quadrupedal mammals. Article. Aug 2009. The dynamic similarity hypothesis postulates that different mammals move in a dynamically similar fashion whenever they travel at speeds that give them equal values of a dimensionless parameter, the Froude number. Thus, given information about one species, it could be possible to predict for others relationships between size, speed and features of gait such as stride length, duty factor, the phase relationships of the feet and the patterns of force exerted on the ground. Data for a diverse sample of mammals have been used to test the hypothesis. It is found to be tenable in many cases when com