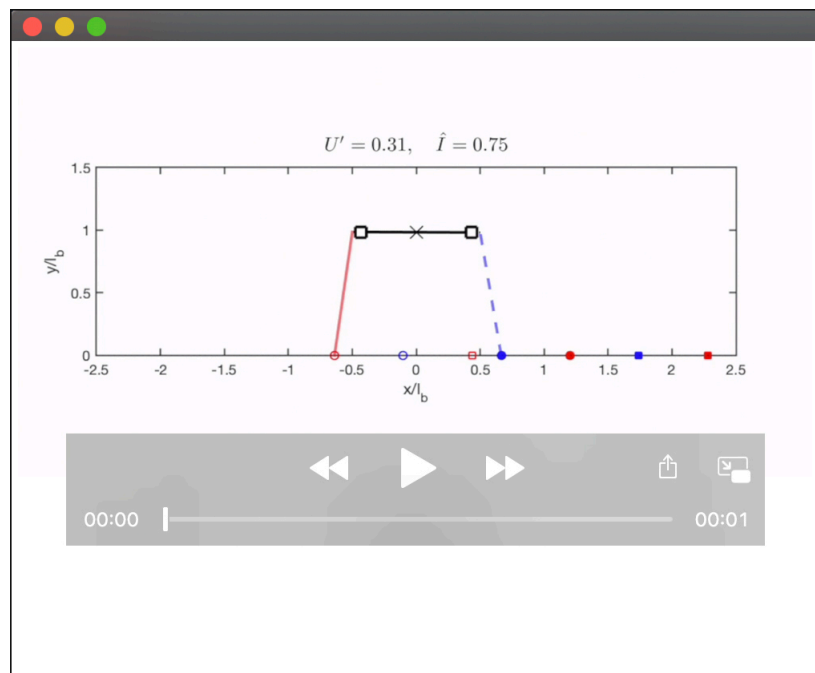
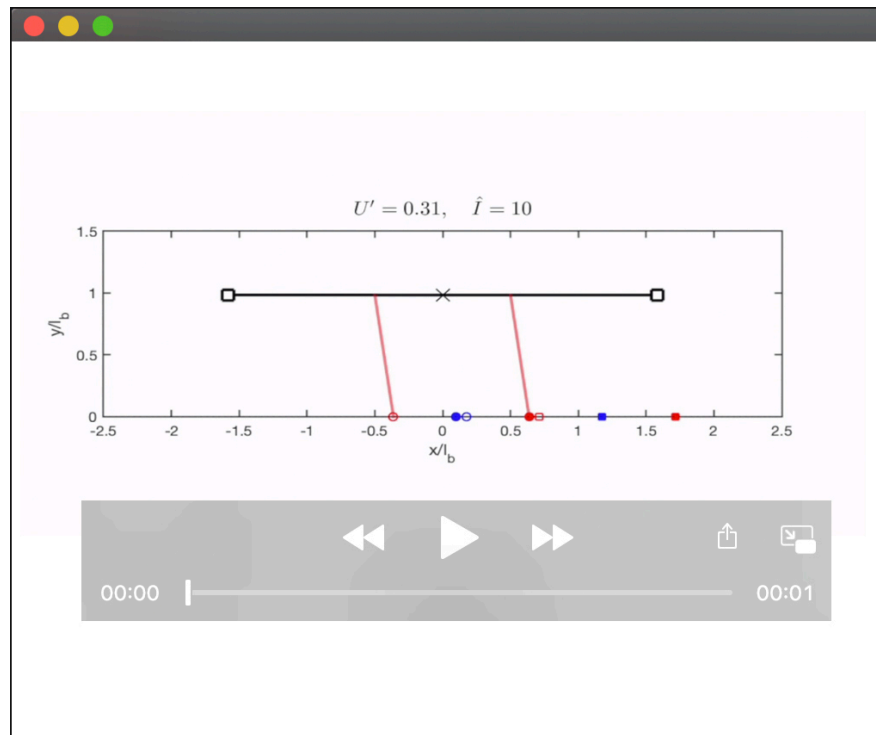


1 Descriptions of supplemental videos



Movie 1: **Three walking sequences at $U' = 0.3$ show how four-beat walking does not look qualitatively different as \hat{I} increases.** However, the forces of the vaulting limb during transfer of support of the opposite pair do change systematically (Fig 2B-D). Animations are adjusted so that one stride cycle takes 4 seconds. Leg transparency is proportional to ground reaction force, as a fraction of maximal force. Leg contact is displayed when ground reaction force exceeds $0.01\ mg$. The center of mass (COM) is marked with an “x”, while squares mark a radius of gyration from the COM.



Movie 2: **Four sequences at $\hat{I} = 10$ show how gait changes with increasing speed at a large Murphy number.** At low speeds, a two-beat gait is optimal. At higher speeds, a gait emerges with $DF < 0.5$ (a run by the classic Hildebrand definition) but with alternating phases of walking-like vaulting between fore- and hind limbs. Around $U' = 0.9$, a hybrid gait emerges, with a vaulting phase in hindlimbs and bouncing phase in forelimbs. At still higher speeds, a four-beat run emerges. The ground-reaction forces associated with these cases are shown in Fig 2E-H. Animations are adjusted so that one stride cycle takes 4 seconds. Leg contact is displayed when ground reaction force exceeds $0.01\ mg$. The center of mass (COM) is marked with an “x”, while squares mark a radius of gyration from the COM

2 Supplemental Figure

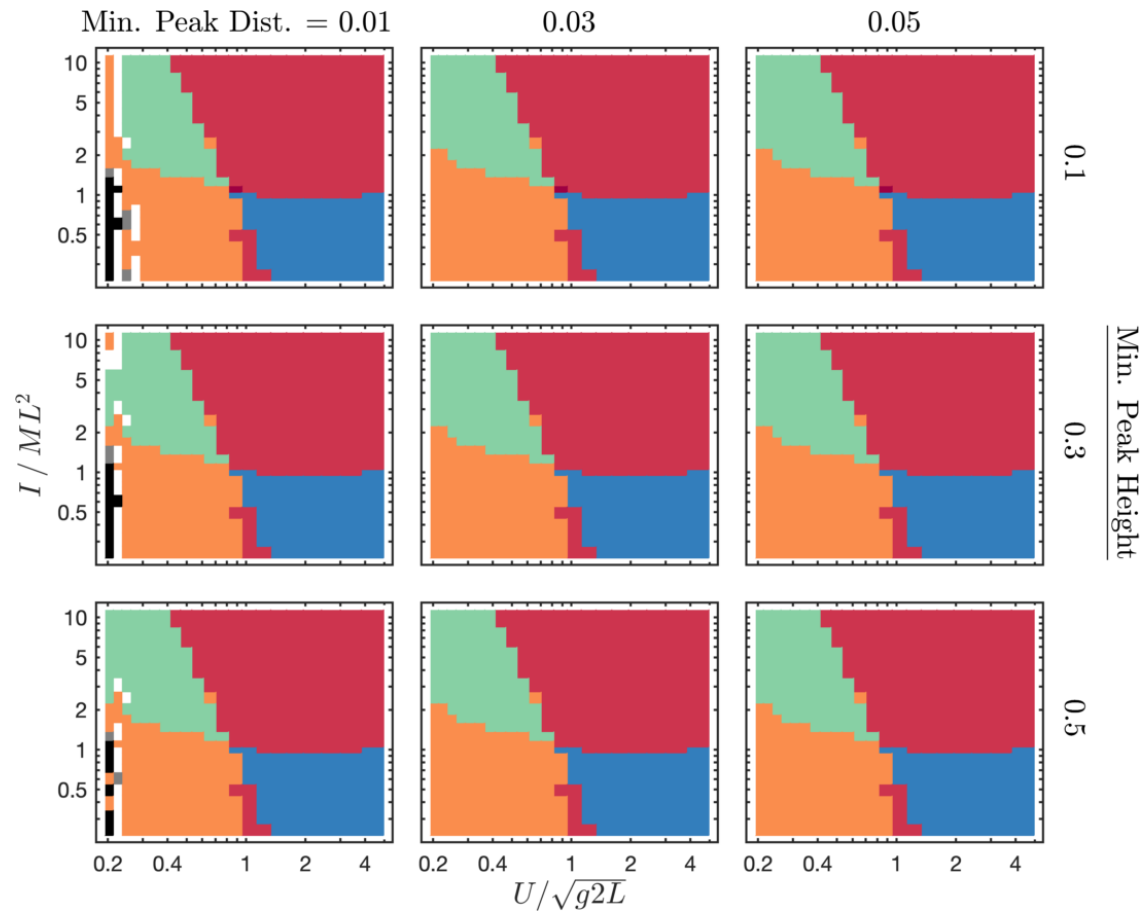


Figure S1: **As beat detection tolerances change, the shape of gait zones change at slow speeds and at the walk-run transition for $\hat{I} = 1.1$.** Elsewhere, gait zones do not change. Key: green, two-beat walk; red, four-beat run; orange, four-beat walk; blue, two-beat run; dark red, 6-beat run; grey, six-beat walk; black, eight-beat walk; white, no data, and value could not be interpolated.