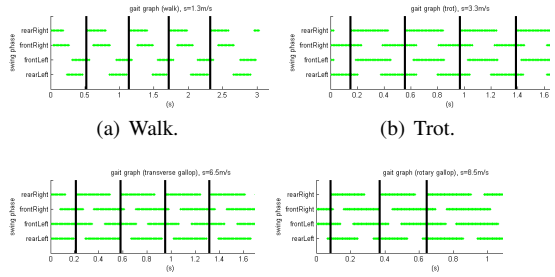
Supplemental Material



(a) Walk. (b) Trot.

(c) Transverse gallop. (d) Rotary gallop.

Figure 1: *Experimental gait graph data for a dog.*

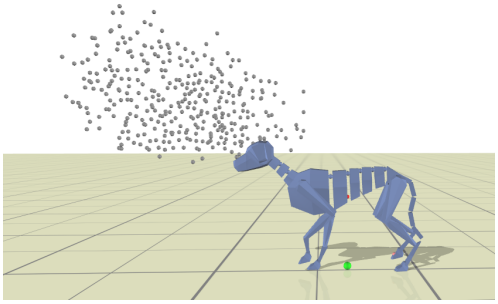


Figure 2: *Capabilities of the parameterized leap, indicating the peak COM height for leap initiated from a trotting speed of* $v = 1\,m/s$.

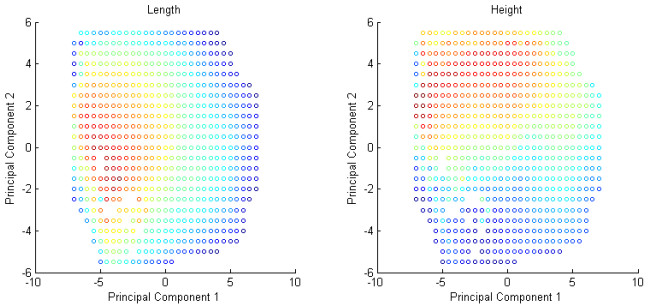


Figure 3: *Height and distance capabilities of leaps constructed from the first two PCA components. The initial state is a trot at* $1\,m/s$.

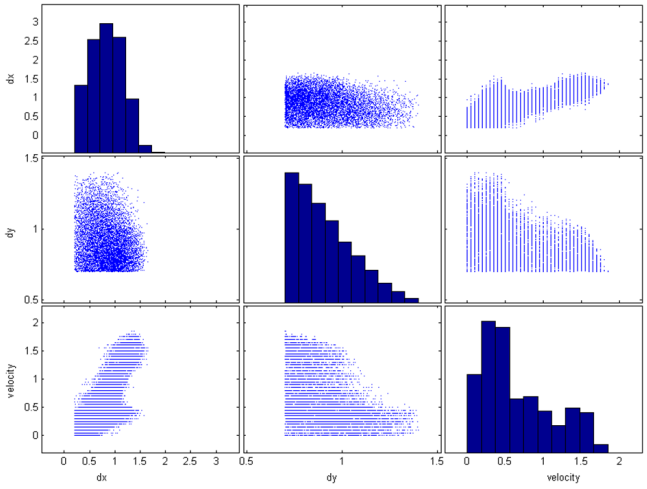
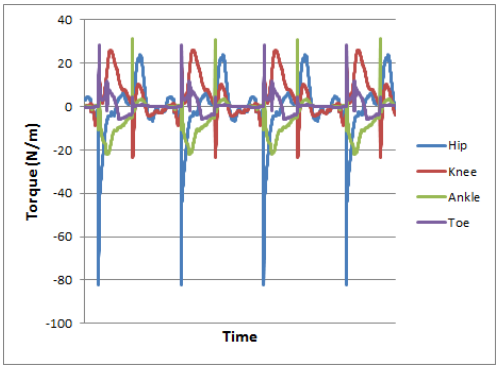
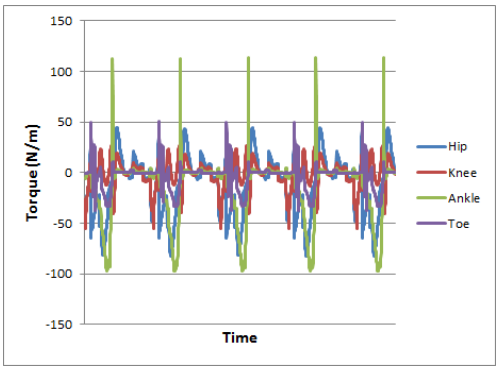


Figure 4: *Capabilities of the parameterized leap as a function of distance, height, and speed.*



(a) 2.2 m/s trot



(b) 4.1 m/s transverse gallop

Figure 5: *Sagittal-plane torques on a hind leg during two seconds of simulation.*

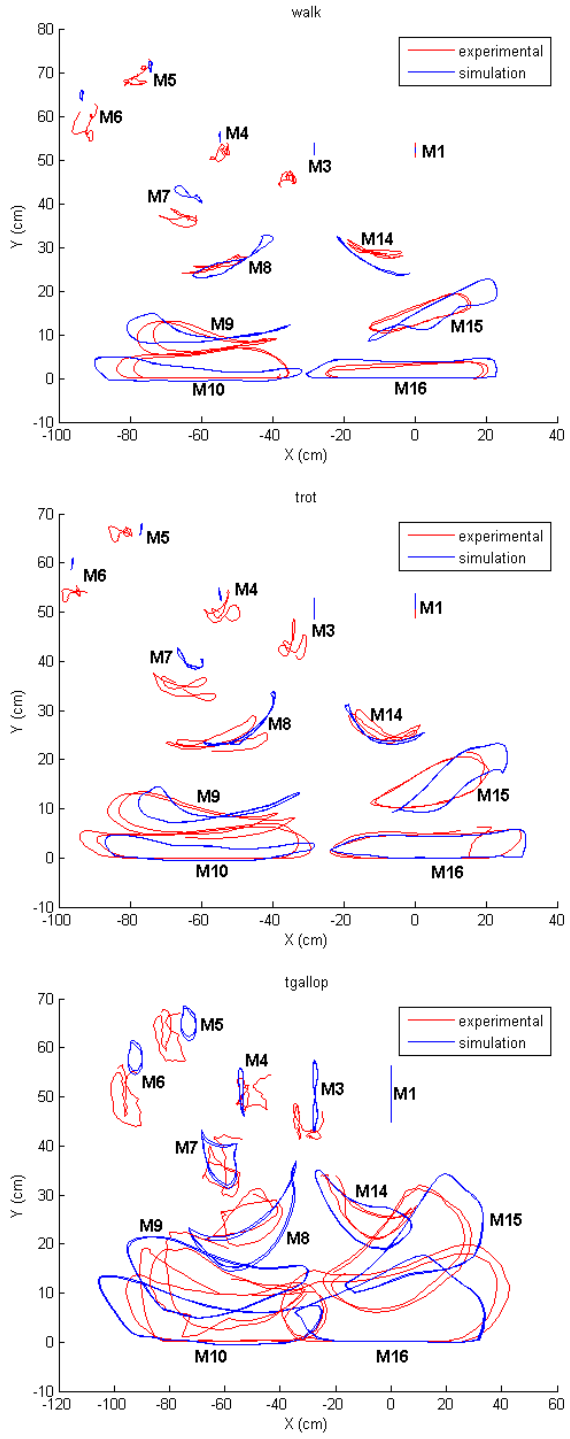


Figure 6: *Comparisons of simulated gaits with capture gaits.*

symbol	description	function of	number of parameters
T	stride duration	-	1
P_{LF}	feedforward step length, sagittal and coronal, per leg	-	2 x 4
s_{fp}	step feedback scale factor, per leg	-	1 x 4
t_{sw}	step interpolation trajectory, per leg	swing phase	5 x 4
h_{sw}	step height trajectory, per leg	swing phase	5 x 4
k_v	gain used to regulate sagittal COM velocity	-	1
k_p/k_d	gains used to modulate height of shoulders/hips	-	2 x 2
h_{LF}	desired height for hips/shoulders	stride phase	2 x 4
k_ft	proportional gain for virtual force applied at swing leg	swing phase	4 x 4
F_D	virtual force applied by each stance leg, sagittal and vertical components	D	2 x 4 x 2
$F_{v_{shoulders}}$	feedforward vertical force applied by the stance legs of the shoulders	-	1
$F_{v_{pelvis}}$	feedforward vertical force applied by the stance legs of the pelvis	-	1
Ω_n	pitch trajectory for the neck and head orientation	stride phase	4
Ω_{LF}	pitch, roll and yaw trajectories for hips and shoulders	stride phase	2 x 3 x 4
$\theta_a, t_a, \theta_b, t_b$	toe-off parameters, per leg	-	4 x 4

Table 1: *List of optimizated variables.*