Supplementary Information

Decoding the essential interplay between central and peripheral control in adaptive locomotion of amphibious centipedes

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Supplementary Table S1 | Coefficients of viscous friction employed in simulations

	Leg tip		Body trunk	
	$0 \leq \phi_{i,j}^{L} < \pi$	$\pi \leq \phi_{i,j}^{L} < 2\pi$	tangential	normal
On land	0	μ_g	0	0
In water	μ_w	μ_w	μ_t	μ_n
	$0 < \mu_w < \mu_g$		$0 < \mu_t < \mu_n$	

Supplementary Table S2 | Parameter values employed in simulations

Parameter	Value	Dimension
ω_L	18.0	$[s^{-1}]$
ω_B	12.0	$[s^{-1}]$
σ_1	50.0	$[s^{-1}]$
σ_2	10.0	$[s^{-1}]$
σ_3	45.0	$[s^{-1}]$
ψ_L^{ipsi}	$\pi/2.7$	
ψ_L^{contra}	π	
ψ_B	$\pi/11$	
c_0	$\pi/2$	
c_L	0.75	
c_B	$\pi/18$	
τ_M	0.055	[s]
τ_S	0.14	[s]
c_S	1.0×10^3	
F_{th}	1.0×10^1	
μ_g	1.4×10^{-1}	$[kgs^{-1}]$
μ_w	7.1×10^{-5}	$[kgs^{-1}]$
μ_t	7.1×10^{-5}	$[kgs^{-1}]$
μ_n	2.4×10^{-3}	$[kgs^{-1}]$
k^L	6.0×10^{-4}	$[m^2s^{-2}kg]$
d^L	1.5×10^{-6}	$[m^2s^{-1}kg]$
k^B	2.1×10^{-3}	$[m^2s^{-2}kg]$
d^B	3.0×10^{-6}	$[m^2s^{-1}kg]$
Spring constant of leg link	70.6	$[kgs^{-2}]$
Damping coefficient of leg link	2.4×10^{-1}	$[kgs^{-1}]$

【Legends for Supplementary Movies】

Supplementary Movie S1 | Walking of the centipede *Scolopendra subspinipes mutilans.*

Supplementary Movie S2 | Swimming of the centipede *Scolopendra subspinipes mutilans.*

Supplementary Movie S3 | Centipede locomotion during transition from land to water.

Supplementary Movie S4 | Centipede locomotion during transition from water to land.

Supplementary Movie S5 | Walking of a nerve cord transected centipede.

Supplementary Movie S6 | Swimming of a nerve cord transected centipede.

Supplementary Movie S7 | Simulated centipede locomotion during transition from land to water.

Supplementary Movie S8 | Simulated centipede locomotion during transition from water to land.

Supplementary Movie S9 | Simulated locomotion of a nerve cord transected centipede.

Supplementary Movie S10 | Locomotion of a nerve cord transected centipede during transition from water to land.

Supplementary Movie S11 | Locomotion of a nerve cord transected centipede during transition from land to water.

Supplementary Movie S12 | Simulated centipede locomotion during transition from water to land, driven by a control mechanism different from our proposed model. Locomotor mode of each segment is determined by Eq. (12).

Supplementary Movie S13 | Simulated centipede walking when a part of the terrain was removed. Grey area denotes the gap appeared between the land area (white-colored).

Supplementary Movie S14 | Simulated centipede walking when three pairs of leg in the middle segments were amputated.

Supplementary Movie S15 | Locomotion of the centipede *Scolopendra subspinipes mutilans* on a slippery upslope surface. The movie was taken from the top. The ground made of plastic plate was inclined 12° with respect to the horizontal.