**Behavioral Experiments**

Leeches were anesthetized by placing individual in the freezer, until the saline that surrounded it was barely freezing. Then the surface of the animal was dried and points (8 to 14) of water-based paint were drawn along their dorsal longitudinal axis. In around 30 minutes the animals recovered and were allowed to crawl on a white smooth surface. The camera was supported above the animal on a wheeled holder that allowed to follow it, filming at 30 fps.

The pixel position of each dot was set in the first frame and then tracked using Lucas-Kanade method with pyramids (CITA) for the length of the video in Python-OpenCV. The position of the front and rear edge were computed by calculating the intersection between the animal’s contour and a linear fit of the first three points with the front edge, and the last three with the rear edge.

Data **processing**

Data analysis was performed using *ad hoc* Python algorithms. For each video the length of the intervals between consecutive markers was calculated and then split 5 segments. These segments were smoothed using a 3 point sliding window average, and elongantion and contraction speeds were calculated using the symmetric difference quotient.

Crawling cycles where delimited from the data by finding the first time the speed was larger than its median absolute deviation and after the moment when the total length of the animal was the shortest . That is, the moment when the first segment begins a significative stretch after the animal ended the contraction from the previous cycle. The length of each segment on each cycle was then normalized by subtracting its minimum and dividing by its maximum value.

Data analysis