Decoding how salamanders walk

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A schematic of a salamander walking that demonstrates its lateral body bending. Credit: Ishiguro-Kano lab

Researchers at Tohoku University and the Swiss Federal Institute of Technology in Lausanne, with the support of the Human Frontier Science Program, have decoded the flexible motor control mechanisms underlying salamander walking.

Their findings were published in the journal *Frontiers in Neurorobotics* on July 30, 2021.

Animals with four feet can navigate complex, unpredictable, and unstructured environments. The impressive ability is thanks to their body-limb coordination.

The salamander is an excellent specimen for studying body-limb coordination mechanisms. It is an amphibian that uses four legs and walks by swaying itself from left to right in a motion known as

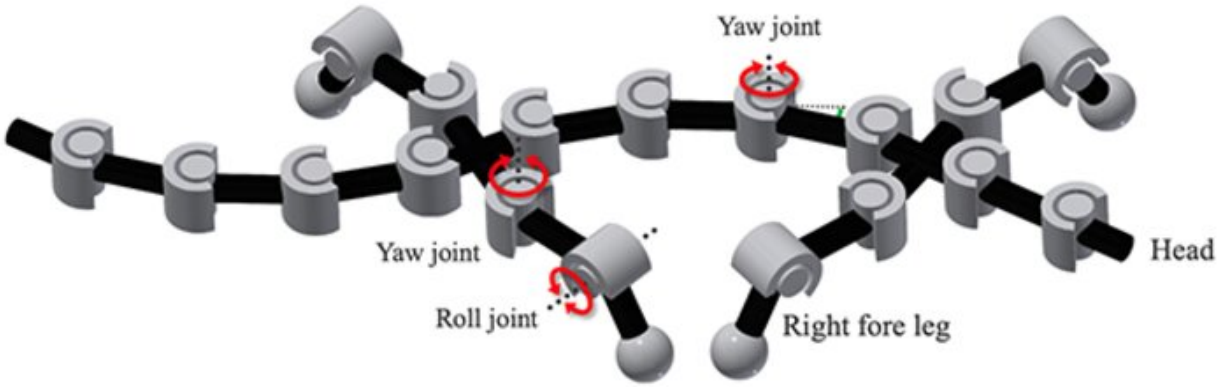
undulation.

Their nervous system is simpler than those of mammals, and they change their walking pattern according to the speed at which they are moving.

To decode the salamander's movement, researchers led by Professor Akio Ishiguro of the Research Institute of Electrical Communication at Tohoku University modeled the salamander's nervous system mathematically and physically simulated the model.

In making the model, the researchers hypothesized that the legs and the body are controlled to support other motions by sharing sensory information. They then reproduced the speed-dependent gait transitions of salamanders through computer simulations.

"We hope this finding provides insights into the essential mechanism behind the adaptive and versatile locomotion of animals," said Ishiguro.



The simulated salamander model. The trunk has 10 rotary joints and each leg has two rotary joints. Credit: Ishiguro-Kano lab

The researchers are confident their discovery will aid the development of robots that can move with high agility and adaptability by flexibly changing body-limb coordination patterns.

More information: Shura Suzuki et al, Spontaneous Gait Transitions of Sprawling Quadruped Locomotion by Sensory-Driven Body–Limb Coordination Mechanisms, *Frontiers in Neurorobotics* (2021). DOI: 10.3389/fnbot.2021.645731

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