

Study of Sensing Function Recovery in Damaged Structure by Adaptive Shape-shifting: Case of Rodent's Vibrissae

2021 INTERNATIONAL WORKSHOP ON EMBODIED INTELLIGENCE

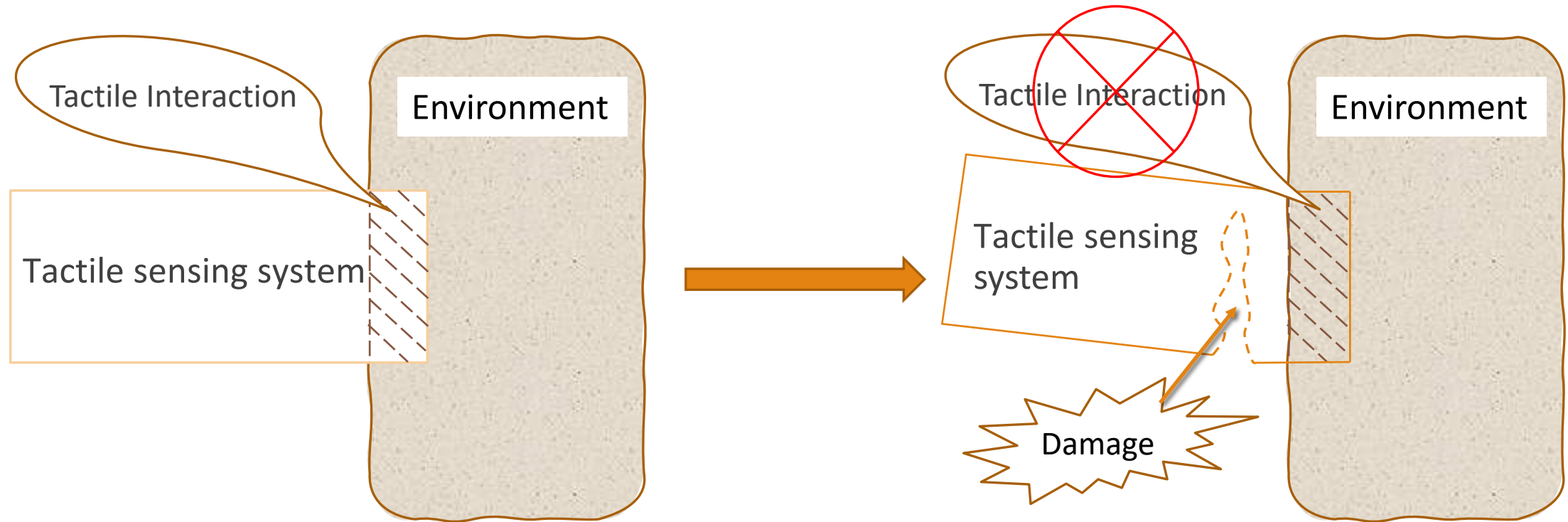
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[HTTP://WWW.JAIST.AC.JP/MS/LABS/VANHO/INDEX-E.HTML](http://www.jaist.ac.jp/ms/labs/vanho/index-e.html)

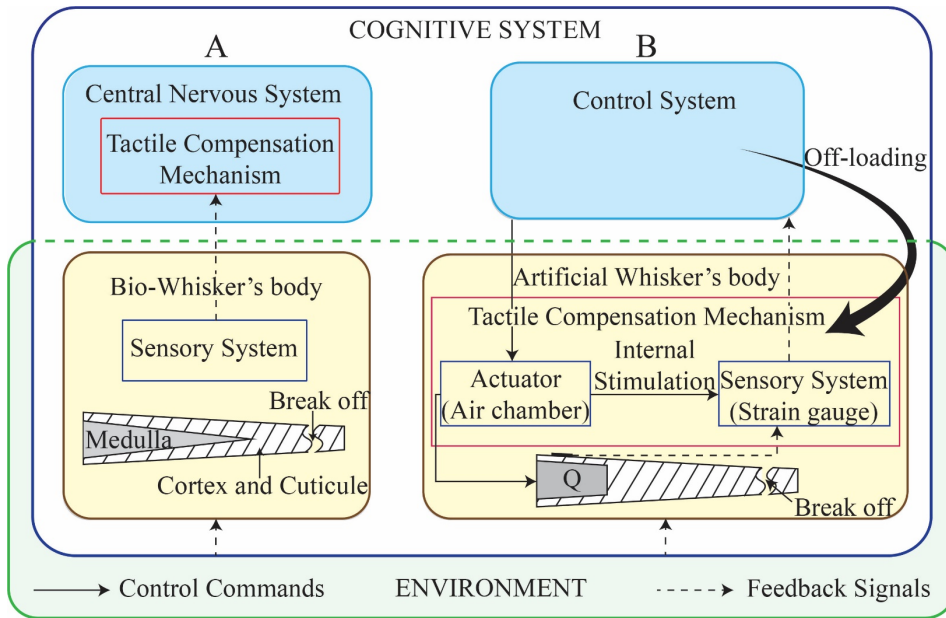
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Motivation



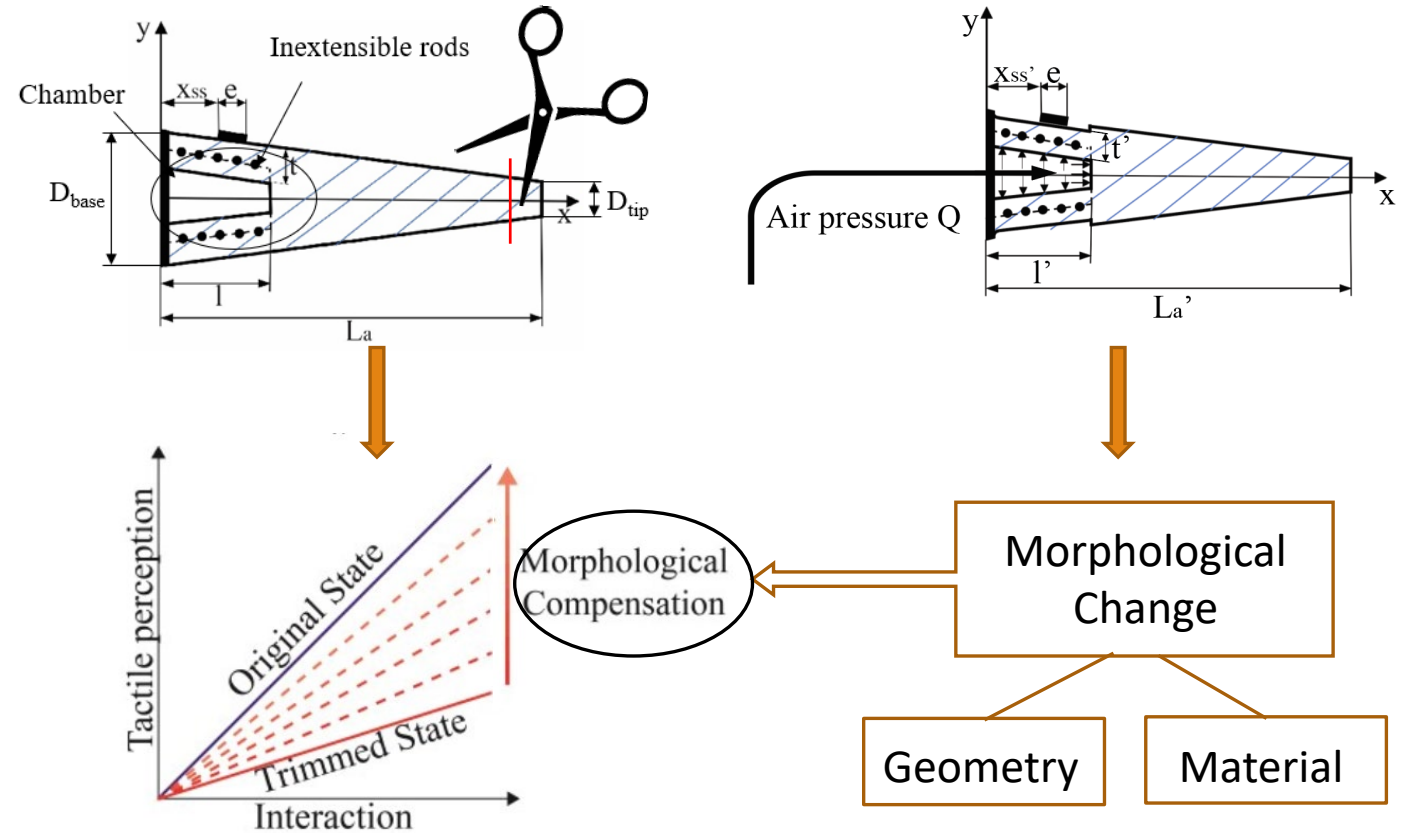
Self-recovery function is needed

Methodology



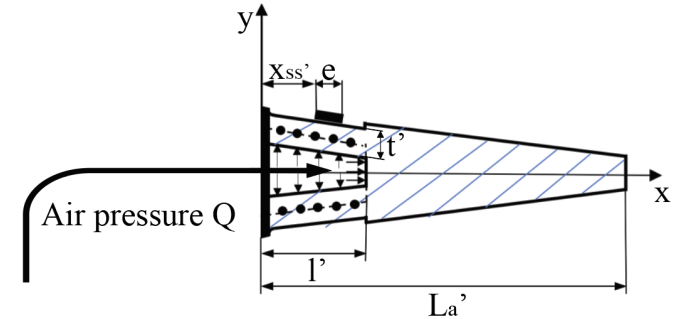
Artificial Whisker with Variable Morphology

Morphological Computation



Challenges

- ❖ A tactile compensation strategy to determine the proper morphology state (i.e., inner pressure Q) is required.
 - Analytical Analysis [1]
 - Finite Element Analysis [2]
- ❖ Adaptive range should be optimized while keeping compensation pressure Q_c in the chamber as small as possible. Please refer to [2] for more details.
 - An optimization framework for geometric parameters based on Evolutionary Algorithm is proposed
- ❖ Lacking clear evidence to prove that offloading compensation mechanism from control system to the body is more advantage in terms of computation cost, etc



[1] N.H. Nguyen and V. A. Ho, "Mechanics and Morphological Compensation Strategy for Trimmed Soft Whisker Sensor," *Soft Robotics*, vol. 00, no. 00, Jan. 2021.

[2] N. H. Nguyen and V. A. Ho, "Tactile Compensation for Artificial Whiskered Sensor System Under Critical Change in Morphology," in *IEEE Robotics and Automation Letters*, doi: 10.1109/LRA.2021.3064460.

Contributions

- ❖ Strengthen the significant role of Embodied Intelligent in the matter of creating self-resilience for various functions from critical damage in structure
- ❖ Propose a potential underpinning strategy to develop soft mechanisms and controller for soft robotic systems with the joining of morphology as a computation source.

Publications

- ❖ [1] N.H. Nguyen and V. A. Ho, "**Mechanics and Morphological Compensation Strategy for Trimmed Soft Whisker Sensor**," *Soft Robotics*, vol. 00, no. 00, Jan. 2021. (Open Access)
- ❖ [2] N.H. Nguyen and V. A. Ho, "**Tactile Compensation for Artificial Whiskered Sensor System Under Critical Change in Morphology**," in *IEEE Robotics and Automation Letters*, doi: 10.1109/LRA.2021.3064460.

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THANKS FOR YOUR ATTENTION