

Artificial Cilia Arrays

Versatile Mechanosensing Tool for Perception and Response

Traditional cilia-based sensors are associated with limitations in scaling and sensitivity thresholds, and they require complex fabrication due to their bulky magnetosensing layers.

Researchers at Virginia Commonwealth University have introduced a novel artificial cilia sensor array that detects mechanical stimuli through inter-cilia electrical contact, offering versatile and scalable sensing solutions.

The Technology

This invention introduces a graphene-based artificial cilia sensor fabricated using direct ink writing and solvent casting techniques, integrating conductive silver electrodes, micro-sized cilia, and a flexible dermal layer. The sensor operates via a unique inter-cilia contact mechanism where mechanical disturbances cause adjacent cilia to touch, closing an electrical circuit and altering current flow. This approach enables the detection of various stimuli such as airflow, water flow, vibration, and surface textures with customizable cilia dimensions and arrangements. The device is highly adaptable for multiple sensing configurations, including perception and reception modes, and is suitable for industrial, environmental, biomedical, and accessibility applications.

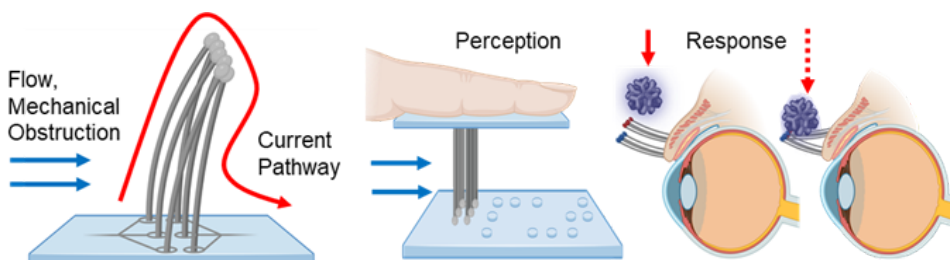


Figure 1. When the cilia sensor is subjected to air, water flow, vibration, or any other type of mechanical disturbance, the ends of the cilia make contact, forming a closed circuit and resulting in a change in the current flow.



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Benefits

- » Facile and scalable 3D printing fabrication
- » Novel sensing mechanism providing sensitive and versatile detection
- » Customizable for different stimuli
- » Lightweight, flexible, and integrable with various materials
- » Cost-effective
- » Capable of both perception and reception sensing modes

Applications

- » Environmental monitoring
- » Industrial and manufacturing processes
- » Biomedical devices
- » Robotics and artificial intelligence
- » Accessibility tools
- » Aerospace and automotive sensor integration
- » Research laboratories and universities

IP Status:

Provisional patent application filed

Licensing Status:

This technology is available for licensing to industry for further development and commercialization

Category:

Engineering & Physical Science

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