PURDUE INNOVATES | Office of Technology Commercialization

Spherical Neuromorphic Device Architecture for Microgravity Manufacturing

Spherical building blocks for neuromorphic hardware provide uniform, multidirectional sensing and radiation resilience for flexible electronics and space-based manufacturing.

This technology addresses limitations of planar semiconductor devices that suffer from anisotropic sensing, rigidity, and manufacturing inconsistency. The innovation introduces a conceptual class of spherical neuromorphic building blocks designed for uniform, omnidirectional interaction and resilience in extreme environments. Compared to traditional silicon approaches, this architecture conceptually supports isotropic sensing and flexible integration, while microgravity-enabled fabrication offers material uniformity unattainable on Earth. Demonstrations to date include conceptual device architecture and feasibility evaluations based on physics considerations and microgravity process advantages. Potential impact includes improved sensing fidelity, enhanced resilience, and new design pathways for flexible electronics and neuromorphic systems.

Technology Validation

Validation consists of conceptual modeling, comparative analysis of geometric and environmental advantages, and feasibility of microgravity-supported uniform material formation, without process parameters.

Advantages

â€¢ Omnidirectional interaction enabled by spherical geometry

â€¢ Flexibility and conformability compared to rigid planar devices

â€¢ Potentially greater resilience to radiation and mechanical stresses

â€¢ Conceptual compatibility with neuromorphic analog computation

â€¢ Microgravity-supported uniform material distribution

Applications

Technology ID
2026-MALS-71547

Category
Semiconductors/Devices & Components

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â€¢ Flexible sensing arrays

â€¢ Neuromorphic computing architectures

â€¢ Wearable or conformal electronics

â€¢ Radiation-resilient electronics for extreme environments

â€¢ In-space manufactured microelectronic components

TRL: 2

Intellectual Property:

Provisional-Patent, 2026-01-22, United States