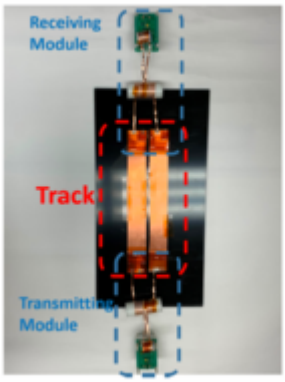
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Wireless Power Transfer for Modular Robotics

TECHNOLOGY NUMBER: 2020-271



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Category
Hardware
Engineering & Physical Sciences
Semiconductor, MEMS, and Electronics

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OVERVIEW

A bi-directional, wireless energy transfer system

- Permits energy transfer between robotic modules
- Provides ease of development, reconfigurability, and re-usability

BACKGROUND

Modular robotics provides improved flexibility and range than standard, bulk machinery, yielding advantages in reconfigurability. The technology is therefore more easily customized and adaptable to different applications than are existing bulk machines. Modular robotics are also more user-friendly than traditional bulk machinery, using simpler control interfaces as well as more intuitive programming. However, one of the key challenges in designing modular robotics systems is ensuring that the batteries in each module are well-balanced in energy. Given that the energy requirements of each module can vary depending upon the task they are performing, any imbalance in battery energy can cause decreases in performance and efficiency. As such, a need exists for a new method to improve balance in energy balances between modules.

INNOVATION

Researchers have invented a bi-directional, wireless energy transfer system that uses capacitive energy transfer between separate battery packs within each module. The wireless configuration creates a technology that is highly adaptable and which does not hinder the natural reconfigurability of a modular system. The modular approach to the complex robotic systems is

desirable due to advantages such as ease of development, reconfigurability, and re-usability. This technology permits 13.5 W power transfer between two modules at high frequencies and relatively low wall capacitance. By allowing modules to share energy, this approach ensures that the average power consumption for each module battery is similar. This bi-directional wireless power transfer scheme may greatly impact future wireless electronics and smart systems as current trends of wireless devices continue.

PATENT APPLICATION

Number: 17/198,978

References

1. Saran A, Abbot D, Revzen S, and Avestruz A. , Bidirectional Capacitive Wireless Power Transfer for Energy Balancing in Modular Robots. 2020 IEEE Applied Power Electronics Conference and Exposition (APEC), 2020, pp. 852-85910.1109/APEC39645.2020.9124139