

Restore Tactile Sensation for Prosthetic Hand Users



NRI: Towards Restoring Natural Sensation of Hand Amputees via Wearable Surface Grid Electrodes

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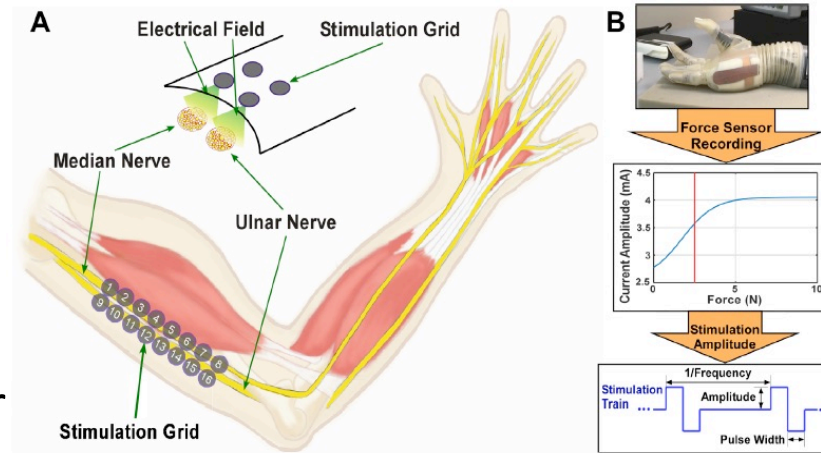
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Challenge

- Prosthetic hand users lack intuitive tactile feedback

Solution

- Wearable sensors to monitor user and robot states
- Peripheral sensory nerve stimulation to provide location matched tactile feedback



Wearable sensing and nerve stimulation to elicit tactile sensation at the phantom hand

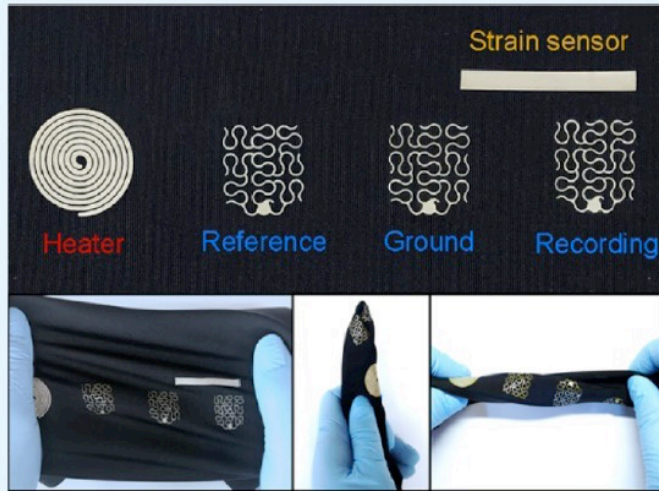
Scientific Impact

- Improve intuitive control of prosthetic hand
 - Enhance embodiment
- ## Broader Impact
- Improve utility of advanced robots
 - Enhance quality of life: allows object property recognition
 - Education and Outreach
 - Supported Minority PhD and UG students
 - Hosted demos to high-school students

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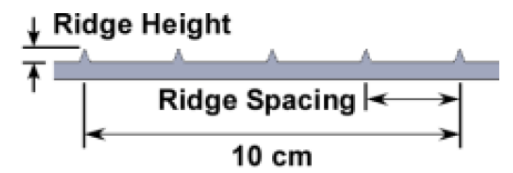
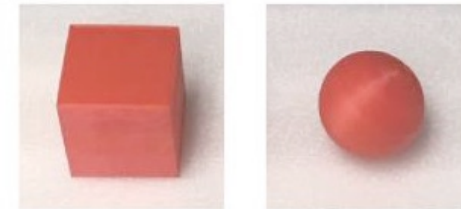
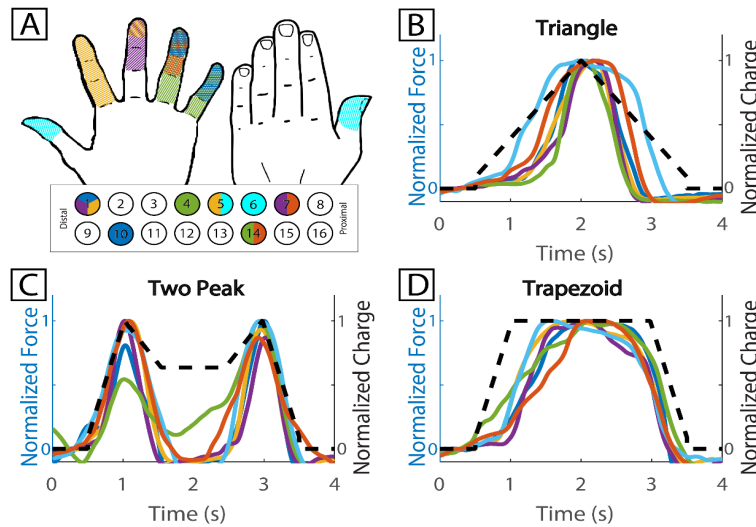
Wearable sensors to monitor user and robot states



Object property perception (> 90% accuracy): including Stiffness, shape, & surface topology



Location and amplitude specific tactile sensation from peripheral sensory nerve stimulation



A Perceived Object Stiffness

	High	Moderate	Low
High	73	7	0
Moderate	5	73	2
Low	0	4	76

A Perceived Ridge Spacing Relation

	First	Second	Same
# of Ridges	50	1	9
Time	45	4	11
# of Ridges	1	53	6
Time	0	51	9
Same	6	3	51