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System to Interface with Targeted Neurons

Current neural interface and neuromodulation technologies lack the stability and specificity to target specific sensory or motor neurons within a nerve bundle. Emerging prosthetic devices for the central and peripheral nervous system require interfaces that can stimulate or sense targeted neurons with high discriminability to achieve very specific end-target organ function or detect specific functional states of the end-target organ. Stability and specificity remain key challenges that hinder the realization of successful chronic neural prosthetic technologies for central and peripheral nervous system.

Researchers at Arizona State University have developed a system to precisely interface with targeted motor or sensory neurons in a nerve fiber. This system can be positioned within nerve bundles at locations that provide optimal motor control and sensing and can be used for stimulating and blocking. When not stimulating, the system can detect local action potentials to monitor end organ functional states. Precise control and tunability of the positions of individual components is a key component of this system.

TThe ability to target specific motor or sensory neurons in a nerve bundle, make this system highly unique and very promising for neural prosthetic devices.

Potential Applications

- Neural interfaces for central and peripheral nervous system
  - Neural prostheses (hearing, vision, motor, cognitive, etc.)
  - Prosthetics for pain relief
  - Prosthetics for bladder control/incontinence
  - Restoration of motor function following spinal cord injury or stroke
  - Treatment of epilepsy by electrical stimulation of the vagus nerve
  - Treatment of chronic migraines by stimulation of the occipital nerves
- Monitor end-organ functional states

Benefits and Advantages

- Ability to independently and precisely tune the position of the each microelectrode in micrometer scale increments within the nerve bundle for optimal performance
- Electrodes can detect local action potentials to monitor end-organ functional states
- Can stimulate and/or block nerves as well as monitor action potentials

For more information about the inventor(s) and their research, please see Dr. Muthuswamy's laboratory webpage