The hair brush that reads your mind

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(PhysOrg.com) -- One of the main techniques for measuring and monitoring mental activity, called functional near infrared spectroscopy (fNIRS), can often be impaired because a person's hair gets in the way. But now, thanks to a team of researchers at the University of Texas at Dallas and the University of Texas at Arlington, a novel device called a "brush optrode" is providing increased sensitivity with fiber tips designed to thread through hair to enhance scalp contact.

Details of the device will be presented at the Optical Society's (OSA) 94th annual meeting, Frontiers in Optics (FiO) 2010, at the Rochester Riverside Convention Center in Rochester, N.Y., from Oct. 24–28.

fNIRS is a noninvasive optical technique that measures oxygen levels in the brain to chart neurological activity. The difference between oxygenated hemoglobin and deoxygenated hemoglobin can be used as a correlate of brain activity. Using fNIRS, this difference in blood oxygen level is determined using a relative spectroscopic measurement at two near infrared wavelengths.

"Using light to measure a person's thinking pattern has numerous advantages over EEGs, including ease of use, reliability, cost, portability and MRI compatibility," says Duncan MacFarlane, professor of electrical engineering in the Erik Jonsson School of Engineering and Computer Science at the University of Texas at Dallas.

"The conventional fibers used in fNIRS systems terminate in a large, flat bundle, and it is easy for a patient's hair to get in the way and block the

signal," he explains. "So we developed a new tip for the fNIRS fibers -- a brush optrode that slides the fibers between the hair follicles. Signal levels increase 3- to 5-fold, and patients report that the brush optrode is considerably more comfortable than the conventional fiber ends. And the brush optrode is easier to set up, which saves time and money."

This research is expected to open the door to portable, easy-to-use, high-density optical scanning of brain activity. For example, the University of Texas researchers' work focuses on the imaging of changes in cortical plasticity as a function of impairment severity in children with cerebral palsy. According to Georgios Alexandrakis, a member of the UT Arlington research team, the newly developed optrodes could also be potentially useful to a variety of fNIRS projects, including the evaluation of recovery from stroke, changes in brain activity in Alzheimer's patients, the perception of pain, and for assessing developmental changes in normal and impaired pediatric populations.

More information: The presentation, "Improved fNIRS Using a Novel Brush Optrode" is at 12:30 p.m. on Tuesday, Oct. 26.

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