

# Finger-Friendly 'Tactile Interface' Could Aid

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A Johns Hopkins researcher has joined experts from four other institutions who plan to create a dynamic electronic surface to allow blind or visually impaired people to "feel" mathematical graphs, diagrams and other visuals now displayed on computer screens.

Although the prototype is expected to convey relatively simple graphics, further advances may someday allow blind people to use the interface to sense more complex illustrations, including pictures and maps. The prototype is expected to be completed within three years.

The project was launched recently with support from a \$330,000 National Science Foundation grant. The team is led by Ilona Kretzschmar, assistant professor of chemical engineering at The City College of New York's Grove School of Engineering. Among her five primary collaborators is James E. West, a research professor in the Department of Electrical and Computer Engineering at Johns Hopkins. West is a widely respected inventor who received the National Medal of Technology from President George W. Bush in a White House ceremony earlier this year.

West was recruited for the tactile interface team because of his extensive knowledge of how to move electrical charges through plastic or polymer materials. The device is expected to utilize an electro-active polymer film that can rise slightly and may even wiggle in response to electronic signals, enabling the user's fingertips to sense a pattern. The tool may also feature sound feedback to help users steer their fingers along the lines of a graph or diagram. In developing the prototype, Kretzschmar

and West will be joined by other leading researchers are from Baruch College, CCNY, Northwestern University and the University of Maryland, College Park.

"This is an excellent team," West said. "Eventually, if we can show this is feasible, I think this device will open up the world for people who are blind or visually impaired. The interface could help them sense contours and changes in shape and texture and use their fingers to perceive some of the computer images that people with normal vision take for granted."

Costly instruments to help the blind access the Internet already exist, but they require Braille keyboards and can only process text. "We're trying to make a cheaper device that would receive information tactilely and also be able to receive graphic information," said Kretzschmar, who is principal investigator of the NSF grant.

Kretzschmar first contacted West several years ago to learn more about his research into the electronic properties of polymer materials. At Bell Labs in 1962, West and his colleague Gerhard Sessler patented the electret microphone, in which thin sheets of polymer film, metal-coated on one side, are given a permanent charge to help convert sound to electrical signals with high fidelity. Almost 90 percent of the more than 2 billion microphones produced today are based on the principles developed by West and Sessler. These microphones are used in most telephones and many other electronic devices worldwide. In 2002, West joined the faculty of Johns Hopkins' Whiting School of Engineering, where he has continued his research into the behavior of these polymers.

He is now lending this expertise to the Kretzschmar-led project, which is called "A Dynamic Tactile Interface for Visually Impaired and Blind People." The interface is expected to consist of three layers: The bottom layer will be a touch screen connected to a computer for audio feedback to communicate the position touched on the screen. The middle layer

will have embedded isolated electrodes to address segments of the polymer top layer. The top layer will consist of an electro-active polymer film covered with a thin gold film. Segments of the top layer will be able to extend out from the surface as voltage is applied from the corresponding electrode in the middle layer.

"In a world that increasingly depends on graphical, pictorial and multimedia technology, visually impaired and blind people have struggled to keep up," Kretzschmar said. "If we can develop a viable dynamic tactile interface that allows graphic and pictorial information to be presented in real time in tactile rather than visual space, the amount of information available to visually impaired and blind individuals will increase dramatically."

Kretzschmar is producing Janus particles — particles with two halves and named for the Roman god Janus — to be added to the polymer film to increase its electro-active properties and run mechanical functions. The film will then be tested to measure its addressability, maximum elongation, durability and readability.

Members of her research team have begun to consult with representatives of the National Federation of the Blind and with visually impaired faculty members to obtain advice on how touch can best convey visual graphic displays, how much the material needs to change for optimal tactile detection and what is the best way to receive the information.

Source: Johns Hopkins University

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