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Nanotouch technology shrinks touchscreen displays

Prototype technology lets a user control a touchscreen with the back of the display

By Nick Barber, IDG News Service
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Touchscreens can only get so small before fingers start to block most of the information on them, but a project from Microsoft Research and the Hasso Plattner Institut in Germany called Nanotouch allows a touchscreen device to be controlled from its backside, preventing fingers from occluding the screen.

"We're using a principle called pseudo transparency so that we can pretend we can see through the screen and as we do this we see the document we're manipulating, we can see the finger and we get no occlusion and precise manipulation," said Patrick Baudisch, a research scientist with Microsoft Research and a professor and chair of the Human Computer Interaction Department at the Hasso Plattner Institut in Potsdam, Germany.

Baudisch had several prototype 2.4-inch screens on display at the Computer Human Interface, or CHI, conference in Boston. One of the displays was the pseudo transparent display, which showed a finger on the display screen when a real finger touched the back of the display. Another prototype featured a first-person shooter (FPS) game where the gamer guided the shooter through the game using the back of the device.

On the back of the prototype is a gray and white grid with four raised nubs, similar to those on the F and J keys on a keyboard. Baudisch said those are for orienting fingers on the back of the device.

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could be developed using the technology.

Baudisch said there are touchscreen watches on the market, but that some required styluses for control of the screens. Baudisch's plan is to embed the technology on the wrist band of the watch so that the user has greater control without occluding the display with a finger.

"It's not like we're waiting for a specific time to start doing this, but every year as technology shrinks we can pack more and more technology into these devices," Baudisch said.

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Video: The new NanoTouch device in action

Electronic devices have been shrinking for years, but you might be forgiven for thinking that one that's only a centimetre across would be just too difficult to operate.

Now tests of a prototype device only slightly larger than this have shown that it can be made perfectly usable by combining a screen on the front with a touch-sensitive pad on the back.

Touch screens can be an intuitive method of interacting with computers and are now near ubiquitous in smartphones and other high-end hand-held gadgets.

Fat fingers

It is often assumed that touch-screen device can be made smaller, because they do away with the need for buttons. But paradoxically, they are often larger than the push button gadgets they replace, according to Patrick Baudisch at the Hasso Plattner Institute in Potsdam, Germany, and Microsoft Research in Redmond, Washington.

It's the "fat finger" problem that is to blame. It is hard to hit small touch targets on a screen because your finger hides what you are aiming for.

Last year, Baudisch and Daniel Wigdor of Mitsubishi Electric Research Labs (MERL) in Cambridge, Massachusetts, led a team that developed a fix to that. Their "transparent" LucidTouch device let users interact with a screen from the reverse side.

A new, smaller prototype created by Baudisch and his student Gerry Chu at the University of Toronto takes the idea further. Called NanoTouch, it has a 6-centimetre (2.4 inch) screen and a touch pad of the same size on the back. It can detect the touch or press of a finger, allowing the user to move a tiny cursor around and click and drag with it.

Transparent interface

When the user touches the interface on the back, an image of a finger appears behind the icons on the screen and moves around in sync with the user's finger, almost as if the device were transparent. A small active spot marked on the finger's end is used to interact with buttons onscreen.

To complete the illusion, the fingertip turns white as if pressed against a sheet of glass when the user presses on the touchpad (see video above).

User tests showed that targets just 1.8 millimetres across were easy to hit using NanoTouch. Targets on conventional touch-screen devices such as the iPhone are at least twice that size.

Speed reading

That precision opens the way for truly tiny devices, with screens as small as a centimetre across that are still easy to use, says Baudisch. Further user tests with NanoTouch simulated those smaller devices by reducing the active area of the screen. Even a screen just 8 mm across was easy to use. Displaying information on such small screens will need some new approaches, though.

"We are particularly excited about rapid serial visual presentation (RSVP) as a means for compressing data into small spaces," he says. RSVP involves flashing up text just a word or sentence at a time and has been shown to allow faster reading on small displays.

"Interestingly, the world record in speed reading – by a substantial margin – was reached using an RSVP-based reader," says Baudisch.

Watch interfaces

Stephen Brewster, a computer interface expert at the University of Glasgow in the UK, says the NanoTouch prototype is "compelling" and an interesting new extension of LucidTouch.

"Touch screens are the interaction surface of the moment, but they do have their drawbacks. Occlusion by the finger is a real problem. Patrick has a nice approach to solving it," he says. "[Now] we can start to design really small devices such as interactive watches that have really good interactions."

The NanoTouch prototype will be presented at the Computer and Human Interaction conference in Boston, Massachusetts, in April 2009.

By Colin Barras