



### The Touch It Is A-Changing ...

by Geoff Walker

The touch industry is undergoing change like never before. In the past 3 years, the pace of change and innovation has accelerated drastically. Prior to 2005, only the four conventional touch technologies – resistive, surface capacitive, surface acoustic wave (SAW), and infrared – had any significant presence in the marketplace, so choosing a touch technology for use in a new product was relatively easy. At that point, comfortable monopolies existed for surface-capacitive (3M) and SAW (Elo TouchSystems) touch systems, the only touch-technology choice for mobile devices was resistive, and multi-touch had not been used in any commercial product. It is a different world now.

Consider the following subset of the many significant events that have occurred in touch technologies since 2004:

- Projected-capacitive touch moved from an obscure niche into the mainstream as a result of the Apple iPhone and iPod Touch.
- Camera-based optical touch emerged and began moving into the mainstream as a result of its inclusion in the HP TouchSmart “family computer” and use in interactive digital signage.
- Optical waveguide touch, optimized for use in mobile devices, emerged as a much-lower-cost alternative to traditional infrared touch.
- Traditional infrared touch was used in a mobile phone (Neonode’s original N1 and its new N2) for the first time.
- Force-sensing touch, originally developed by IBM in the early 1990s but withdrawn from the market as an unsuccessful product before the end of the decade, re-emerged with all of its original problems solved by a combination of clever engineering and Moore’s Law.
- Bending-wave touch was commercialized by two industry giants: 3M (Dispersive Signal Technology, DST), based on real-time measurement of bending waves, and Elo TouchSystems (Acoustic Pulse Recognition, APR), based on a look-up table of sampled bending waves.
- Touch integrated into the backplane structure of an LCD (called “in-cell” touch) emerged in three separate forms (light sensing, capacitive sensing, and digital resistive).
- 3M’s patent on surface-capacitive touch technology and Elo TouchSystem’s patent on surface acoustic wave (SAW) technology expired, resulting in more than 20 new suppliers of these technologies in Korea, Taiwan, and China.
- The first commercial application of multi-touch was successfully launched in a line of music controllers.
- The choice of touch technologies for mobile devices expanded from only one (resistive) to five [resistive, projected capacitive, bending wave (APR), optical waveguide infrared, and LCD in-cell].
- New materials were developed to replace indium tin oxide (ITO), a critical but lifetime-limiting component of resistive touch screens.

The articles in this issue were chosen to provide an in-depth look at various aspects of several of these events. The lead article describes how the first commercial applica-

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## guest editorial

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tion of multi-touch was developed by Jazz-Mutant (now renamed Stanton) for use in its display-based music controllers. Digital resistive, the touch technology used in Stanton's products, is typically used only in low-resolution applications such as button displays. Guillaume Largillier, the co-founder and CEO of Stantum, explains why this passive-matrix sensor technology makes sense in higher-resolution applications.

The next article, written by David Soss, one of the inventors of InfiniTouch from QSI, explores the technology of force-sensing touch. David provides a clear explanation of the challenges faced and overcome in developing a robust force-sensing scheme, as well as several applications of the technology.

The third article provides a thorough overview of optical-touch technologies, including current technologies such as traditional infrared and camera-based optical as well as emerging technologies such as Frustrated Total Internal Reflection (FTIR), LCD in-cell light sensing, and optical-waveguide infrared. Ian Maxwell, founder and executive director of RPO, argues that recent technology developments in optical touch could pave the way to the renaissance of optical touch as the dominant touch technology.

Rounding out the issue is an article on how to select a surface-capacitive touch-screen controller. Now that 3M's monopoly on this technology has ended, selecting a technology supplier has become more difficult. In addition to providing detailed guidance on selecting a controller, Carl Bauman, the president and general manager of Hampshire Company, also explains the construction, materials, theory of operation, and problems and solutions of this not-very-well understood touch technology. ■

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*After 7 years of running his own independent consultancy focused on touch, displays, and mobile computers, **Geoff Walker**, ID's Guest Editor for Touch, returned to industry this month. He is now the Global Director of Product Management for Elo TouchSystems (a division of Tyco Electronics), responsible for all of their products and product strategy. He can be reached at 301 Constitution Drive, Menlo Park, CA 94025; telephone 650/361-4295, e-mail: gfwalker@tycoelectronics.com.*