DiamondTouch Characteristics and Capabilities

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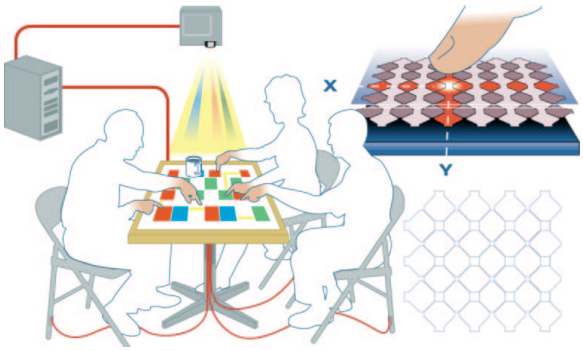
Abstract. DiamondTouch is a technology for creating touch-sensitive input devices which allow multiple, simultaneous users to interact in an intuitive fashion. Touch location information is determined independently for each user, allowing each touch on a common surface to be associated with a particular user. The surface generates location dependent, modulated electric fields which are capacitively coupled through the users to receivers installed in the work environment.



Introduction

DiamondTouch is a multi-user touch technology for tabletop front-projected displays. It enables several different people to use the same touch-surface simultaneously without interfering with each other, or being affected by foreign objects. It also allows the computer to identify which person is touching where. DiamondTouch has the following characteristics:

1. Multipoint: Detects multiple, simultaneous touches.
2. Identifying: Detects which user is touching each point.
3. Debris Tolerant: Objects left on the surface do not interfere with normal operation.
4. Durable: Able to withstand normal use without frequent repair or re-calibration.
5. Unencumbering: No additional devices should be required for use – e.g. no special stylus, body transmitters, etc.
6. Inexpensive to manufacture.

How it Works

DiamondTouch works by transmitting a unique electrical signal to an array of rows and columns embedded in the table surface. When a user touches the table, signals are capacitively coupled from the touched rows and columns, through the user, and into a receiver unit in the user's chair. The receiver can then determine which parts of the table surface the user is touching.

Current and New Hardware

The current DiamondTouch hardware has 160 columns and 96 rows with an aspect ratio of 5×3. Each row and column is 0.5 cm wide. The effective resolution of the system is actually about sixteen times finer than this because of the interpolation techniques used. The interface to the host computer is by several RS-232 connections (one per user) and the system has an update rate of 15 Hz. It can support up to four simultaneous users.

Newer hardware is in the contruction phase. The rows and columns are the same width, but there are only 128 columns yielding an aspect ratio of 4×3 (to match video projectors). It's interface to the host computer is USB and the system has an update rate of 30 Hz. The new hardware also has higher sensitivity and less noise and can support up to eight simultaneous users. Per unit cost for the first few hand-built units is about US$2000 each.

Technology Capabilities

DiamondTouch is not limited to rows and columns; the sensitive areas can be of practically any shape and size. It is possible to build very large units or very small ones. While the current prototypes use front projection, it is possible to build units using transparent conductors (such as ITO) so that back projection can be used as well. If designed for mass production, a DiamondTouch unit could be manufactured for tens of dollars. The touch surface is quite robust and can be made water, fire or chemical resistant as desired.

DiamondTouch does require that the users be "tethered" to the system, currently through their chairs. If a standing venue is more desireable, conductive footpads could be used instead.

References

1. Dietz, P. and Leigh, D., *DiamondTouch: A Multi-User Touch Technology* in Proc. ACM UIST 2001, November 11–14, 2001, Orlando, Florida, USA. pp. 219-226.