

MULTI-USER TOUCH SURFACE

FIELD OF THE INVENTION

[0001] The present invention relates generally to the field of touch sensitive surfaces, and more particularly to large-scale, multi-user touch surfaces.

BACKGROUND OF THE INVENTION

[0002] Touch screens are widely used to present a user with an intuitive pointing interface. For example, touch screens are used in automatic teller machines, scientific and industrial control devices, public kiosks, and hand held computing devices, to name but a few common touch applications. Touch screens can use resistive, capacitive, acoustic, or infrared sensors. In most touch screen applications, the touch sensitive surface is permanently mounted on a display device such as a cathode ray tube (CRT), or a liquid crystal display (LCD).

[0003] During operation of most prior art touch screens, a formatted image is rear projected through the touch screen while a transmitter drives signals across the x- and y-axis of the touch screen. As the user touches the screen with a finger or stylus, pointing out specific parts of the image, receivers detect the location of specific x- and y-coordinates of where the screen is touched. The receivers are coupled to processes that can then take appropriate actions in response to the touching and the currently displayed image.

[0004] Recently, there has been interest in extending touch technologies to electronic whiteboard applications. There, the main difference is one of scale. As stated above, traditional touch screen are designed for use with small displays and a single user, whereas whiteboards are large displays, generally used in group situations.

[0005] While it is possible to scale up touch screen, specifically with acoustic signals, prior art touch screens do not differentiate among the touches by multiple users. Also, most prior art touch screen cannot distinguish multiple, none identify simultaneous touches by one or multiple users.

[0006] While electronic whiteboards are useful for group discussions, turning the interactive surface into a table that a number of users can be seated around would facilitate longer work sessions. A problem with this arrangement is that users tend to put items on tables, such as books, paper, and cups. For pressure sensitive surfaces, static objects generate spurious touch points. In a single touch system, any such object causes the surface to malfunction.

[0007] Therefore, an improved interactive touch surface should have the following characteristics: detects multiple, simultaneous touches, detects which user is touching each location, objects left on the touch surface should not interfere with normal operation, withstand normal use without frequent repair or recalibration, not require additional devices, e.g. no special stylus, body transmitters, and the like, and be inexpensive.

SUMMARY OF THE INVENTION

[0008] It is an object of the invention to provide a multi-user, large-scale touch surface. It is another object of the invention to provide a touch system that can uniquely associate multiple simultaneous touches with multiple users.

It is also an object of the invention to differentiate multiple simultaneous touches by a single user. It is also desired to have a touch surface that can operate independent of a display device.

[0009] The invention provides a multi-user touch system that includes a touch sensitive surface with touch sensitive locations. The basic idea behind the invention is to have the users complete a capacitively coupled circuit running from the touch point on the touch surface to devices embedded in the environment. For example, an interactive display table contains an array of antennas, each transmitting a unique signal. When a user touches near a particular antenna, the transmitted signal is capacitively coupled to that user. If the user is sitting or standing on a conducting electrode, the signal will also be capacitively coupled to that electrode. A receiver connected to that electrode can thus detect which antennas the user is touching near. Of course, the system can also work in reverse, with the table being an array of receiving antennas and the user coupling signal from a unique transmitter in a chair or floor plate.

[0010] With proper design, capacitive coupling through the human body is reliable. One consideration is to operate via "near field," i.e., capacitive, coupling. By limiting the transmitting frequencies so that the antennas are very short compared with a quarter wavelength, very little energy is radiated. Thus, for reasonable sized tables, frequencies are in the sub-MHz. range to prevent EMI compatibility problems.

[0011] More particularly, a transmitter is coupled to multiple antennas mounted on a surface to transmit uniquely identifiable signals to the antennas. Receivers are capacitively coupled to different users, and configured to receive the uniquely identifiable signals. When multiple users simultaneously touch any of the antennas, each touched antenna is associated with a particular user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a schematic of a multi-user touch screen according to the invention.

[0013] FIG. 2 a block diagram of a receiver according to the invention;

[0014] FIG. 3 is a block diagram of a touch screen used in one embodiment of the present invention; and

[0015] FIG. 4 is a schematic of the capacitive coupling according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Our invention provides a touch sensitive system that enables multiple users to simultaneously touch a surface, and to associate the location of each touch or multiple simultaneous touches with a specific user. Our touch system capacitively couples a signal between locations on the touch surface and users so that unique touched locations can be identified with specific users. Thus, multiple users can simultaneously interact with a touch surface.

[0017] System Structure

[0018] As shown in FIG. 1, a preferred embodiment of our invention can use a tabletop 101 to display an arbitrary image, not shown. The tabletop is fitted with conductive