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Tileable Large-Scale Proximity or Touch Sensor

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ABSTRACT

Large-scale touch or proximity sensors, e.g., sensors that span the wall of a home or office, have recently been described in research publications. Such wall-scale touch sensing technologies enhance a wall (or room) with sensing, interactivity, and computation, while retaining the look-and-feel of an ordinary wall. Wall-scale touch/proximity sensors that have been proposed thus far are not made of modular components. As such, each wall that is to be enhanced with touch/proximity sensing abilities is custom-treated based on the size of the intended display, using a labor-intensive process. This disclosure presents a design for a large-scale touch sensor that is segmented, e.g., built using pre-manufactured and easily installable panels.

KEYWORDS

- segmented sensor panels
- tileable sensor panels
- touch panel
- proximity sensor
- modular sensor panel

BACKGROUND

Large-scale touch or proximity sensors, e.g., sensors that span the wall of a typical home or office, have recently been described in research publications [1]. Such wall-scale touch-sensing technologies enhance a wall (or room) with sensing, interactivity, and computation, while retaining the look-and-feel of an ordinary wall. For example, wall-scale touch/proximity sensing has been shown to detect occupants' positions, estimate their body pose, track their touch

and gestures, etc. The lengthy conductive strips that comprise the wall-scale touch-sensor act as antennas, and are able to capture electromagnetic noise emanating from active appliances (e.g., laptop computer, lamp-stand, hair-dryer, television, etc.) in a room, thereby recognizing, localizing and tracking the on/off state of such appliances.

Wall-scale touch/proximity sensors that have been proposed thus far are not made of modular components. As such, each wall that is to be enhanced with touch/proximity sensing abilities is custom-treated based on the size of the intended display, using a labor-intensive process. Even if tiled, the present configurations require bundles of row wires between tiles, which can result in sensing unevenness or false-positive signals along the bundles.

DESCRIPTION

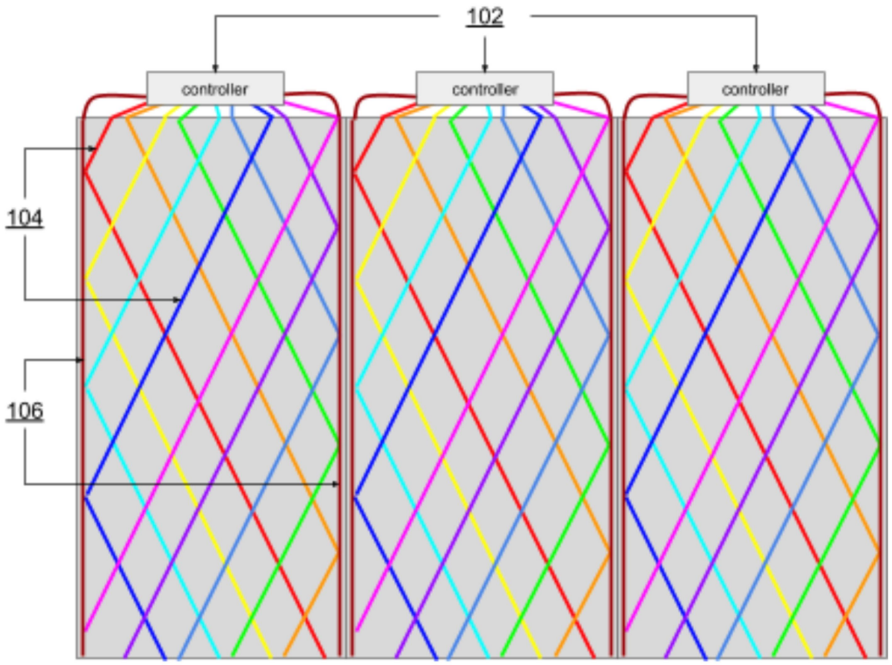

Fig. 1: Segmented large-scale touch / proximity sensor

As illustrated in Fig. 1, this disclosure presents a design for a segmented sensor that can be repeated infinitely on one axis (vertical axis in Fig. 1), and up to twice along the perpendicular axis. A single repetition (panel) comprises a controller (102) along one edge of the panel connected to a set of electrode wires (104), each taking a V-shaped pattern across the panel. The wires are arranged such that any pair of wires crosses at most once. Additionally, there can be straight wires (106) down either edge of the panel to improve sensing along the edges.

When multiple such panels are placed next to each other, a synchronization technique minimizes cross-talk. Synchronization is accomplished by either daisy-chaining the panels or connecting them to a central master controller. The panel can be cut to any length, as long as the full width and controller edge are maintained. Unlike a normal column/row multi-touch controller, the controller drives each wire in turn, sensing mutual capacitance to every other wire. Disambiguation is done to minimize the effect of capacitance between wires that run adjacent to each other and also cross.

Panels can be extended to multiple crossings by running multiple wires in parallel in place of each single wire in the design illustrated in Fig. 1. Some of the wires in the multi-wire bundle can stop part way down the panel so that each crossing has a unique set of wires. The angle of the wires can be varied to achieve different sensing resolution in different directions.

Fig. 2 illustrates alternate patterns of wiring that achieve the same results, e.g., infinite repeatability along one axis, twice-repeatable along a perpendicular axis, wire arrangement such that any pair of wires cross at most once, etc.

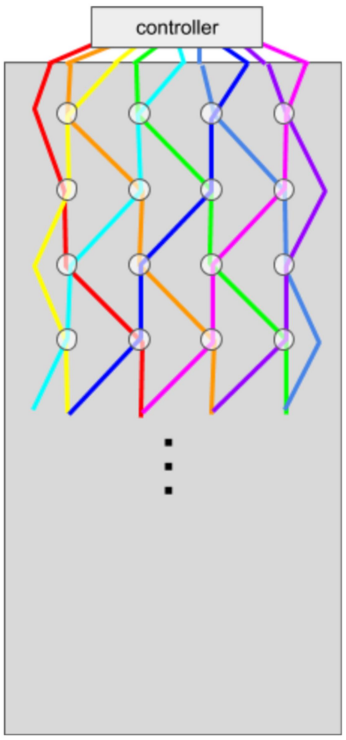

Fig. 2: Alternate wiring pattern for segmented large-scale touch / proximity sensor

CONCLUSION

This disclosure presents a design for a large-scale touch sensor that is segmented, e.g., built using pre-manufactured and easily installable panels.

REFERENCES

[1] Zhang, Yang, Gierad Laput, and Chris Harrison. "Electrick: Low-cost touch sensing using electric field tomography." In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, pp. 1-14. ACM, 2017.