Electrospun Bundled Carbon Nanofibers for Skin-Inspired Tactile Sensing, Proprioception and Gesture Tracking Applications

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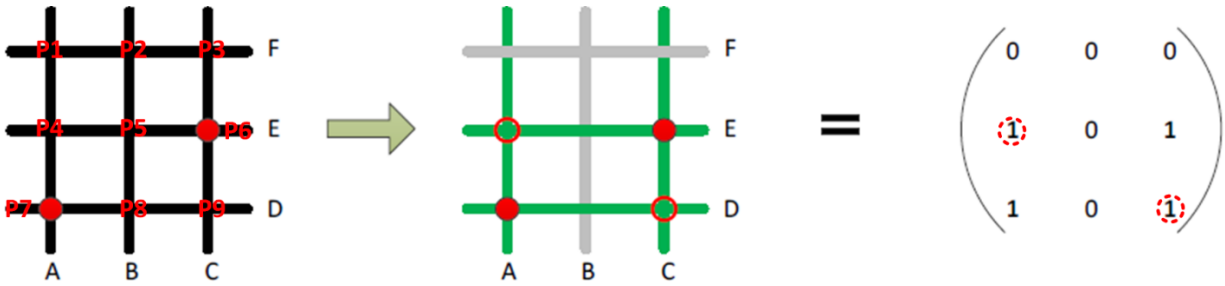
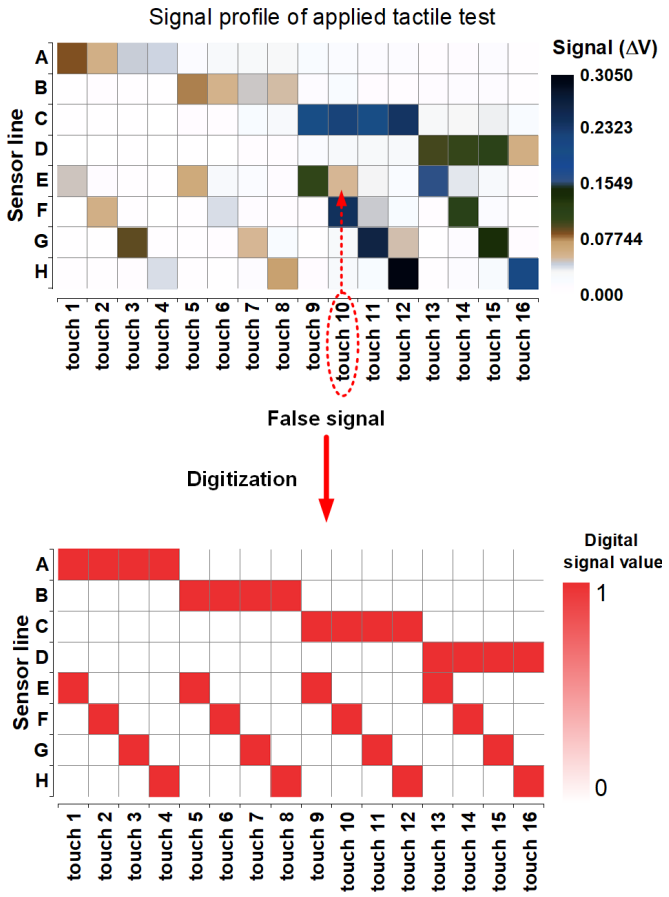
Supporting Information

The 16-point touch sensitive array has been validated for single touch operation. However, with the proposed design choice it is not possible to detect multiple simultaneous touches. The reason for this lies in the design decision of choosing intersecting sensor lines to form a sensing pixel instead of using individual sensors for each pixel. To further illustrate the point, we consider the illustration shown in Supplementary Figure 1. showing a 3 X 3 sensor matrix. The red dots represent two arbitrary points P6 and P7 being pressed simultaneous and as a result the resistances of the intersecting sensor lines change as represented by the green lines. As seen from the illustration, applying pressure/touch on points P6 and P7 simultaneously creates false signals as shown by the dotted circles (points P4 and P9) such that it becomes impossible to distinguish between the points P4, P6, P7, and P9. The matrix representation demonstrates the point further. The problem can be mitigated by employing individual isolated sensors for each of the sensing points.



Supplementary Figure 1: Illustration to demonstrate the drawbacks associated with the 16-point touch sensitive array.

For most practical applications involving tactile sensing, the position of the touch is often more important than the actual pressure applied at the point. For instance, in most day-to-day applications, the position of touch on a conventional touchscreen is more important than the exact magnitude of touch/pressure being applied. In order to identify the origin of touch better, a threshold can be applied to each sensor line. A simple algorithm is adapted for setting the threshold for weeding out false signals. For instance, when point 10 (intersection of C and F) is touched, in ideal case only grid corresponding to C and F should display readable signals. However, as observed from the grid plot in Supplementary Figure 2, the adjacent grid E also shows an output voltage (owing to point 9's proximity to point 10). In this case, voltage signals on grids C and F are of comparable magnitude whereas the signal on grid E is less than 20% of the acquired signals on grids C/F. In the digitized plot, grids C and F are set to 1 while grid F being considered as a false signal is set to 0. As long as the signal strength is below the ~20% threshold, it would be perceived as "0". Similar treatments are applied to touch inputs involving point 11 and 12.



Supplementary Figure 2: The digitization algorithm and subsequent removal of false signals.