IEEE Sensors Journal • Том 22, Выпуск 11, Страницы 10446 - 10453 • 1 June 2022

Тип документа
Статья

Тип источника
Журнал

ISSN
1530437X

DOI
10.1109/JSEN.2022.3171218

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Dual-Mode Flexible Capacitive Sensor for Proximity-Tactile Interface and Wireless Perception

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Краткое описание

Flexible sensors with proximity and tactile sensing have attracted great interest in electronic skins (E-skin), human-machine interfaces (HMI), and soft robotics. However, it remains challenging to have both proximity and haptic sensing ability in one flexible device, yet enable wireless sensing. Here, based on the edge electric field and piezo-capacitive effect, we successfully present a combination of approaching non-contact sensation with pressure perception in one flexible dual-mode capacitive sensor (FDCS) which possesses both proximity-tactile interface interaction and wireless sensing. Large scale and low-cost methods of the screen printing and the laser engraving are selectively used to fabricate flexible electrodes and cone-pattern mold, respectively. Thanks to the stable conductivity of the electrodes and the micro-cone-like dielectric structure, the FDCS exhibits a detection distance of up to 20 cm in proximity mode and an extended operating range of 200 kPa, a low detection limit (10.2 Pa), fast response time (90 ms), and long endurance (>10,000 cycles) in pressure mode. A 64-unit pressure matrix successfully interacted with the coupling of the proximity finger and the actual pressure in two different modes. In addition, by assembling the FDCS with a planar spiral coil to form an LC (inductance-capacitance) resonator, rather than connecting directly to an LCR device, the device was able to detect external pressure wirelessly. The development of this dual-mode sensor and its demonstration paves the way for potential flexible sensors for applications in HMI and soft robots. © 2001-2012 IEEE.

Ключевые слова автора

interface; proximity; Sensor; tactile; wireless

Включенные в указатель ключевые слова

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