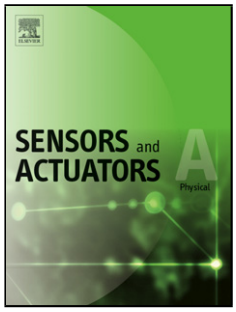

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Highly Sensitive Flexible Proximity Tactile Array Sensor by using Carbon Micro Coils

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Abstract

Recently, the new generation of robotics, called soft robotics, are exploited by soft materials as the revolutionary tools which innovate the current challenges. In this paper, we propose a novel dual mode array sensor based on the carbon microcoils (CMC) in soft dielectric elastomer substrate material. It can detect the distance to the object as well as the pressure when it has contact. In the first, the design of sensor structure and its properties are investigated. Various experiments are performed on the dielectric substrates, electrode structures, and the target objects by changing electrical impedance formed by CMC under the alternating current (AC) excitation voltage with the dominant excitation frequency at 100kHz. Secondly, the tactile sensing, and proximity sensing, that is dual mode sensing performance are examined with respect to repeatability, reversibility, durability, sensitivity, and hysteresis. In the next, the sensor signal processing for measuring impedance (LCR) are analyzed with an analog signal processing, analog switching circuit, and digital processing. Finally, we successfully demonstrate the performance of 10×10 proximity tactile sensor which is capable of detecting a 30 mg (300

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