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Abstract
A novel flexible tactile sensor for sensing the incident slippage and its direction were designed by introducing the concept of structural electrodes on a piezoelectric film (PVDF). The structural electrodes consisted of silicone rubber column and distributed microelectrodes between the silicone rubber column and PVDF film. As an object placed upon the silicone rubber column and pushed by an external force, the movement and slippage of object can be detected by the output voltages from the distributed electrodes due to the corresponding stress state under the rubber column. In addition, two opposite output signals from different sides of column can differentiate the direction of slippage as the column was bent by object. The resulting signal for sensing slippage depends on the size of column, weight of object, as observed in the experiments.

A larger peak value of signal can be generated for either larger size of column or heavier weight of object due to the more bending moment and normal force, respectively. In general, the flexible tactile sensor can predict not only the occurrence of slippage if the normal force is not only enough but also the direction of object movement, which cannot be achieved by conventional pressure sensor or touch sensor for normal force. Therefore, the sensing technique can be applied to many applications such as handheld devices, smart skin for robot and entertainment devices in the future.
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