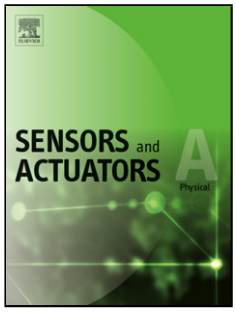

Title: Passive tactile sensor for measuring elastic modulus of soft material: continuum-mechanics model and experiment

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Abstract

To rapidly determine the elastic modulus of soft materials, a novel passive tactile sensor with simple structure suitable to micro-fabrication is presented Although the sensor consisting of two elements of different stiffness is based on the conventional sensing principle, the compliant element is designed as a combination of a flexible spring and a rigid plate, instead of a bulk elastic body. This ensures the contact of the sensor and the measured object to be a four-part boundary value problem that can be analytically solved in an approximation sense. For a specific sensor, it is found that the elastic modulus can be completely determined by the spring stiffness and the force ratio between the total force acted on the sensor and the spring force. To validate the effectiveness of the sensor model, finite element analyses and experiments are conducted. The good agreement between the theoretical estimations, the finite element results and experimental values demonstrates the possibility and feasibility of integrating the miniature version of the sensor to the medical instrument.