(SD2022-327) Design and Evaluation of a Miniaturized Force Sensor Based on Wave Backscattering

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ABSTRACT

Wireless researchers at UC San Diego have invented a wireless force sensor comprising a deformable passive force sensor that induces a change in an interrogation RF signal present on a conductive connection to produce a changed reflective signal and an ID circuit that responds with an ID and the changed reflective signal.

TECHNOLOGY DESCRIPTION

Background: Minimally invasive surgical devices and robots are example tools that can benefit from force sensing. Force sensing allows a robot to detect contact with objects, as well as grasp and manipulate delicate objects if the force sensing is sensitive enough. Despite its many benefits, teleoperated robotassisted minimally invasive surgery is limited by the inability of current instruments to sense forces applied during surgery.

Adding force sensing at the tip of a surgical robot or a minimally invasive surgical tool would provide an important tool to reduce the risk of injury. Sensing forces along any portion of the tool or robot that interacts with the patient would also provide valuable information to increase the safety and efficiency of surgical procedures.

Technology: Wireless researchers at UC San Diego have invented a wireless force sensor comprising a deformable passive force sensor that induces a change in an interrogation RF signal present on a conductive connection to produce a changed reflective signal and an ID circuit that responds with an ID and the changed reflective signal.

APPLICATIONS

medical robotics: cardiothoracic; laparoscopic; urologic procedures

ADVANTAGES

STATE OF DEVELOPMENT

OTHER INFORMATION

CATEGORIZED AS

- Communications
  - Wireless

RELATED CASES

2021-Z08-1

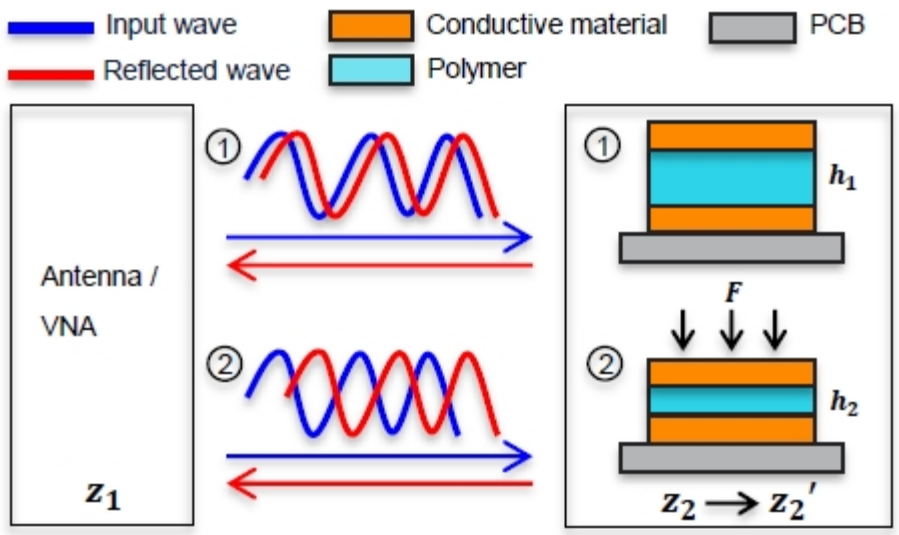

Fig. 2. Illustration of the working principle of the proposed sensor. As a force is applied, the soft polymer layer deforms and brings the conductive layers closer together, leading to a change in the impedance of the sensor, which results in a change in phase of a reflected RF signal.

INTELLECTUAL PROPERTY INFO

UC San Diego is seeking companies interested in commercializing this patent-pending technology.

RELATED MATERIALS

▶ D. Park, A. Gupta, S. Bashar, C. Girerd, D. Bharadia and T. K. Morimoto, "Design and Evaluation of a Miniaturized Force Sensor Based on Wave Backscattering," in IEEE Robotics and Automation Letters, vol. 7, no. 3, pp. 7550-7557, July 2022, doi: 10.1109/LRA.2022.3184767. - 06/20/2022

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