Max-Planck-Innovation

Technology Offer

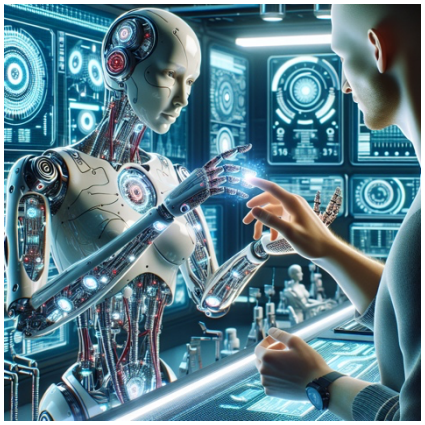
Artificial Skin: Piezoresistive Laminate Design to Sense Surface Normal Pressure and Lateral Strain

File no.: MI-0104-6068-GÖ-IT

Max-Planck-Innovation GmbH
Arnulfstr. 58
80335 Munich
Germany

Phone: +49 (89) 29 09 19 - 0
Fax: +49 (89) 29 09 19 - 99
info@max-planck-innovation.de
www.max-planck-innovation.de

Contact
Gökce Özyurt
Phone: +49 (89) 29 09 19 - 18
oezyurt@max-planck-innovation.de

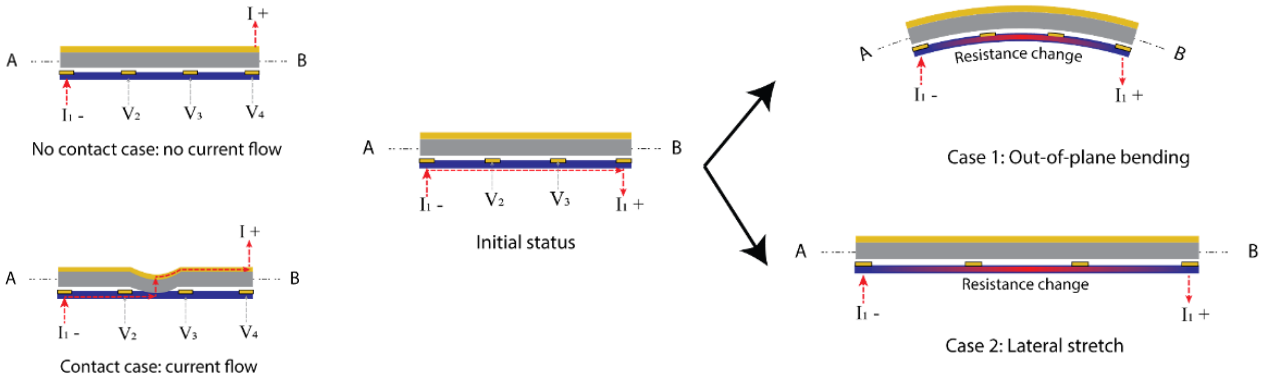


Background

A human-like electronic skin for physical contact handling is an essential component of autonomous systems which still lack tactile sensors that can cover large and curved surfaces of robots. This invention introduces a special piezoresistive laminate design, electrodes arrangement, current injection and voltage measurement strategy and reconstruction process in order to estimate both surface normal contact sensing and lateral strain sensing simultaneously. We offer a tactile sensor that can measure contact pressure and out-of-plane bending itself.

Technology

The first layer of the laminate is a piezoresistive layer that is sensitive to lateral strain, which includes more conductive distributed electrodes, made of possibly conductive fabric, ink or intrinsically conductive polymers. The spacing layer in between has a very low conductivity itself but becomes conductive and connects the two layers under compressive pressure. The third layer is an electrode layer with high conductivity. All the electrodes, including the distributed electrodes on the piezoresistive layer and the electrode layer, are connected to the electronic circuits for current injection and voltage measurement using a multiplexer.



For contact sensing, a current source (+I, -I) is connected to one of the electrodes on the piezoresistive layer and the electrode layer. Only when there is a contact, the spacer layer electrically connects the two layers forming electrical potentials around the conductive medium. The electrical potentials are measured from the distributed electrodes on the piezoresistive layer. For lateral sensing, the current source is connected to two electrodes in the piezoresistive layer and the electrical potentials change according to resistance changes.

A resistance reconstruction method calculates resistance distribution of the continuum medium when injected currents and corresponding voltages are known. Two linear mapping functions for contact and lateral sensing are computed by perturbating the forward operator that is modeled with approximate resistance network model.

Patent Information

PCT patent application PCT/EP2021/086037, regionalized & pending in EU, USA, CN, KR