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# Development of a tactile sensor based on optical fiber specklegram analysis and sensor data fusion technique

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## Highlights

- A tactile sensor based on fiber specklegram analysis and data fusion was developed.
- Measurements are performed over  $30 \times 30 \text{ mm}^2$  area by utilizing only 3 fibers.
- The sensor has  $0.5 \text{ N}^{-1}$  sensitivity and detects changes of 1 mm in force location.
- The force magnitude and spatial distribution can be estimated by data fusion.

## Abstract

The development of a tactile sensor based on optical fiber specklegram analysis is reported. The device is comprised of 9 microbending transducers connected to 3 multimode fibers, and attached to a  $30 \times 30 \text{ mm}^2$  touching surface in a matrix arrange. The output fiber speckle fields, produced by coherent light transmission through the multimode waveguides, are processed for evaluation of the normalized inner-product coefficients, being further correlated to the external load characteristics according to a specklegram referencing approach. Finally, the magnitude and location of the forces applied over the tactile frame are estimated by means of a data fusion technique, yielding the probabilistic distribution of

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