

Technology Offer

Barodome: Arrangement of Barometric Sensors and Machine Learning Based Force Inference Method

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Background

When developing applications such as robots, sensing of forces applied on a robot hand or another part of a robot such as a leg or a manipulation device is crucial in giving robots increased capabilities to move around and manipulate objects. We offer a complete low-cost sensor solution with the sensor arrangement, production method, the neural network and its training method.

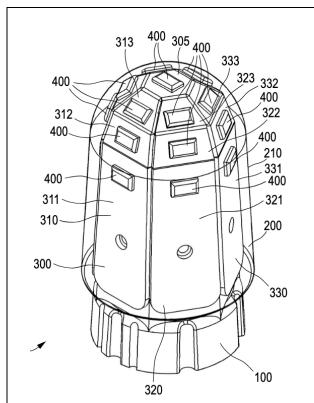
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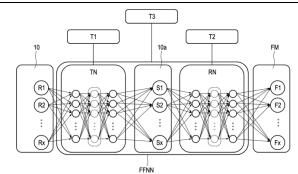
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Technology



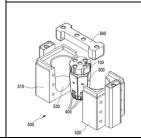
The sensor arrangement comprises a flexible circuit board and a number of barometric pressure sensors being mounted on the flexible circuit board. The flexible circuit board is wrapped around and mounted to a rigid core and covered with a compliant layer providing a measurement surface.



The pressure values from the sensors are read and a force map on the measurement surface is calculated using a feed-forward neural network, which comprises a transfer network (TN) and a reconstruction network (RN). TN maps the barometric pressure sensors to a number of virtual sensors of a finite element model of the sensor arrangement. RN maps the virtual sensors of the finite element model to the force map.

RN is trained with calculated simulated force maps and corresponding virtual sensor values which are obtained by finite element simulation.

TN is trained using barometric sensor values which are read during a force test and corresponding virtual sensor values which are obtained by finite element simulation under applied forces.





The flex with sensors and the mold in which the rigid core with the flexible circuit board is placed and covered with the compliant layer.

Applications & Advantages

- Robot hands, legs and effectors
- Low-Cost
- · Very high resolution thanks to the trained neural network

Patent Information

Sensor: PCT patent application PCT/EP2020/083260, regionalized & pending in EU, USA, CN, JP, KR

Force Inference: PCT patent application PCT/EP2020/083261, pending in EU, USA, CN, JP, KR