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Novel tactile sensor systems are based on pressure sensors dispersed over a surface. They endow technical systems with the capability to detect and spatially resolve contact and pressure distributions.

This makes it possible to equip machines, assistance systems and robots in manufacturing, medical and, in the future, even healthcare and household sectors with pressure sensitive surfaces and interface systems so that they are not only easier to operate but also can interact safely with their environment.

Our Services

The Fraunhofer IFF develops and produces tactile sensor systems, including the electronics and software, customized and optimized for your need. Our scientific expertise comprises the areas of materials technology, production processes, electronics, communication infrastructure, software, and safety technology.

Specializations

- Tactile sensor systems with shock-absorbing features to make robots and moving machine parts safe
- Tactile interaction systems that simplify robot operation and programming
- Tactile enabling switches for safe and ergonomic control of dangerous processes
- Tactile flooring that localizes people and objects over large areas with spatial resolution
- Tactile grippers that monitor gripping processes
- Tactile sensors that measure pressure distribution

FRAUNHOFER INSTITUTE FOR FACTORY OPERATION AND AUTOMATION IFF

Director
 Prof. Michael Schenk

Sandtorstraße 22
 39106 Magdeburg
 Germany

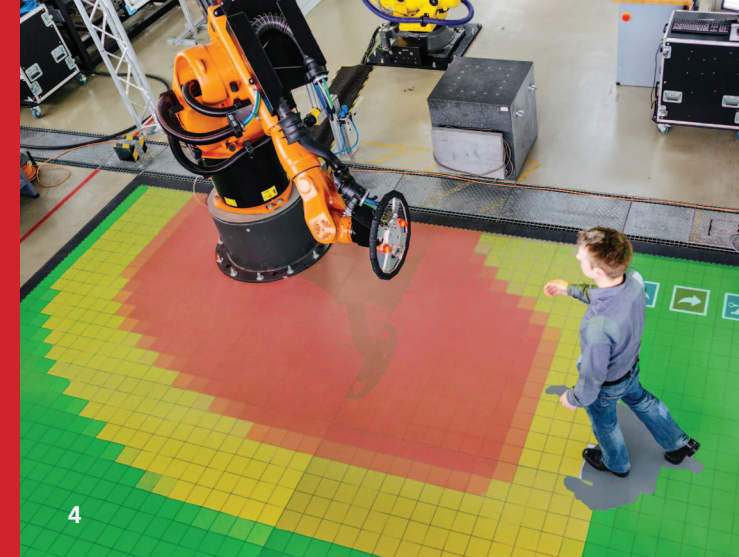
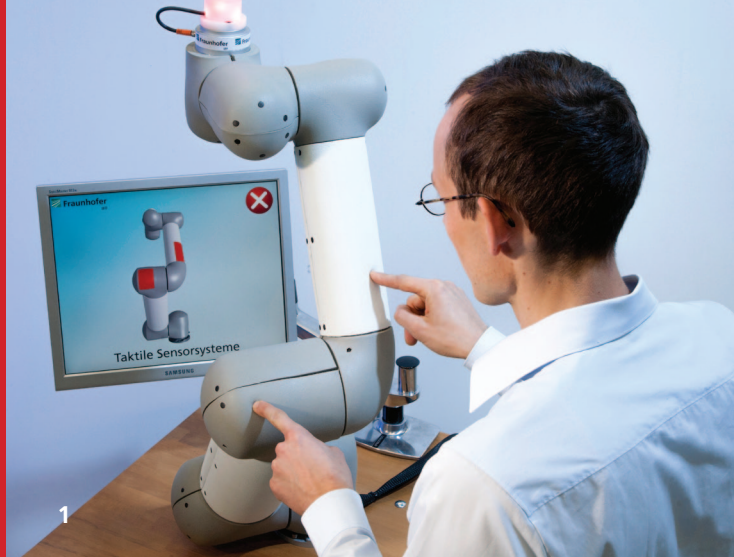
Phone +49 391 4090-0
 Fax +49 391 4090-596
 robotik@iff.fraunhofer.de
 www.iff.fraunhofer.de/en

Contact
 Robotic Systems Business Unit
 Prof. Norbert Elkmann
 Phone +49 391 4090-222
 Fax +49 391 4090-250
 norbert.elkmann@iff.fraunhofer.de

Veit Müller
 Phone +49 391 4090-281
 Fax +49 391 4090-90-281
 veit.mueller@iff.fraunhofer.de

TACTILE SENSOR SYSTEMS





SENSOR TECHNOLOGY

The heart of the tactile sensor systems developed at the Fraunhofer IFF are transducers based on piezo resistive polymer composites. The thusly implemented principle of resistive measurement in combination with an innovative patented matrix design measures pressure distributions with a spatial resolution. Smart sensor electronics guarantee that the transducers scan rapidly and reliably. Various communication interfaces or even switching outputs are available to integrate the system. The sensing principle makes it suitable for use as a safety sensor.

Diverse Uses

The tactile transducers' shape, size and resolution can be modified for any application. Even sensors for complex 3D components are feasible. A variety of materials are available for different operating conditions. In addition to highly rugged designs, waterproof, breathable or shock-absorbing transducers can also be produced.

High Safety Standards

Since the reliability and control of the sensor function are crucial especially in safety applications, the tactile sensor system is equipped with a fail-safe circuit. Thus, every single sensor cell's operation can be monitored. In addition, used as a collision sensor for instance, the sensor system effectively reduces the risk of injury by detecting collisions and employing shock-absorbing shell materials. This is crucial to safety, when humans and robots interact in a shared workplace.

APPLICATIONS

Safe Collision Detection

Tactile sensor systems are a key technology for detecting collision and limiting contact forces in applications that allow humans and robots to interact directly.

To provide seamless touch recognition, the robot's surface is equipped with customized transducers. Additionally, a soft, shock-absorbing surface effectively minimizes the forces of a collision.

Touch Operation

Tactile sensor systems can also be used as user interfaces. Apart from the information that contact has occurred, the tactile sensor system delivers additional information on the location and amount of force applied. The forces acting on the tactile sensor system are interpreted directly as control pulses and can be used to control movement intuitively, without additional technical knowledge and operator panels.

This supports novel methods of programming and operation in industry and simplified intuitive interfaces for human-robot interaction.

Enabling Switch for Safe Movement

Tactile sensor systems can act as a classic three-stage enabling switch. Therefore, if the operator suddenly lets go off or clenches the switch, the process is shut down safely.

Contrary to classic enabling switches, any number of surfaces or parts can be equipped with an enabling function. This allows for more flexible and ergonomical operation.

Person Detection and Workspace Monitoring

Flooring with integrated tactile sensor systems are able to detect both stationary and moving objects and thus offer new application possibilities in the fields of plant safety, logistics and property protection.

Moreover, tactile flooring can be used for fall detection and gait analysis in medical or rehab environments.

By combining tactile sensor systems with optical feedback systems (projection technology or integrated LEDs), the user can obtain visual feedback and thus mark security sectors, fade in information or give instructions.

Sensitive Gripping

Object handling is an essential task in industrial and service robotics. Tactile sensor systems in grippers measure forces acting on their surfaces, offer spatial resolution about where the forces act and monitor the entire gripping process reliably.

The tactile sensor system not only makes the gripping process safer but also allows so-called reactive gripping. This biologically inspired principle allows fine adjustment of the grip as a function of the forces acting on the surfaces of the gripper.

The tactile sensor system is thus the ideal technological basis for the development of handling systems for fragile or pliable objects.

Title KUKA Agilus with pressure sensitive skin.

- 1 Low payload robot UR5 with pressure sensitive skin.
- 2 Exemplarische Druckverteilung.
- 3 Tactile enabling device for robot hand guiding „STROBAS“.
- 4 Tactile flooring with optical feedback system „SAPARO“.