

Category: Sensors & Measurement Techniques

Reference: TD-DE-1005

Fiber optic sensor

The Canadian Space Agency's contribution to the International Space Station is the Mobile Servicing System (MSS) and a Special Purpose Dexterous Manipulator, two handed 21 degree of freedom robot that will perform maintenance tasks on the space station. The MSS and SPDM will be remotely controlled by Space Station astronauts, or from a ground station. The MSS is being used to assemble and service the Space Station.



As an extension of the astronauts' limbs, the advanced robotic limbs could perform tasks that require human dexterity but lacked one critical feature - a sense of touch. In the absence of tactile feedback the arms could collide when working in close proximity or a robotic hand could inadvertently crush an object in its grasp if an astronaut misjudges size, distance or other visual cues.

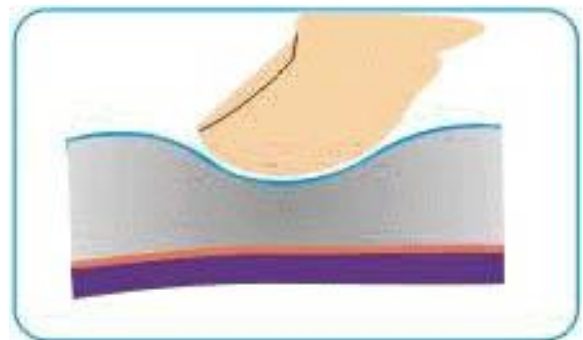
Recognizing this sensing challenge, the technology KINOTEX® was developed. KINOTEX® is a robust, compliant sensor that emulates human touch, and could cover the entire robotic limbs like a skin to provide tactile feedback required by the astronauts. Now KINOTEX® is available for terrestrial applications.

The KINOTEX® sensor is a polymer foam. Deformation of the foam generates an optical signal.

Sensitivity and compliance can be engineered to meet a broad range of user requirements. KINOTEX® can be fabricated in arbitrary shapes.

KINOTEX® devices sense pressures from as low as 0.1 kPa (.01 psi) to over 200 kPa (25 psi) and sense deformations as small as 0.025mm (.001") and up to many mm/inches.

Area arrays can resolve contact position with millimeter precision and can resolve multiple contacts simultaneously. Devices can respond on a sub-millisecond timescale. Operating temperatures can range from -80°C to over 200°C depending on the choice of materials.



Innovative Aspects:

The KINOTEX® pressure/displacement sensor functions by detecting a change in energy intensity in and around an illuminated integrating cavity; comprised of polymer foam material. Deformation of the integrating cavity by an external influence, e.g. pressure, induces a change in the illumination energy intensity.

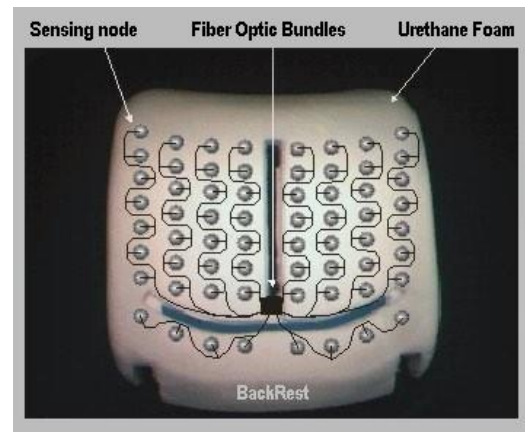
Key benefits of the sensor include simplicity, robustness, amenability to being inexpensively fabricated in large arrays with rapid response speed. Area arrays can resolve contact position with millimetre precision and can resolve multiple contacts simultaneously.

Application Areas:

The optical sensor technology could be used, e.g. in aeronautical, automotive and medical applications.

Automotive applications:

- **Crash sensor:**
KINOTEX® can deliver more essential crash information than other crush zone sensors.
The KINOTEX® Crush Zone Intrusion Sensor (CZI) is a technological advance in crash sensing, providing essential crash severity information early in an event, increasing the effectiveness of automotive occupant protection systems.
The sensor can resolve the intrusion extent, velocity and location on a sub-millisecond time scale. The information can be used to improve advanced air bag firing decisions.
- **Occupant sensor:**
KINOTEX® can reduce the risk of inappropriate air bag deployment.
Integrated into the seat cushioning material, a KINOTEX® array can sense an occupant's presence and weight. An automotive seat instrumented with KINOTEX® sensors can resolve contact pattern and force information. Such information can be analyzed to classify an occupant for advanced air bag deployment decisions, increasing the effectiveness of an automotive occupant safety restraint system.
- **Key Features:**
 - Classify occupant according to weight
 - Recognize normally seated occupant, child seat, etc
 - Sense empty seat
 - Non-electrical, non-corrosive sensor, no EMI susceptibility
 - integration into the seat cushioning foam, for low cost assembly
- **Interior controls:**
KINOTEX® touch surfaces are well suited for the provision of seat, window and other controls fully integrated with interior trim surfaces.



Non-automotive applications of KINOTEX® include:

- Biomedical monitoring devices, security and biometrics
- Computer touch pad
- Musical instrument
- Robotic sensing

Cooperation:

The technology provider is seeking partnership for joint research & development, product development and manufacturing.

In the area of automotive applications already very good relations with the German OEMs were established. Similar with Airbus industries and some research institutes. The provider seek for partnership to develop medical applications and look for a R&D partnership in for the development and production of interface electronic unit.