Applications of smart textiles: In the domain of medical, transport & energy, protection & communication.

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APPLICATIONS of SMART TEXTILES

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Contents

- Smart textiles for medical purposes.

- Smart textiles in transportation and energy sector.

- Application of smart textiles in protection, security, communication and textile electronics.

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SMART TEXTILES IN MEDICAL SECTOR

Role of smart textiles in medical and health sector

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Monitoring and sensing devices

NUUBO wearable ECG unit	VRLOGIC Data glove with flex sensors
https://www.nuubo.com/en-us	https://vrlogic.com/hardware/5dt-glove-ultra

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Therauptic devices

- Photodynamic therapy (PDT)

- Respiratory therapy devices

- Pain management devices

- Rehabilitation devices

https://hal.science/hal-02868900

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Advances of smart textiles

- Texisense are smart socks which has been developed to reduce fall events for patients at risk.

- Biosensing Textile for Health management (BIOTEX) aims at developing wearable biochemical sensing textiles that can provide real-time sweat rate measurements.

- Chromic materials can be used to develop medical masks, wherein external stimuli will cause color changes to act as warning signal.

- Smart wound dressing for the detection of any infections as a preventive measurement.

- Antibacterial smart textiles developed using nanoparticles of ZnO.

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SMART TEXTILES IN TRANSPORT & ENERGY SECTOR

Role of smart textiles in transportation and energy sector

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INSITEX:
Textile seat occupation sensor

Sensors embedded into automotive components such as car seats, steering wheel and roof for passenger safety.

INSITEX concept overview

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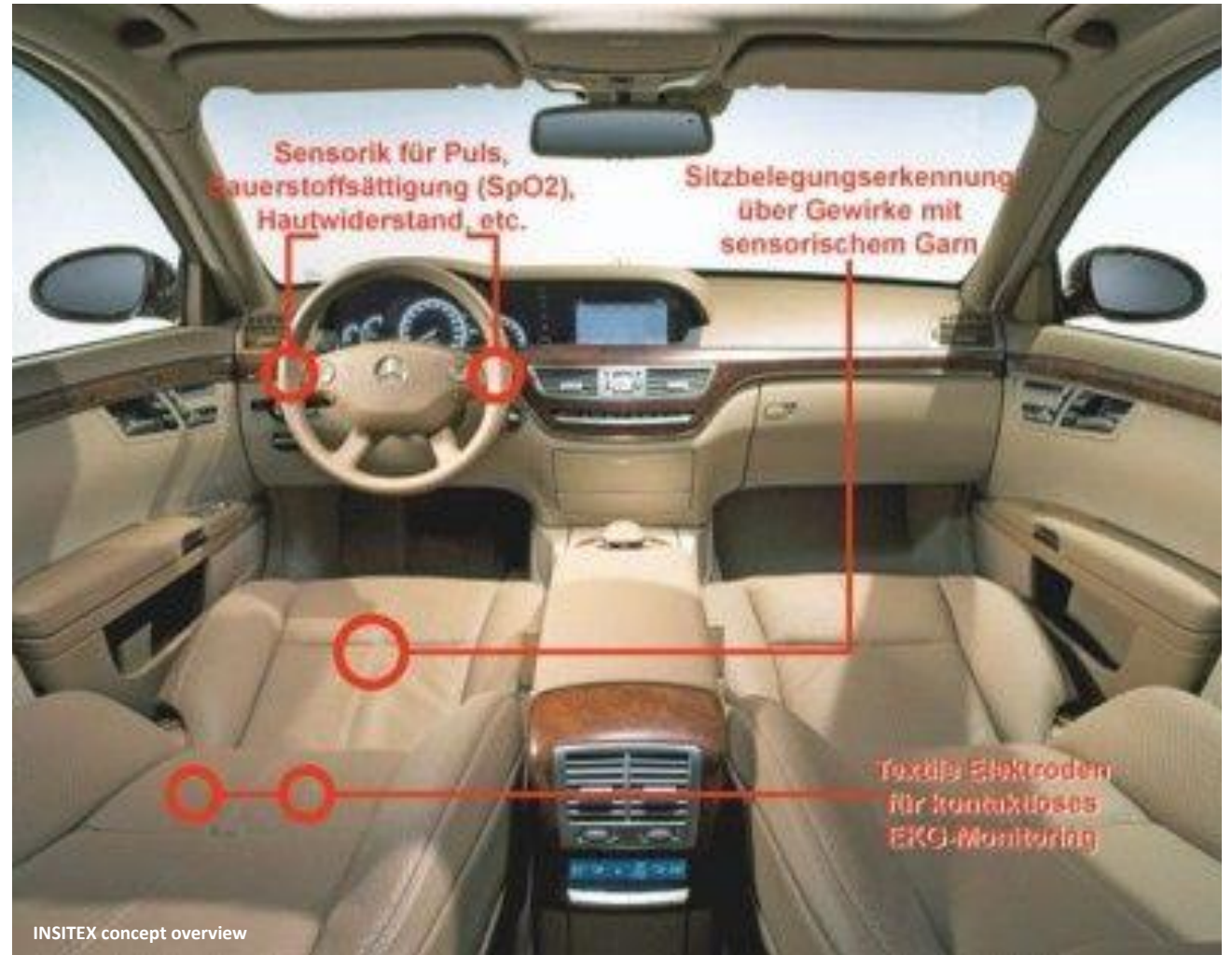
Textiles in transport vehicles

| **Textiles and Composites in Vehicles**	**´Layer´ Innovative air bus seat**
• Provide comfort, safety • Stable at extreme climatic condition • Improved performance with cost reduction • Allows structural design and flexibility	 https://layerdesign.com/project/move/#top-page

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Smart textiles for energy harvesting

Energy issues are more and more important today. Smart textiles may offer important contributions for energy harvesting and production (flexible photovoltaic cells, wind mills, piezoelectric yarns) and for energy storage (super capacitors, flexible batteries).

Fabric designed to harvest energy. It turns body moviment into power source, a fabric woven with special strands of material that harvest electricity from the sun and motion.

© Georgia Institute of Technology

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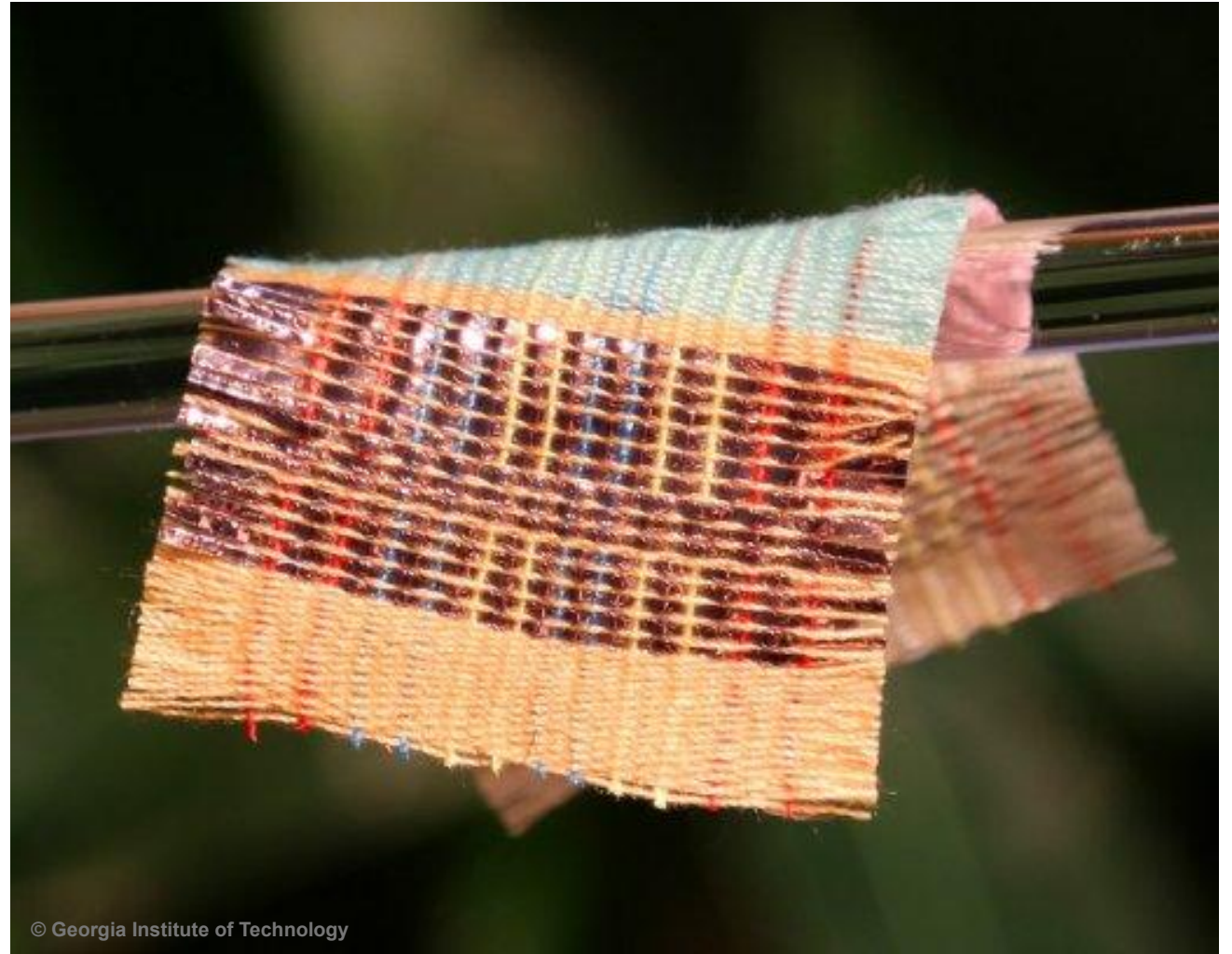
Recent advances for energy harvesting

- **Piezoelectric energy harvesting,** transforming mechanical energy into electrical energy. Polyvinylidene fluoride (PVDF), PLA, cellulose polyamides and polyurethanes exhibit interesting piezoelectric properties.

- **Tribolo electric energy harvesting**, relies on rubbing contact and electron transfer and provides high power density and conversion efficiency. E.g. polytetrafluoroethylene (PTFE) with polyamide 6 fabric or carbon nanotubes on a cotton fabric.

- **Thermoelectric energy harvesting,** transforming heat energy into electrical energy. Doped conjugated polymers such as PEDOT:PSS and carbonaceous materials have been explored to prepare flexible thermoelectric modules.

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SMART TEXTILES APPLICATION FOR PROTECTION

In the domain of protection, security, communication and textile electronics

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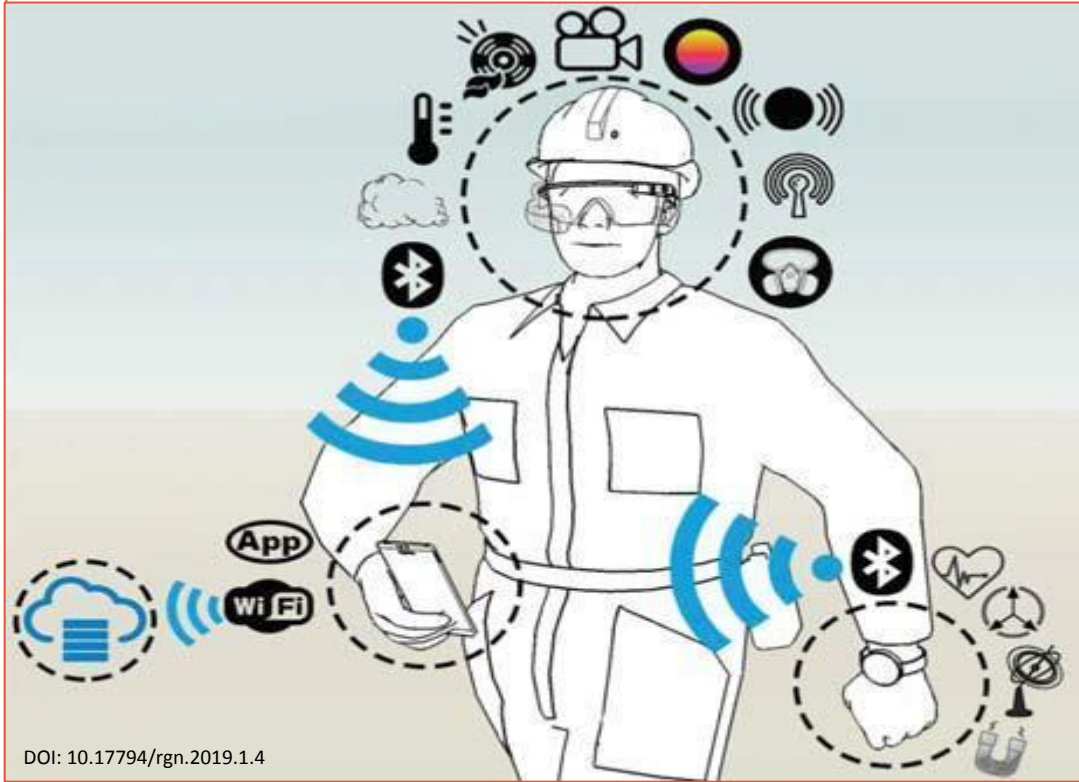# Smart textiles for protection

SIOEN high visibility jacket

SIOEN
Protection
through Innovation

https://sioen-ppc.com/en/ranges/hi-visibility

ColdWear clever jacket

https://www.sintef.no/projectweb/coldwear/

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Smart textiles for security

Miners smart protective equipment

DOI: 10.17794/rgn.2019.1.4

Sensors, actuators and technology upgrade in PPE

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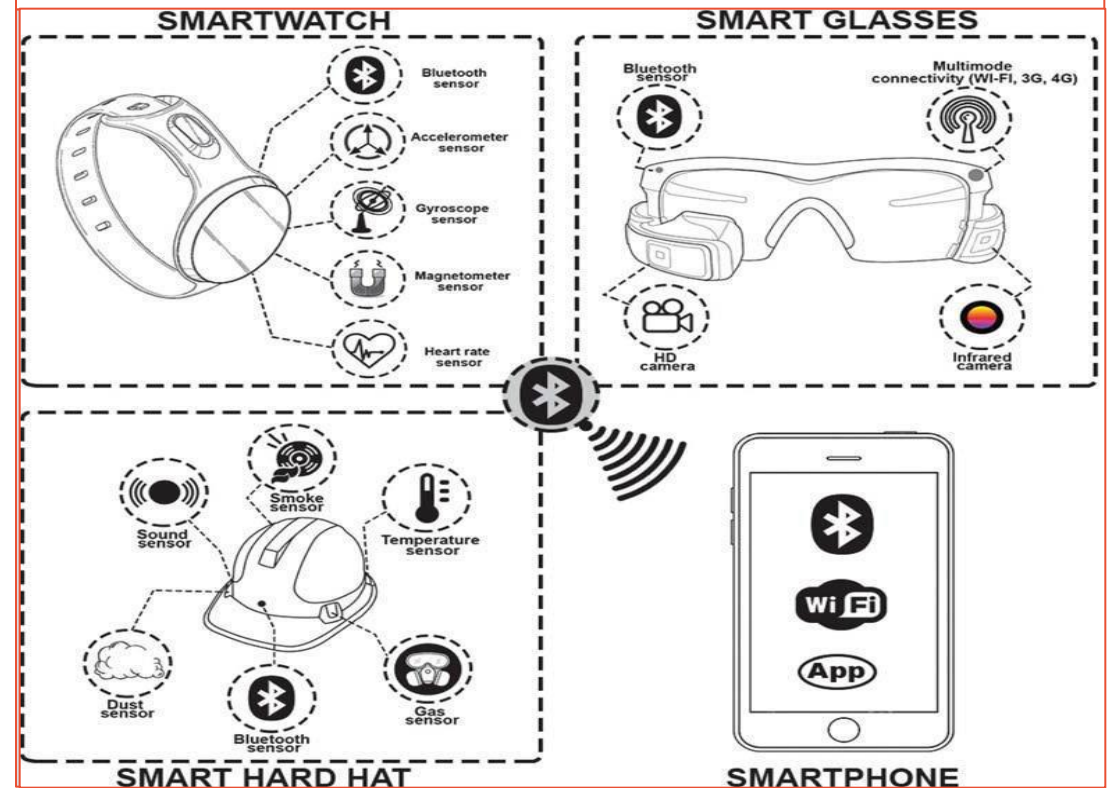
Smart textiles for earthquake protection

Recent earthquake that hit Türkiye and Syria reveals the importance to develop earthquake –resistant materials.

Natural disasters cannot be prevented from occuring, but certainly can be mitigated.

The use of new technologies such as the use of fiber reinforced polymers and composites provides high performace strength and stability against extreme climàtic conditions.

https://www.umbertolenzi.it

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Summary

- Smart textiles are a transformative innovation and represent a significant advancement in the field of textile engineering.

- The development of smart textiles has resulted in the production of high-performance and highly-functional textiles, which are of great interest to various sectors.

- These sectors include healthcare, sports, fashion, military, and aerospace industries. The potential applications of smart textiles are vast and range from monitoring vital signs to environmental sensing.

- In order to develop and optimize the performance of smart textiles, a multidisciplinary approach from different fields, such as intelligent materials, chemistry, and microelectronics is necessary.

- The integration of electronics requires the development of new materials, such as conductive polymers and nanomaterials, and the use of emerging technologies, such as 3D printing and nanotechnology.

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