Harnessing the potential of smart textile to enhance soldier systems

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Abstract

Smart and multifunctional textiles can be integrated into military uniforms and equipment to provide advanced soldier capabilities adapted to the modern battlefield. The European ARMETISS project addresses this opportunity by identifying, integrating and optimising state-of-the-art smart textile technologies, with the ambition of developing the modular soldier protection system of the future.
ARMETISS aims to design, prototype and test a modular soldier system based on smart clothing and equipment through six complementary functional modules: thermoregulation, geopositioning, physiological monitoring, body armour monitoring, energy management and human-machine interfaces (HMI).

Active and passive thermoregulation technologies integrated at different textile layers aim to optimise soldiers' body temperature across a wide range of environmental conditions while minimising downtime and maintaining combat readiness. Textile-embedded geopositioning systems support navigation, particularly in GNSS-denied environments. Conformable and non-intrusive wearable sensors enable continuous monitoring of physiological parameters, supporting soldier well-being and medical assistance. Real-time body armour monitoring can provide in-situ detection of armour damage or fractures supporting both soldier safety and equipment durability.

In parallel, textile-based human-machine interfaces can enhance situational awareness while reducing cognitive and physical burden through ergonomic and intuitive controls. Finally, lightweight textile-based power and data distribution solutions can miniaturise and simplify system architecture while improving soldier comfort and safety.

By combining these technologies within an integrated and modular architecture, ARMETISS demonstrates how smart textiles can evolve from individual functional components into interconnected capabilities supporting the future soldier.
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