

Institut für Mechatronische Systeme

Presentation of LUH-IMES for EDF projects



Institute of Mechatronic Systems

18 full-time researchers and 2 administrative employees @
Campus Maschinenbau Garbsen, Leibniz Universität Hannover

Research Groups and Leaders

Learning & Control

Dr.-Ing.
Simon Ehlers



- Data-driven Estimation and Sensor Fusion
- Learning Control of Mechatronic Systems

Robotic Systems

Dr.-Ing.
Moritz Schappler



- Parallel Robots, Hyperredundant Kinematics
- Dynamic Learning and Sensorimotor AI

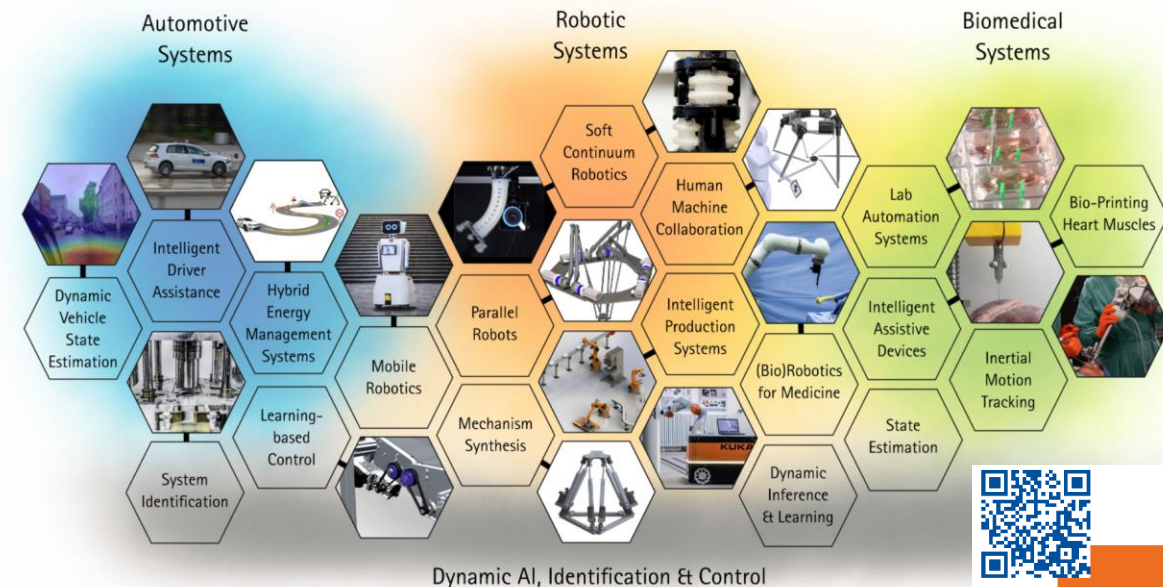
Biomedical Engineering

Leon Budde
M.Sc.



- Robot- and AI-assisted Interventions
- Intelligent Assistive Health Technology

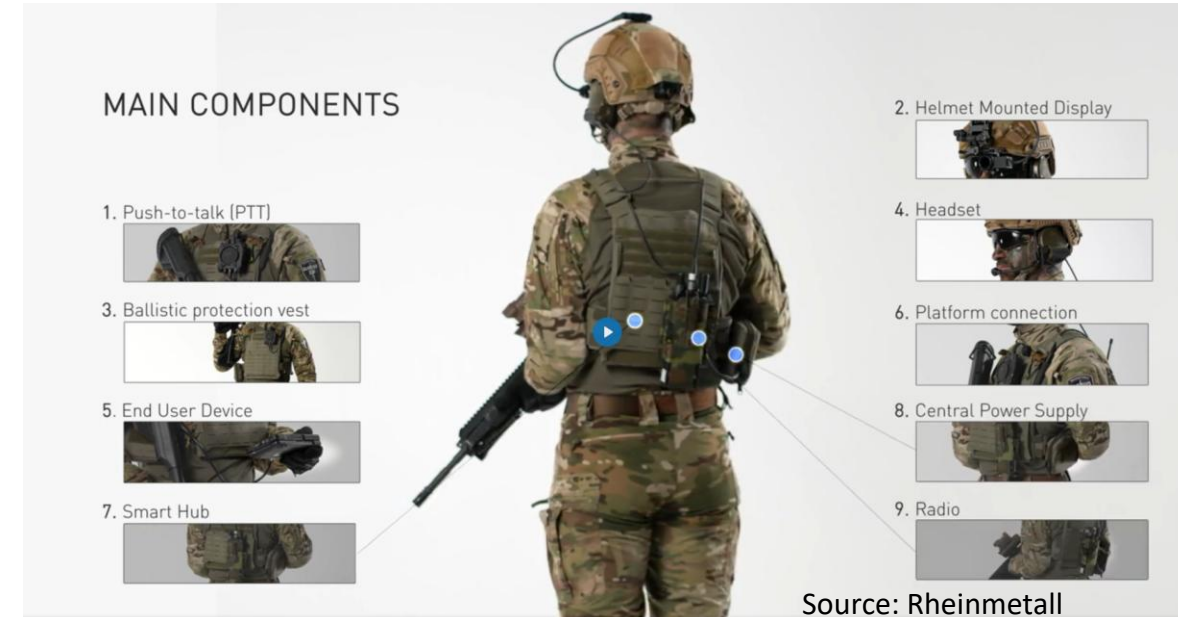
Head of Institute Prof. Dr.-Ing. Thomas Seel



Project Sketch: Sensor fusion applications in defence scenarios

- Idea and Motivation:
 - (1) Future infantry requires navigation skills in GNSS-denied environments
 - (2) health and performance monitoring in real-time by cloth-integrated sensors
 - (3) New modular land platforms benefit from high-fidelity vehicle state estimation for varying payloads and terrains

- Possible Calls:
 - (1) EDF-2026-LS-RA-CHALLENGE-DIGIT-AISAP-STEP
 - (2) EDF-2026-DA-MATCOMP-SMT
 - (3) EDF-2026-DA-GROUND-MBT

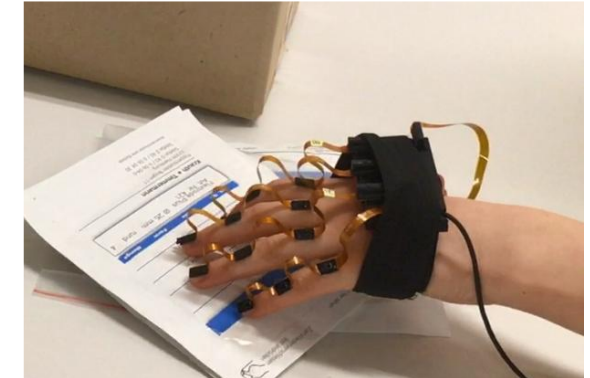


Project Sketch: Sensor fusion applications in defence scenarios

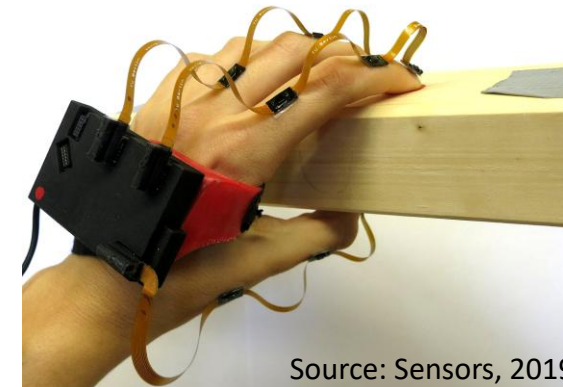
- Offered Technologies:
 - **Human-Motion Tracking** (TRL 3-4):
 - Biomechanical tracking and gait analysis algorithms
 - reconstruct full-body poses from a sparse set of wearable sensors
 - ready for transition into tactical field testing for soldier health and assistance systems



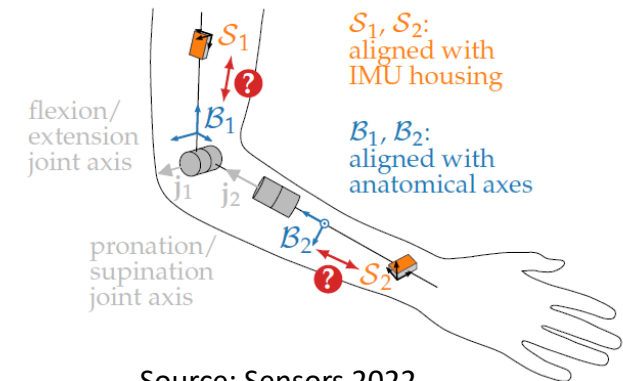
Source: FUSION 2018



Source: EMBC 2019



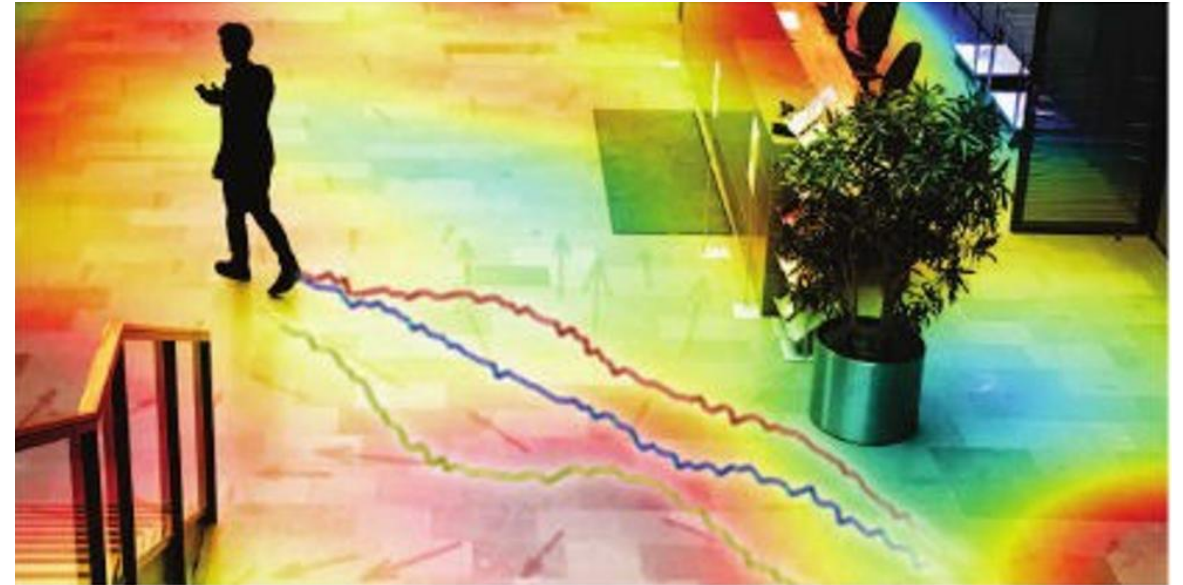
Source: Sensors, 2019



Source: Sensors 2022

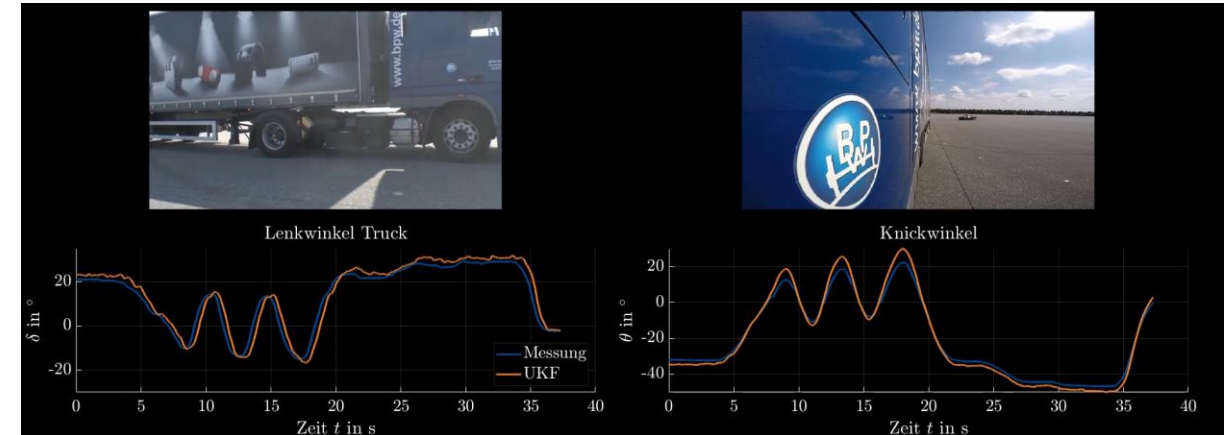
Project Sketch: Sensor fusion applications in defence scenarios

- Offered Technologies:
 - **Sensor Fusion** (TRL 5-6):
 - Filters like the VQF are currently deployed in various industrial sectors
 - Robust orientation estimation without magnetometer sensing
 - Improves navigation indoor and near metal infrastructures and vehicles
 - validated in clinical and laboratory settings



Project Sketch: Sensor fusion applications in defence scenarios

- Offered Technologies:
 - **Vehicle State Estimation** (TRL > 6 for normal road conditions):
 - state (e.g., angles) and parameter (e.g., road friction) estimation methods
 - already deployed in automotive industry by application partners
 - Next step: extension to offroad and unstructured military terrain



Estimation of road friction; Source: IMES