TECHNISCHE UNIVERSITÄT DRESDEN

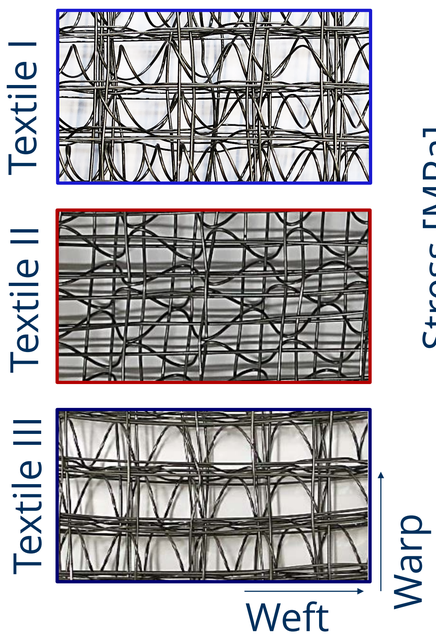
DFG GRK 2250 – Mineral-bonded composites for enhanced structural impact safety

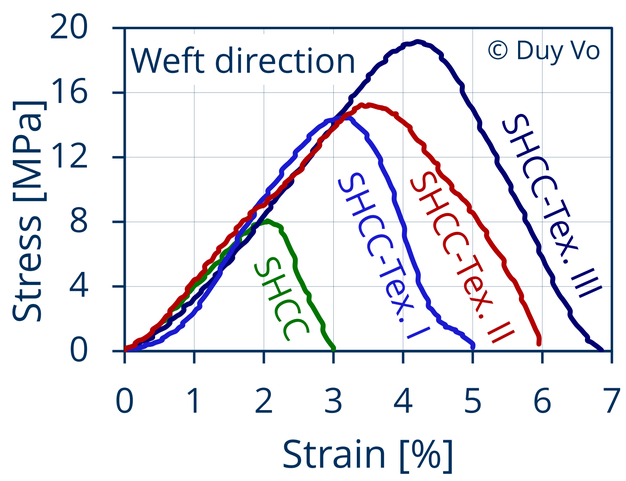
Hung Le Xuan – Doctoral Project A1/II

GRADIENT 3D REINFORCING STRUCTURES WITH INTEGRATED IN-SITU SENSORS

1 STATE OF THE ART

- Development of homogeneous cellular 3D woven steel fiber reinforcing structures
- Technological-constructive development of weaving technique and realization of 3D reinforcing structures
- Investigation of tensile behavior in quasi-static and dynamic loading tests on material and composite level

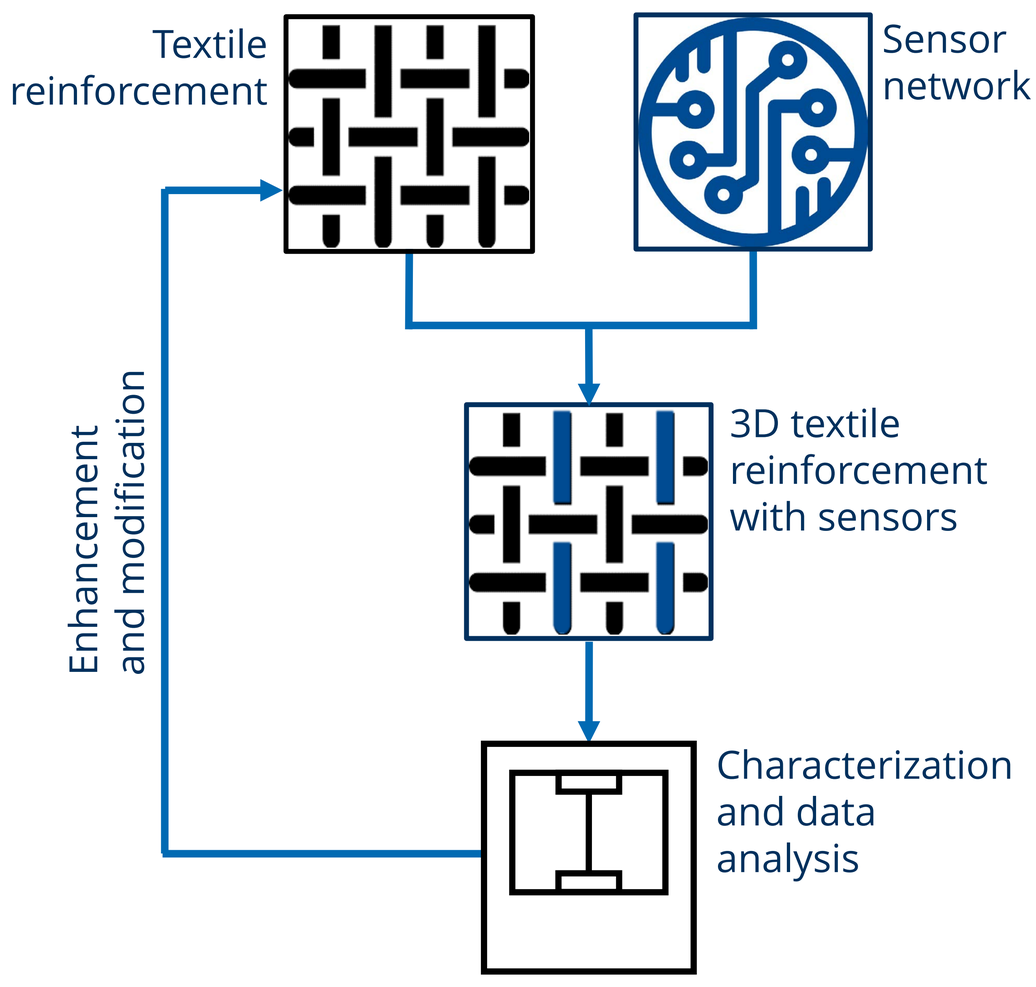




Dynamic tensile loading

2 OBJECTIVES

- Development and validation of an in-situ sensor network to collect high-resolution information about the energy dissipation in real time
- Algorithmic analysis and derivation of structure-property relations
- Further development of the 3D textile reinforcement with gradient properties for enhanced impact resistance



3 METHODS

- Textile technological integration of sensor networks into the 3D woven reinforcing structure
- Characterization of the composite structure in drop tower tests and dynamic impact punch tests

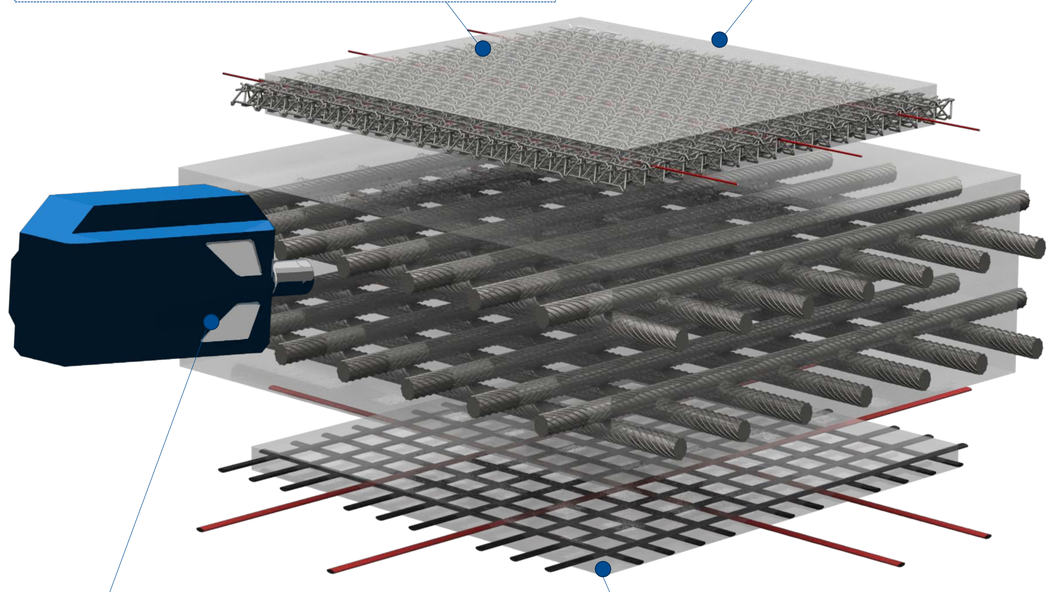
- Digital image correlation (DIC)
- Evaluation of in-situ sensors signals and additional measuring technology and validation of structural-mechanical models
- Development and realization of highly impact resistant 3D textile reinforcement

4 COLLABORATIONS

- M.-M. Popa (A2/II): Fiber interface design
- H. Knobloch (B1/II) and J. Stöcker (B3/II): Modelling and validation; structural design

L. Leicht (A6/II):
Evaluation of a damping layer based on 3D textile reinforcement and/or SHCC functionalized with in-situ sensors

M. Beigh (A3/II) and A. Tawfik (A4/II):
Matrix development and quasi-static/dynamic composite properties



L. Duran (C1/II):
3D photogrammetry

F. Bracklow (A5/II):
Drop tower tests and in-situ sensors in the strengthening of the rear side

Schematic view of a front and rear side reinforced concrete slab