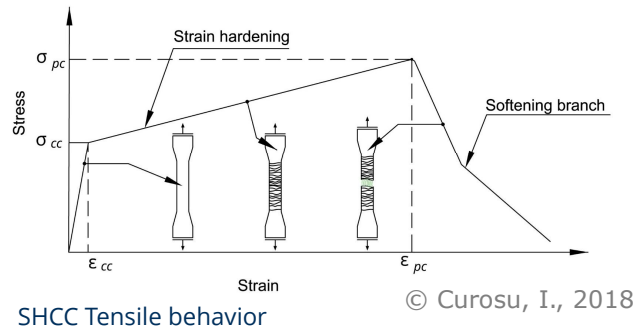


Alaleh SHEHNI – Doctoral Project B2/I

MODELLING FIBER-MATRIX BOND AND STRAIN-HARDENING CEMENT-BASED COMPOSITES (SHCC)

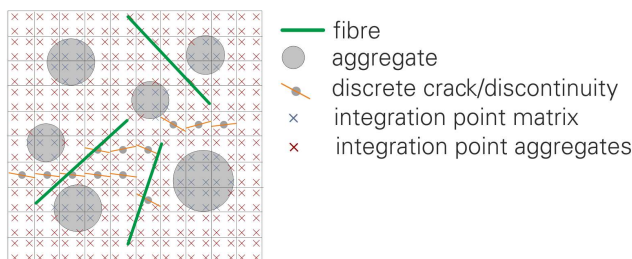
1 OBJECTIVES

- Simulation model for mesoscopic SHCC with :
explicit multiple fiber modeling with random orientation
nonlinear matrix with limited tensile strength
flexible nonlinear bond (SDA approach)
- Parameter studies to identify significant parameters of SHCC quasi-static load-displacement behavior

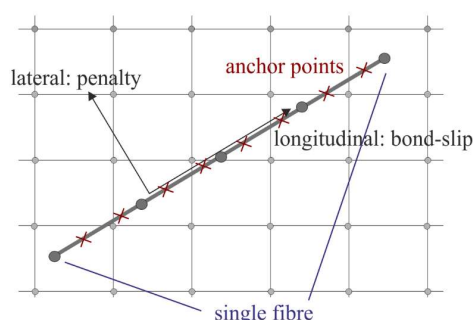


2 METHODS

- Nonlinear FEM
- Modeling of discrete cohesive matrix cracking with Strong-Discontinuity-Approach for continuum elements
- Independent discretization of fibers using truss elements with own nodes with random orientation on underlying continuum

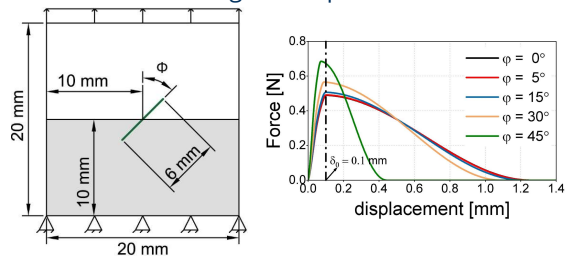


- Coupling of truss elements and continuum elements with newly developed bond element with nonlinear bond behavior (truss element nodes independent from quad element continuum nodes)

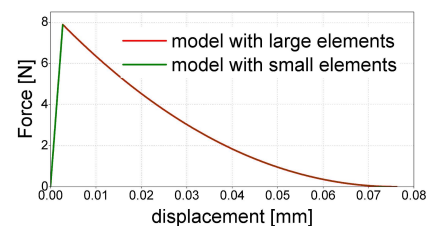


3 RESULTS

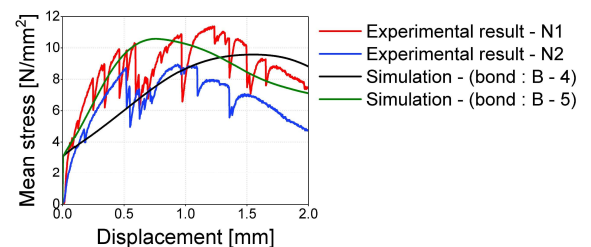
- Validation for single fiber pullout



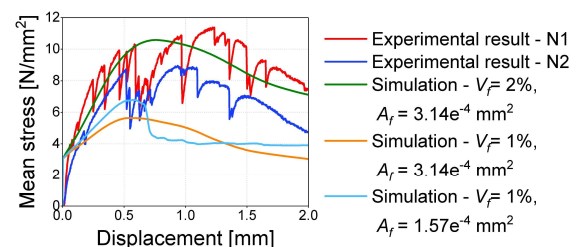
- Mesh size independent modeling of strain softening / discrete crack width with softening crack tractions



- Validation of mesoscopic simulation model for SHCC specimen with respect to experimental results



- Parameter studies with variations of concrete and fiber material properties and bond properties



4 COLLABORATIONS

- I. CUROSU (Postdoc): experimental investigations of SHCC specimen
Shehni et al. Int. J. Sol. Struct. (2020)
- E. WÖLFEL (A2/I): experimental bond behavior of single fibers in cement matrix
- T. GONG (A3/I): Composites with hybrid reinforcement