# History Contd.

- GRIT builds on the experiences from DSC, but is radical different in many aspects. Erleben and Misztal developed the algorithmic framework to overcome the sequential nature of the DSC method and the overhead in the DSC implementation at that time. Hence,
  - GRIT was designed to support domain decomposition through a copy-and-replace sub-domain strategy. Hence GRIT was born to support parallelism in at least a simple matter.
  - GRIT eliminated the sequential control flow in the original DSC algorithm by batching operations into categories. A movement operation batch, a vertex split operation batch, a relabelling operation batch, a refinement operation batch, a coarsening operation batch, smoothing operation batch, and optimisation operation batch. Leading to batching of similar computational operations that all could potentially be made parallel using a kind of red-black Jacobi blocking of the operations within a batch, but keeping batch execution sequential and synched.
  - GRIT was designed to support custom quality measures for all batch operations
  - GRIT was initially designed to support generic attribute vectors to support more easy adaption to various problems. Like defining a heat field, or a viscosity field or whatever field that needs to be included into the model.
  - GRIT abstracted over the actual mesh implementation and math types by defining a mesh interface in terms of topological algebra operations on simplicial complexes and using a math type binder for easily swapping math types.
  - DSC supported rollback mechanism which was abandoned in GRIT.

# Future Focus

- GRIT started as a DSC method parallelization assignment. The domain decomposition and batching of the operations have lead to a generic framework for easily customising remeshing methods without the complicated sequential control flow from previous work.
    - Current ongoing work is exploring the interplay between different remeshing methods  and needs by various simulation problems. We are particular interested in studying effects such as
        - Fracturing, separation and sliding of interfaces shared by multiple phases
    - Contributors to GRIT have made demonstrations of area maximization, Enright test, Zalesak Disk, hyper elastic deformable models, Newtonian liquids, Magnetostatics and more. We hope to study more problems
        - Rigid body motion, Mathematical Morphological Operations, Multiphase level-set segmentation, Meshing of distance fields, and many more
- The goal of Erleben and Misztal is that GRIT can become a computational paradigm for solving PDEs with complicated moving boundary conditions, such as the ones with dynamic solution dependence or inherent non-smoothness either in PDE model or in geometry representation.