Some Points of “Where the Numbers Come Alive”

Basic Idea

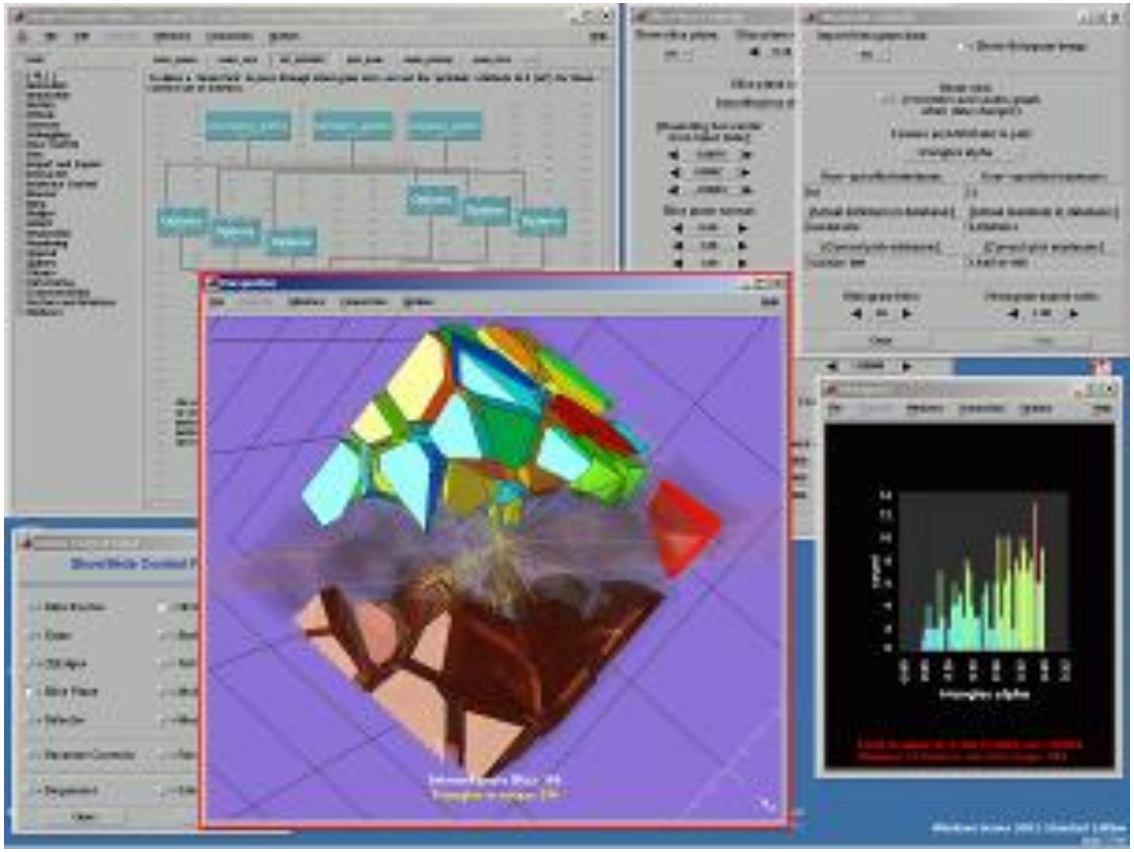
- App scale and complexity increase
- Off-the-shelf visualization & DB sys, Unite!!!

EA-6B case

- crack length in a borehole → out of service
- FEA of polycrystal structures to predict future crack length/remained life

Visualization System

- OpenDX + Microsoft SQL Server 2005 + Python



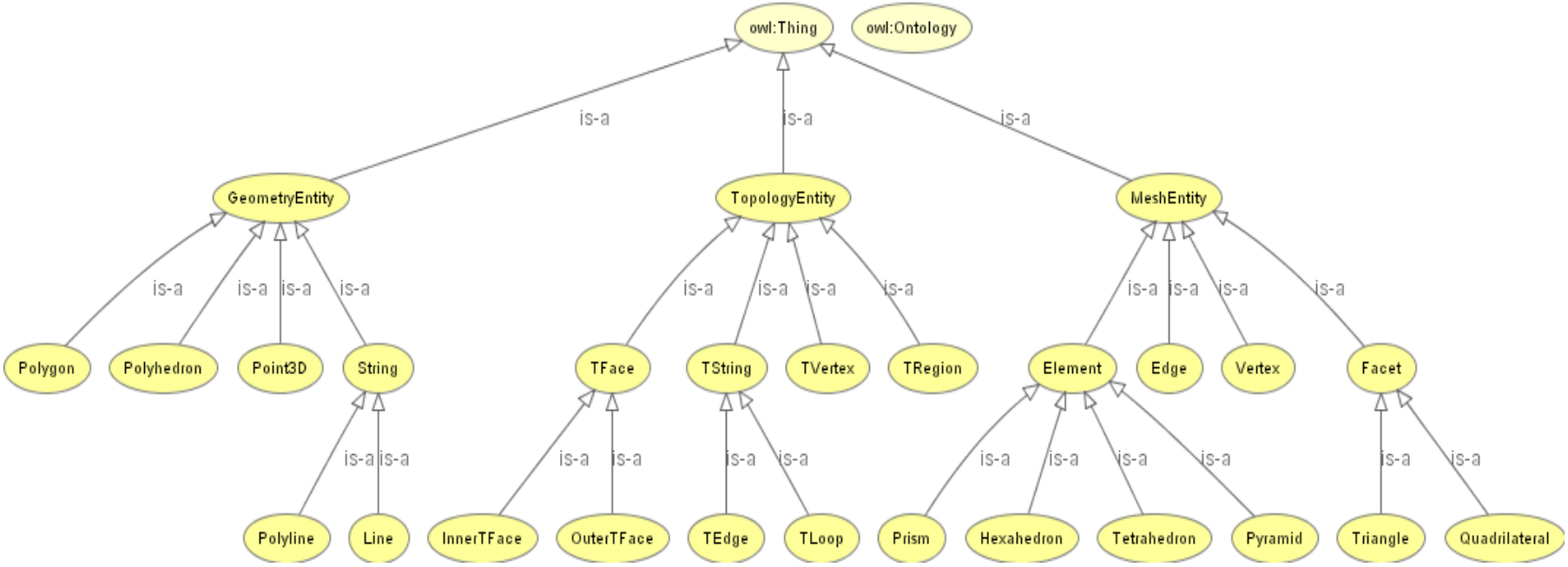
visualization interface polycrystals FEA

Video Clip

- **Polycrystal Viewer**
- http://www.oxford-man.ox.ac.uk/~gheber/PView.wmv

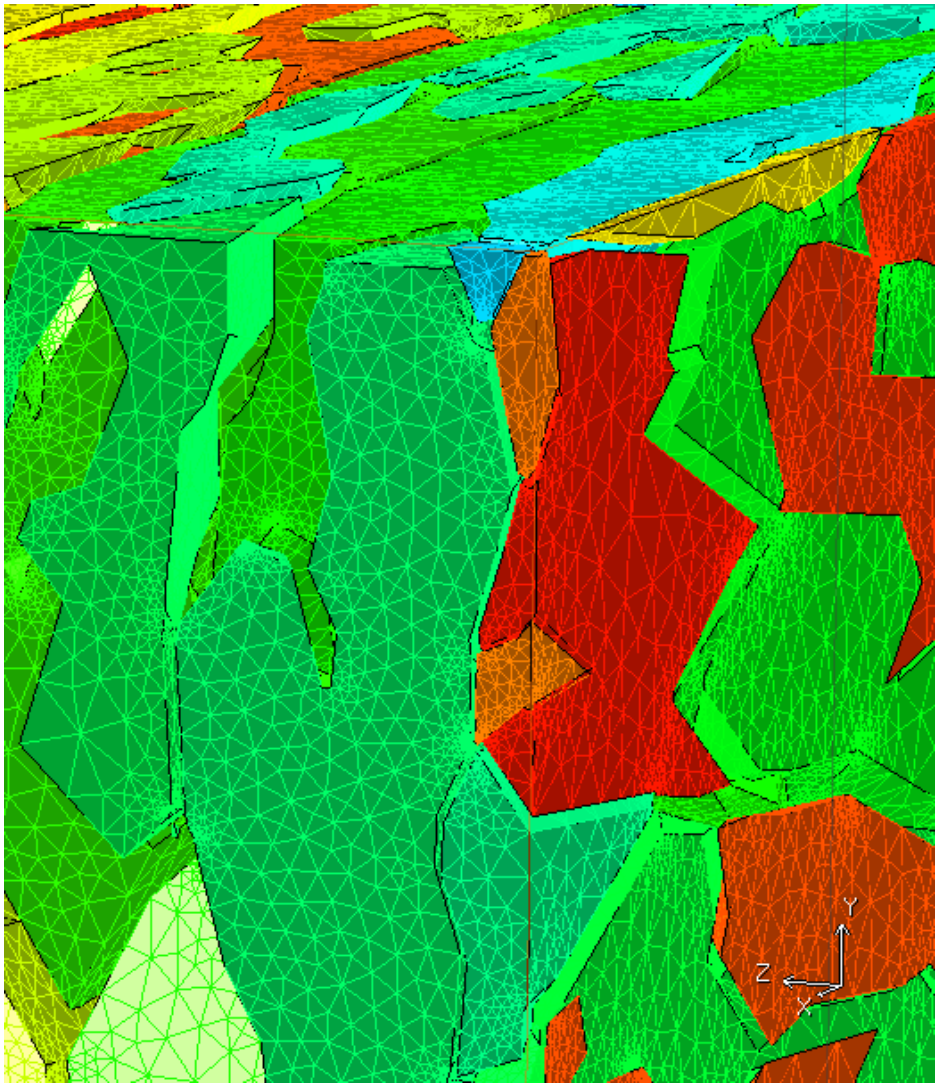
Modeling Polycrystals

- topological, geometric, and mesh entities
- homogenous crystalline grains-> inhomogeneous Polycrystals



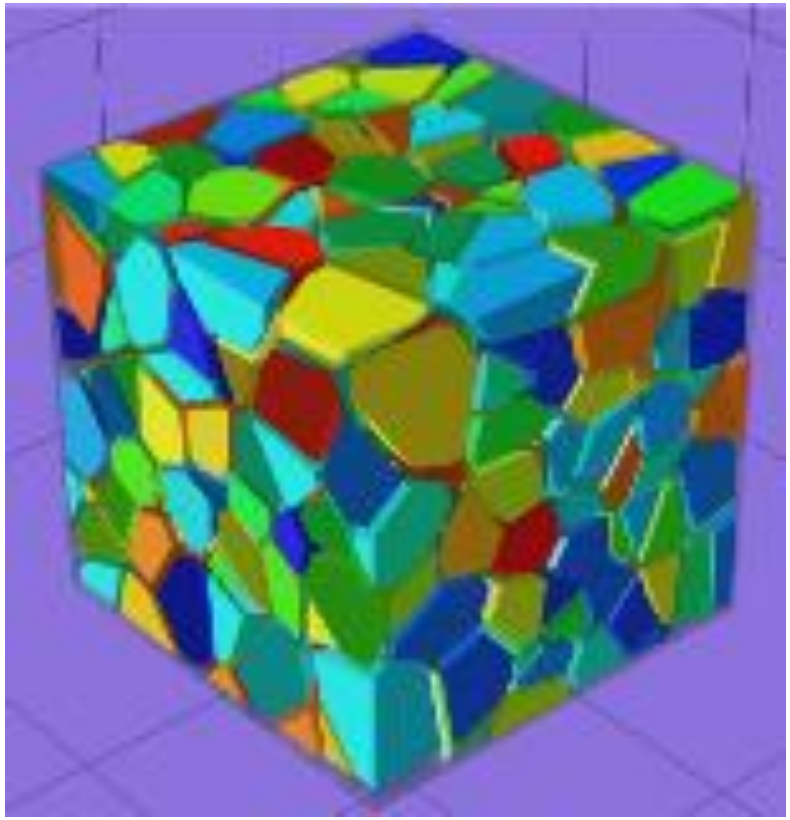
Part of a polycrystal ontology

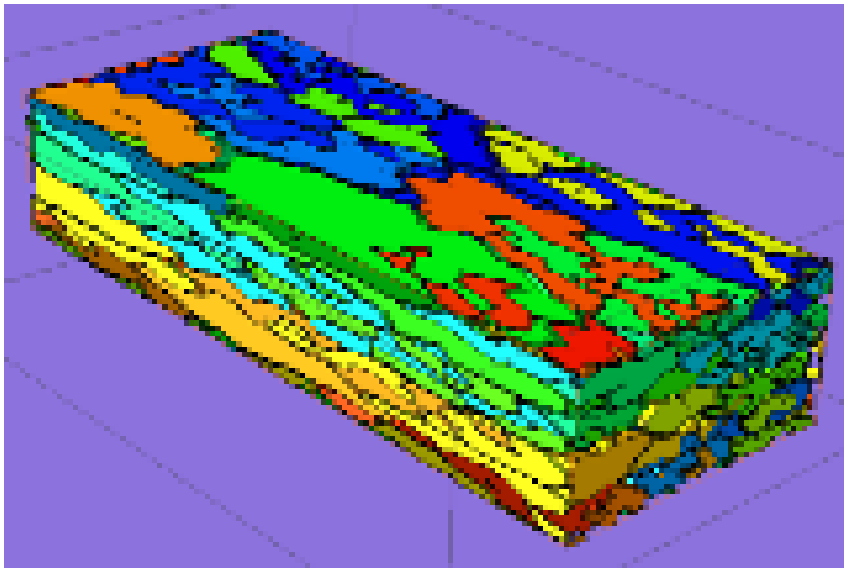
Tessellate crystal as finite element mesh

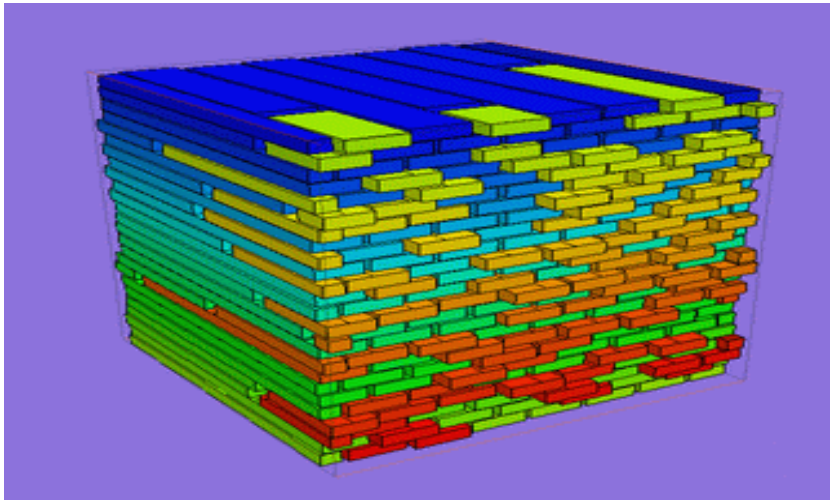


A surface mesh for a grain geometry

polycrystal geometries



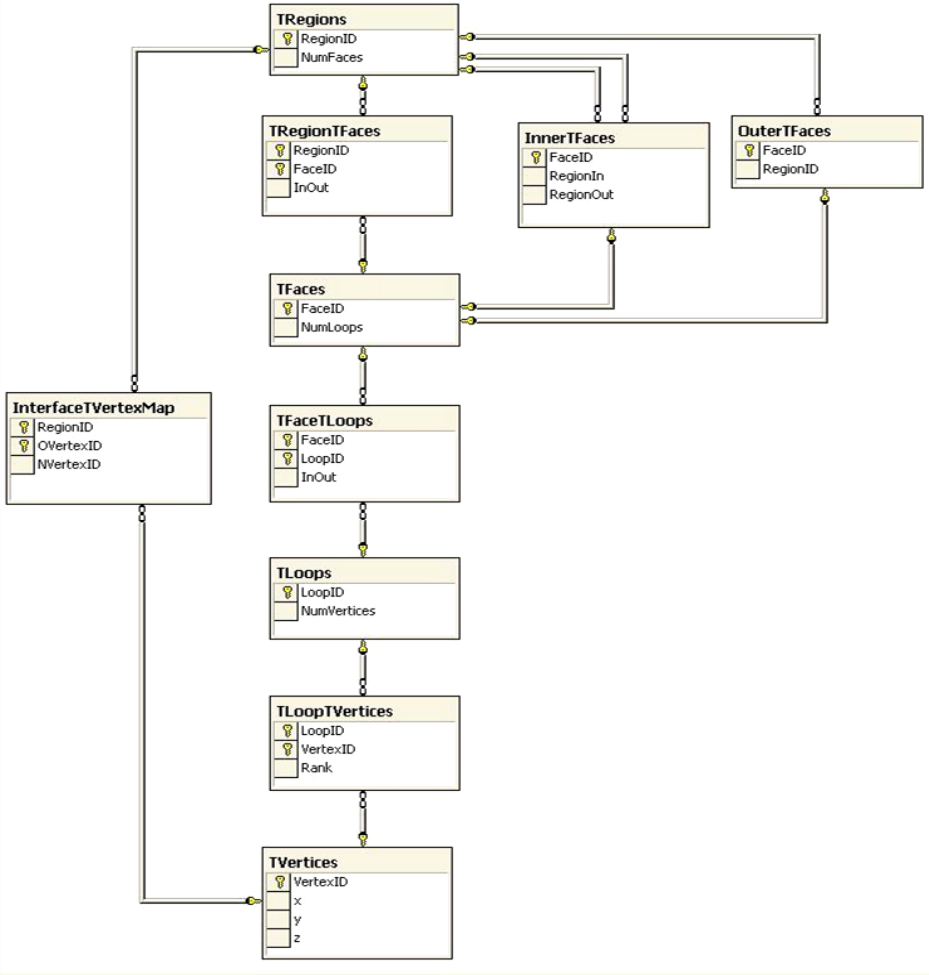




A Relational Data Model for Polycrystal Models

- Visualization view

Vertices → loops → faces → regions



Schema diagram of topology tables and relationships

However,…

- far from exhausting commodity hardware and software' feasibility
- a substantial effort of various domain experts
- laboriously translated the concepts more or less one-for-one, while not "*only the constituent parts of propositions are translated*" (Wittgenstein, L.: *Tractatus Logico-Philosophicus*)

Mystery Data

- *to import and visualize scientists' data*
  - *Not completely/consistently specified*
  - *But data says, "…"*
    - DX Data Prompter for "trail & error"

Suggestion

- *Cosmetic* changes
  - DX database Module
  - SQL embedded Python
  - .NET integration into SQL Server
- Expressive Model to mimic app domain Onto
  - Absence of formalized ontology, but Mystery Data
  - Web Ontology Language (OWL)
    - a larger vocabulary, greater machine interpretability
    - May be in RDF
    - Tend to be still hosted in relational DB

OWL

- 18 kinds of “is-a” (wikipedia)
- OWL avoid it through an explicit logical basis for the language, i.e. Description Logics
  - decidable fragments of 1st-order logic
  - more expressive than propositional logic