

Transparency of Models

Rouse, Hill, Kant, Kumar,
Marzouk, Znati

Modeling Domains

- Processes, Organizations, Enterprises
- Environment and Climate Change
- Models for Sustainability from Socio-Technical Perspective
- Hydrologic Models of Movement of Water
- Chemically Reacting Flow in Engineered Systems and the Environment
- Data Flow, Heat Generation, Etc. of Data Centers, Cloud Computing

Users of Models

- End Users
 - Senior Management & Policy Makers
 - Engineering Functions in Industry
 - IT Developers, Managers & Planners
 - Model-Based Planning for Empirical Studies
 - Urban Planners and Stakeholders
- Other Users
 - Autonomous Use
 - Other Researchers

Overall Observations

- High level descriptions of mathematics vs. detailed implementation (source code, binary)
- Need to foster skepticism regarding models, especially their underlying assumptions
- Need to make models inspectable, especially for legacy models
- Need to make models evolvable in ways consistent with assumptions
- Provenance of data – source, transformations

Overall Observations

- Being able to understand what models are telling you
 - Meaning and implications of outputs
 - Assumptions between inputs and outputs
- Going from reductionist science to integrative science is difficult
 - Models as services with well defined interfaces
- Integrative models are needed; monolithic models are out!
- Insights gained are often more valuable than the particular numbers output

Modeling Issues

- Uncertainty
 - Structural
 - Parametric
 - Boundary Conditions
- Learning and Adaptation of System Elements
 - Intelligent agents
- Linkages of Models at Multiple Levels
 - Need to write code to make linkages

Multi-Scale Models

- Nature of Scales
 - Spatial and Temporal
 - Abstraction and Aggregation
- Approaches
 - Multi-Grid
 - Random Cascades – Multi-Fractal
 - Hierarchical Bayesian Models
 - Agent-Based, Discrete Event, System Dynamics
- Tools
 - AnyLogic – or Arena, Repast, Vensim, Stella
 - Spice, Auto Mesh, Chemical Kinetics
 - MATLAB, CPLEX
 - Markup Languages
 - Visual Analytics

Urban Sim

- Attempt to remedy limitation (opaqueness) of Urban Dynamics
- Language where assumptions are visible to policy maker
- Has been used in metropolitan Seattle

Agreements

- Importance of multi-scale models rather than monolithic models
- Importance of skepticism and inspectability of models
- Need for new paradigms to address large-scale highly connected systems underlying sustainability
 - More holistic & less reductionist
- Need both Newtons and Darwins

Disagreements

- 5 for Steelers
- 1 for Packers
- 1 Abstention