Kevin Mills et. al.

complex systems

IMAGE OF THE MONTH

June

Overview of Measurement Science for Complex Information Systems Project

Measurement Science for Complex Information Systems

Understand & Predict Behavior

in large distributed information systems

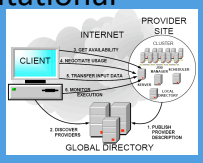
by using mathematical & statistical techniques

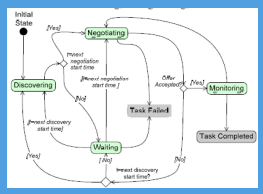
applied by scientists to study physical systems.

Communication Networks

Computational Clouds

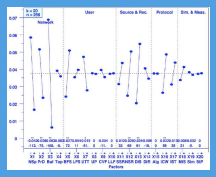
Computational Grids





Dabrowski
Hunt

Markov models
Perturbation analysis



Genin
Marbukh

Differential equations
Fluid flow simulators

Filliben
Mills

Reduced scale DE simulators
OFF experiment designs
Multidimensional data analysis techniques

$$p_{rj}^{(new)} = \begin{cases} p_{rj}^{(old)} + m_{prim} & j = c^{\uparrow} \\ \left[p_{rj}^{(old)} - w \cdot m_{prim} \right]^{+} & j = c^{\downarrow} \\ \left[p_{rj}^{(old)} - (1-w) \cdot m_{prim} \dfrac{p_{rj}^{(old)}}{\sum_{k \neq c^{\uparrow}, c^{\downarrow}} p_{rk}} \right]^{+} & j \neq c^{\uparrow}, c^{\downarrow} \end{cases} \quad (6)$$

$$\frac{dW^N}{dt}(t) = \frac{N}{T} - \frac{1}{2}\sum_{i=1}^{N} W_i^N(t) P_i^N(t)$$

$$\frac{dw}{dt}(t) = \frac{1}{T} - \frac{1}{9} w(t) p(t),$$

$$\frac{dw}{dt}(t) = \frac{1}{T} - \frac{1}{2}\frac{w(t) p_q(w(t-T)) w(t-T)}{T}$$

For more information see: "http://www.nist.gov/itl/antd/emergent_behavior.cfm

An overview of the types of mathematical tools and statistical methodologies used in the Innovations in Measurement Science project "Measurement Science in Complex Information Science". See the NIST Special Publication 500–282 "Study of Proposed Internet Congestion Control Mechanisms", by K. Mills, J. Filliben, D. Cho, E. Schwartz and D. Genin for recently published work. (Available at: http://www.nist.gov/itl/antd/Congestion_Control_Study.cfm)

complex systems
Information Technology Laboratory

NIST National Institute of Standards and Technology U.S. Department of Commerce

2010

The Complex Systems Program is part of the National Institute of Standards and Technology's Information Technology Laboratory. Complex Systems are composed of large interrelated, interacting entities which taken together, exhibit macroscopic behavior which is not predictable by examination of the individual entities. The Complex Systems program seeks to understand the fundamental science of these systems and develop rigorous descriptions (analytic, statistical, or semantic) that enable prediction and control of their behavior.

Program information at: `www.itl.nist.gov/ITLPrograms/ComplexSystems`