Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Dynamic and topological complexity MALGORZATA TURALSKA, University of North Texas, ELVIS GENESTON, La Sierra University, PAOLO GRIGOLINI, University of North Texas — Cooperative phenomena in complex networks are expected to display unusual characteristics, associated with the peculiar topology of these systems. In this context we study networks of interacting stochastic two-state units as a model of cooperative decision making. Each unit in isolation generates a Poisson process with rate g. We show that when the cooperation is introduced, the decision-making process becomes intermittent. The decision-time distribution density characterized by inverse power-law behavior is defined as a dynamic complexity. Further, the onset of intermittency, expressed in terms of the coupling parameter K, is used as a measure of dynamic efficiency of investigated topologies. We find that the dynamic complexity emerges from regular and small-world topologies. In contrast, both random and scale-free networks correspond to fast transition into exponential decision-time distribution. This property is accompanied by high dynamic efficiency of the decision-making process. Our results indicate that complex dynamical processes occurring on networks could be related to relatively simple topologies.

Malgorzata Turalska
University of North Texas

Date submitted: 24 Nov 2009 Electronic form version 1.4