

SG Colloquium

A unifying approach to the dynamics of production, supply and traffic networks

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Abstract

Production systems are complex multi-component systems which may suffer from instabilities and non-linear dynamics, including chaos. This is caused by non-linear interactions, delays, and fluctuations, which can trigger phenomena such as bullwhip or slower-is-faster effects.

Network theory is recently changing our understanding of such systems. Small changes in the network structure can have major consequences for the dynamic behavior of production systems.

Based on a simple model of supply networks, we investigate instabilities and oscillations observed in economic and engineering systems. It turns out that the network structure of material flows itself is a source of instability, and cyclical variations are an inherent feature of decentralized adjustments. This also suggests a new interpretation of business cycles.

We further point out analogies to traffic flows on road networks, which can also be treated as dynamic queuing systems. Methods recently developed for a decentralized, adaptive traffic light control are promising for a more efficient and flexible on-line production scheduling as well.

When? Friday, 11 November 2005, 10:00-12.00 hours

Where? ETH Zentrum, HG G60