**Dataflow Process Networks**

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**What is Ptolemy?**

Ptolemy is an infrastructure for visual/graphics programming (originally for signal processing).

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**What is a dataflow process network?**

- not a von-Neumann architecture-based computer
- not Turing machines
- a rigorous and general framework for dataflow computing

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**Kahn Process Networks**

- non-blocking write
- blocking read

- processes communicate via one-way FIFO channels with unbounded capacity
**SEQUENCES**

\[ X = [0.3, -0.4, 0.6, 10.34, 19.8] \]
\[ Y = [6.0, 45.6, 5.2, -0.01, 8.9 \ldots] \]

\[ S^p = \{x_1, x_2, \ldots, x_p\} \]
set of \( p \) sequences

**FUNCTIONAL PROCESSES**

\[ F: S^p \to S^q \]

**IMPORTANT PROPERTIES**

**CONTINUITY**
\[ F(\cup \chi) = \cup F(\chi) \]

**MONOTONICITY**
\[ X \subseteq X' \Rightarrow F(X) \subseteq F(X') \]

**CONTINUITY ⇒ MONOTONICITY ⇒ DETERMINISM**
DETERMINISM

Is non-determinism always bad?

DETERMINISM IN DATAFLOW PROCESS NETWORKS

stateless function
function with memory

CRITERIA #1
All actors must be functional only

DETERMINISM IN DATAFLOW PROCESS NETWORKS

TRUE DATA INPUT
FALSE DATA INPUT
CONTROL INPUT

the firing rules for 'select' are sequential

CRITERIA #2
Firing rules must be sequential

VISUAL PROGRAMMING LANGUAGE DESIGN
THE PTOLEMY SYSTEM

- hierarchical composition of different MoCs
- I/O streams and parameters
- recurrences and recursion
- high order functions
- data types and polymorphism