From Streams To States

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Abstract

The development of reliable component-based distributed systems needs formal methods supporting the modular specification and systematic refinement. In a functional approach to system design, components are described by their input/output behaviour. This external view relates the input and the output history without referring to the internal structure of the compone nt. An important refinement step amounts in introducing a state space along with a state transition relation.

The paper investigates the transformation of stream processing functions into state-based descriptions. In the setting of deductive design, we expose calculational methods supporting the systematic derivation of state-based descriptions from stream functions. We illustrate the approach specifying and refining various simple components. Throughout the paper, we structure the description by distinguishing between finite and infinite behaviours.