SOFTWARE SYNTHESIS

Implementation of Digital Signal Processing

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Think of the multiple calls to the run method in Arx C++ simulations.

Topics

- Synchronous data flow (recap)
- Optimization criteria

Synchronous Data Flow (SDF)

- Already discussed.
- Each firing of a node consumes a fixed number of tokens and produces a fixed number of tokens (these numbers are annotated along the edges).
- An edge can have delay (initial tokens).
- Consistency:
  - The repetitions vector (relative number of invocations for each node) should exist.
  - There should be no deadlock (situation where nodes are waiting for each other to produce tokens).
CONSISTENT SDF EXAMPLE

EXAMPLE OF SDF WITH DEADLOCK

- Easiest check for deadlock: simulation

OPTIMIZATION CRITERIA

- Buffer memory
- Code memory
- Number of context switches

MINIMAL-BUFFER SCHEDULE

- Buffer size: $buf(S_1) = 11$
- Code size: $c\_size(S_1) = \kappa(X) + 10\kappa(Y) + 10\kappa(Z)$
- Context switches: $c\_sw(S_1) = 21$
**LOOPED SCHEDULE**

\[ S_2 = (5YZ)X(5YZ) \]

- Buffer size: \( \text{buf}(S_2) = 11 \)
- Code size: \( \text{c\_size}(S_2) \approx \kappa(X) + 2\kappa(Y) + 2\kappa(Z) \)
- Context switches: \( \text{c\_sw}(S_2) = 21 \)

**MINIMAL-CODE-SIZE SCHEDULE (1)**

\[ S_3 = X(10Y)(10Z) \]

- Buffer size: \( \text{buf}(S_3) = 25 \)
- Code size: \( \text{c\_size}(S_3) \approx \kappa(X) + \kappa(Y) + \kappa(Z) \)
- Context switches: \( \text{c\_sw}(S_3) = 3 \)

**MINIMAL-CODE-SIZE SCHEDULE (2)**

\[ S_4 = X(10YZ) \]

- Buffer size: \( \text{buf}(S_4) = 16 \)
- Code size: \( \text{c\_size}(S_4) \approx \kappa(X) + \kappa(Y) + \kappa(Z) \)
- Context switches: \( \text{c\_sw}(S_4) = 21 \)