On Channel Restructuring for Complete FIFO Recovery
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To cite this version:
Christophe Alias. On Channel Restructuring for Complete FIFO Recovery. ICCD 2019 - 37th IEEE International Conference on Computer Design, Nov 2019, Abu Dhabi, United Arab Emirates. hal-02433318

HAL Id: hal-02433318
https://inria.hal.science/hal-02433318
Submitted on 9 Jan 2020

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On Channel Restructuring for Complete FIFO Recovery

Focus: Dataflow models as an intermediate representation for High-Level Synthesis
Challenge: Recover FIFO channels after code restructuring
Contributions: HLS algorithm for channel restructuring + Dataflow model to ensure completeness

1) Polyhedral Process Networks

for \( i = 0 \) to \( N + 1 \)
- load\((a[0,i])\);
for \( t = 1 \) to \( T \)
for \( i = 1 \) to \( N \)
  - \( a[t,i] := a[t-1,i] + a[t-1,i+1] \);
for \( i = 1 \) to \( N \)
  - store\((a[T,i])\);

Challenge addressed: Channel synthesis

2) Data-aware Process Networks

Features:
- PPN partitioning based on loop tiling
- Incoming dependences (1,2,3) are loaded
- Outgoing dependences (13,14,15) are stored
- Internal dependences (4 to 12) are solved through local channels

3) Our FIFO Recovery Algorithm

4) Experimental Results

Theorem: FIFO recovery is complete on our DPN model

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