

Elements: Transformation-Based HPC in Dyn. Languages

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GPU/AVX Challenges

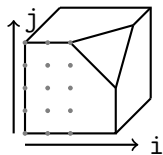
- ▶ Array/vector architectures
- ▶ High memory latency
- ▶ Limited on-chip memory

Loopy:

- ▶ **One** IR from math to machine level
- ▶ Shared between human and machine
- ▶ Gen. CUDA/IS-PC/OpenMP

github.com/inducer/loopy

Polyhedron



$\{[i, j] :$
 $0 \leq i < n$ and
 $0 \leq j < n$ and
 $\dots\}$

Statement(s)

$b[i] = \text{sum}(j,$
 $A[i, j] * x[j])$

Summary

Tree of
Polyhedra
+ Statements
+ Depend.
= Semantics

Proposed Advances:

- ▶ Vector Shuffles
- ▶ Gen. Efficient Scans
- ▶ Transform Addressing
- ▶ Lazy Eval. Arrays
- ▶ Transform GUI

