RFC: A new divergence analysis for LLVM

Simon Moll, Thorsten Klößner and Sebastian Hack

http://compilers.cs.uni-saarland.de

Compiler Design Lab
Saarland University
Saarland Informatics Campus

Recap: VPlan+RV

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- VPlan+RV: Bring RV's analyses and transformations to VPlan.
  → Today: *Divergence Analysis*
  → Coming up: *Partial Control-Flow Linearization* (PLDI '18).

DivergenceAnalysis

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for (int i = 0; i < n; ++i) {
  for (int j = 0; j < m; ++j) {
    uni_var = f(i);
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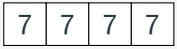

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  → unit tests show what's possible.

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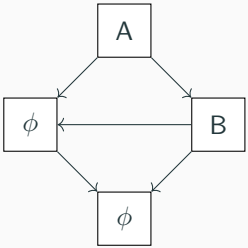
  → unit tests show what's possible.
- Won't be required by VPlan before patch series #3.
  → until then, let's fix LLVM's DivergenceAnalysis for GPUs.

LLVM's DivergenceAnalysis (NVPTX/AMDGPU)



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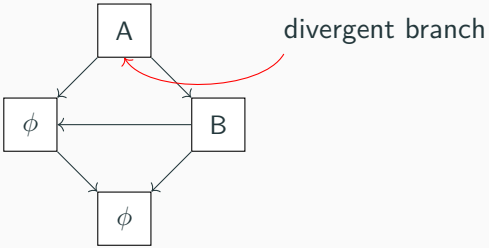

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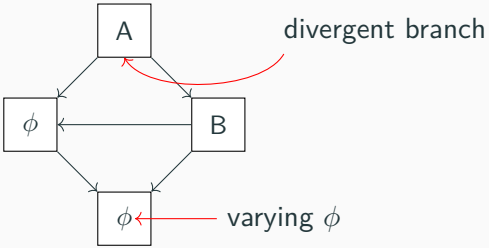

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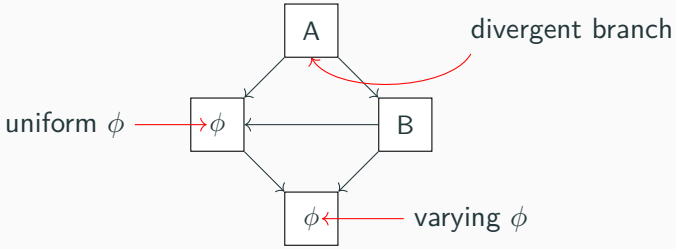

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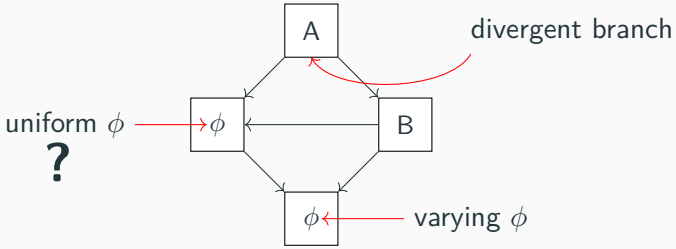

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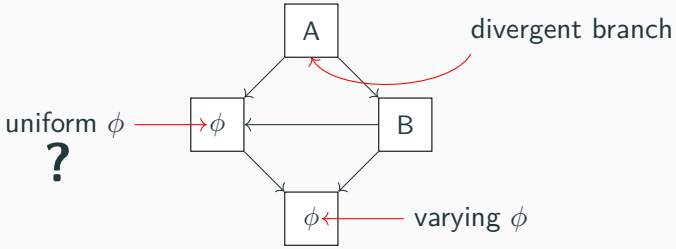

- LLVM's DivergenceAnalysis invalid for unstructured CFGs.

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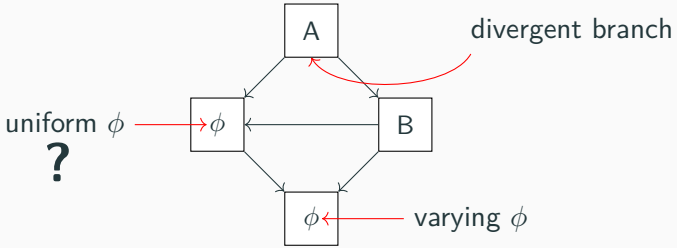
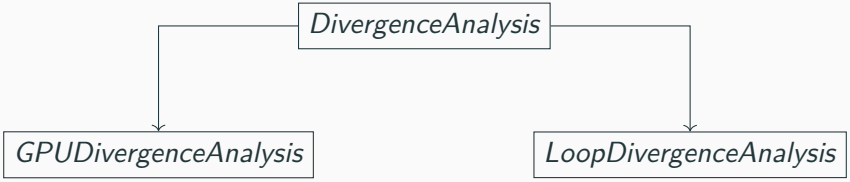


- LLVM's DivergenceAnalysis invalid for unstructured CFGs.
- Our analysis supports unstructured control.



NVPTX/AMDGPU
StructurizeCFG
`-use-rv-da`

LoopVectorizer
`-vectorizer-use-da`

Available at `github.com/cdl-saarland/vplan-rv`