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Monotone Data Flow Analysis Frameworks

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Today's agenda

Background

Monotone Data Flow Analysis Frameworks

Approaches to solving MDFAF

A Variant of Kildall's Algorithm

Undecidability of MOP Problem for MDFAF

Overview

Background

Flow graph

Semilattice

Semilattice: ordering

Semilattice: 0 and 1

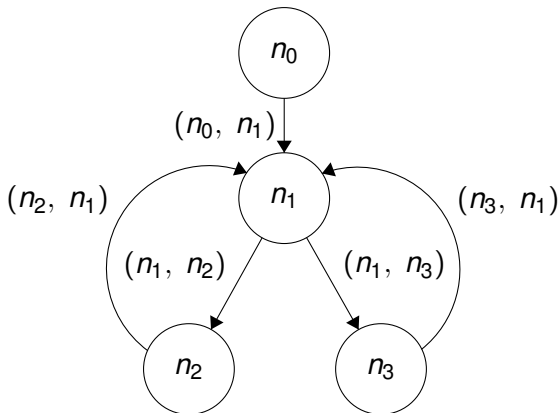
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Triple $G = (N, E, n_0)$



Set L with *meet* operation \wedge

$$a \wedge a = a \quad (\textit{idempotent})$$

$$a \wedge b = b \wedge a \quad (\textit{commutative})$$

$$a \wedge (b \wedge c) = (a \wedge b) \wedge c \quad (\textit{associative})$$

\wedge defines an order on L

$$a \leq b$$

$$a < b = b \wedge a$$

$$\text{iff } a \wedge b = b$$

$$\text{iff } a \wedge b = b \text{ and } a \neq b$$

Zero element: 0

Element $e \in L$ is called zero, labeled 0, if

$$e \wedge x = e \quad \forall x \in L$$

One element: 1

Element $e \in L$ is called one, labeled 1, if

$$e \wedge x = x \quad \forall x \in L$$

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Example usage of blocks and columns

Block 1

- ▶ 1
- ▶ 2
- ▶ 3

Block 2

- ▶ b
- ▶ b
- ▶ b

Example usage of blocks and columns

Block 1

- ▶ 1
- ▶ 2
- ▶ 3

Block 2

- ▶ b
- ▶ b
- ▶ b

Example usage of blocks and columns

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