

# Three Valued Logic Analyzer

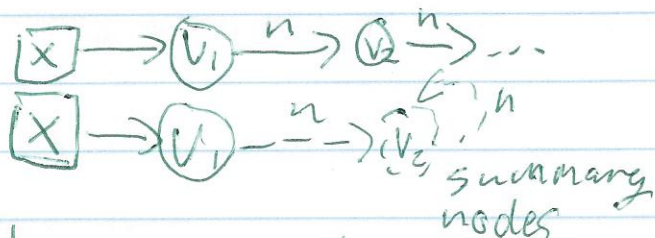
## Motivation

Generate static analysis  
Shape analysis

## How it works

Predicates in 2VL

Abstracted to 3VL  
(compaction)



Embedding theorem: Definite answers in 3VL  
would be the same if evaluated in 2VL

## Input

Variables

Predicates

- Core  $x(v)$   $\boxed{x} \rightarrow \textcircled{v}$      $n(v_1, v_2)$   $\textcircled{v_1} \xrightarrow{n} \textcircled{v_2}$

- Instrumentation  $r[n, x](v) = \exists v_1 : x(v_1) \wedge n^*(v_1, v)$



## Actions

- Precondition

- Focus formula

- Update formula

action  $\text{is\_null}(x) \{$

$x \neq \text{null}$

$\{ \neg p \ \neg \exists v : x(v) \neq \}$

## CFG

start, action, to

$\perp, \text{is\_null}(x), \perp \leftarrow \text{if } (x \neq \text{null})$

$\perp, \text{is\_not\_null}, \perp$

Uses abstract interpretation and fixpointing

## Classification

Sound but not complete

Limited by expressability by finite predicates in first order logic with transitive closure

Heavy weight

Translate program semantics: what it does incorrectly?

Intraprocedural

- No calls supported

Simple library functions

Does not scale:  $2^{2^x}$

Not easy to learn