



Demanded Abstract Interpretation

paper sharing@pldi'21 – 8mins

Bowen Zhang

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Benno Stein
University of Colorado Boulder
benno.stein@colorado.edu

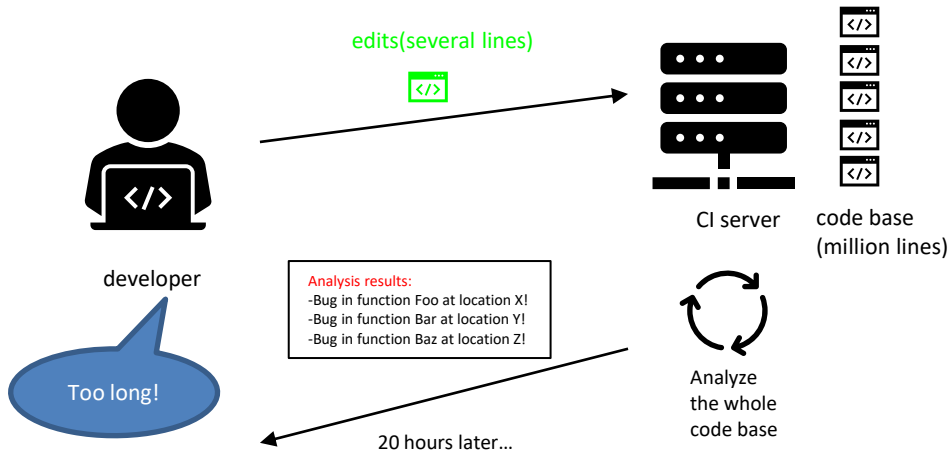


Bor-Yuh Evan Chang
University of Colorado Boulder & Amazon
evan.chang@colorado.edu

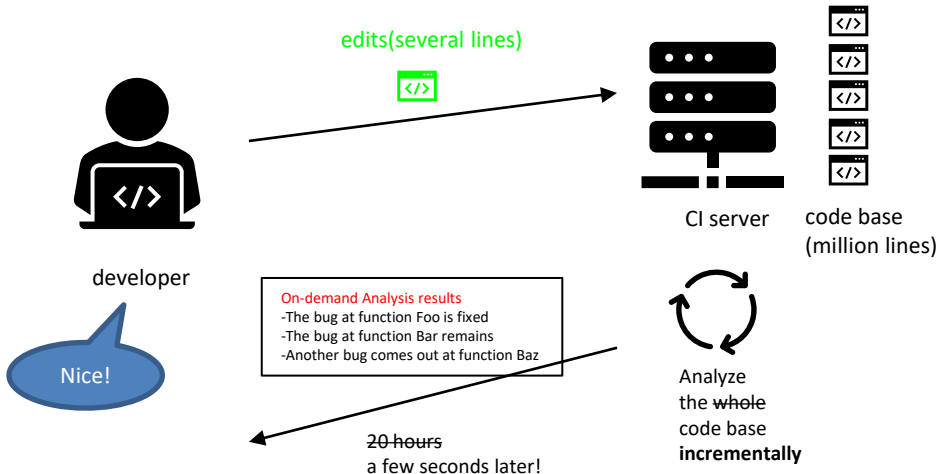


Manu Sridharan
University of California, Riverside
manu@cs.ucr.edu

Static Analysis in Software Group



Incremental? On-demand?



This work:

It designs an Abstract Interpretation framework that supports **incremental** and **on-demand** static analysis

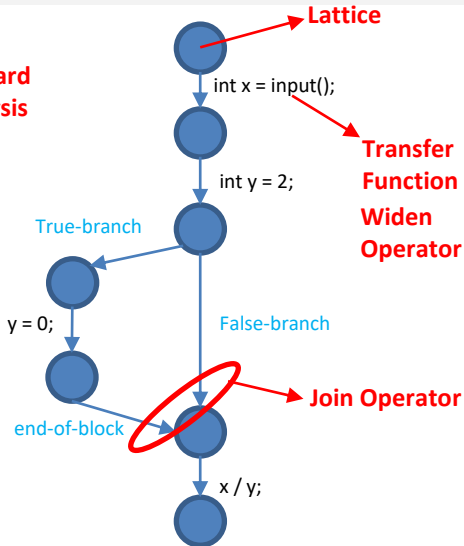
Review Abstract Interpretation

```
1  int main() {  
2      int x = input();  
3      int y = 2;  
4      if(x > 0) {  
5          y = 0;  
6      }  
7      x / y; // divide-by-zero!  
8  }
```

Remember our goal?
Incremental & On-demand

How to extend it?
Reachability analysis!

**Forward
Analysis**

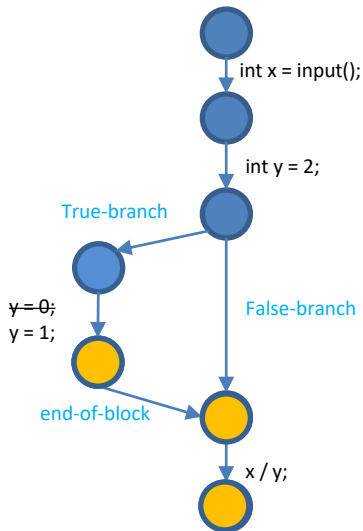


Incremental “AI”

An incremental edit

Forward Reachability!

- Find all **“dirty”** nodes.
- Re-analyze these nodes.

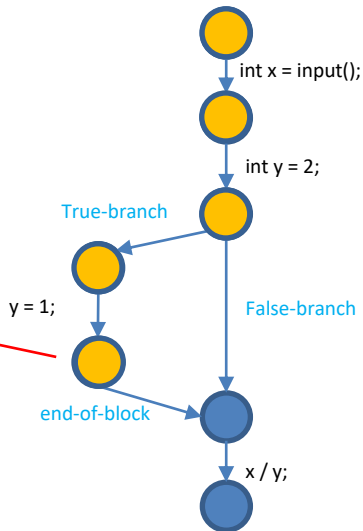


On-demand “AI”

What’s the analysis
result at this node?

Backward Reachability!

- Find all **“required”** nodes.
- Analyze these nodes **lazily**.



Correctness

From-scratch consistency

Incremental query results are guaranteed identical to **batch** analysis on current program version

- Formalize this framework as a language
- Design operational semantics
- Prove this property

Evaluation

- *Expressivity*
- *Scalability*

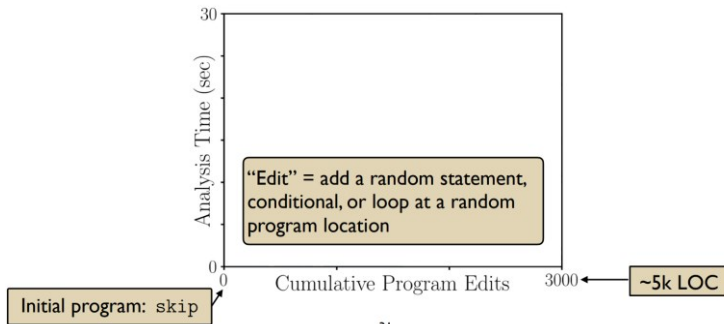
Expressivity

Interval Analysis ✓

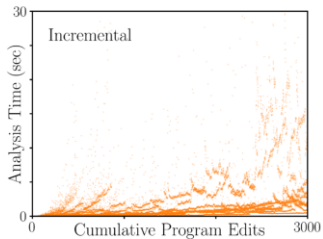
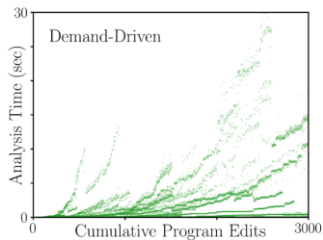
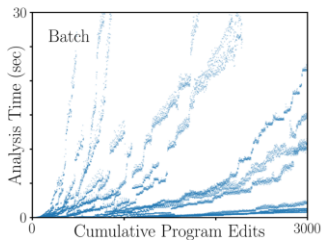
Shape Analysis ✓

Octagon Analysis ✓

Scalability



Scalability



Thank you

Q & A