

Eco: A language composition editor



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2014-05-19

Our problem

We want **better** programming languages

Our problem

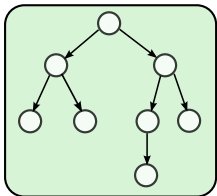
We want **better** programming languages

But better always seems to end up **bigger**

Language composition



Parsing

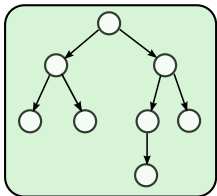


Running

```
SUB    AX,AX
MOV    ES,AX
SUB    BH,BH
MOV    BL,INT_NUMBER
SHL    BX,1
SHL    BX,1
MOV    DI,ES:[BX]
MOV    ES,ES:[BX+2]
ADD    DI,4
LEA   SI,TAG
MOV    CX,TAG_LEN
```

Underlying language composition challenges

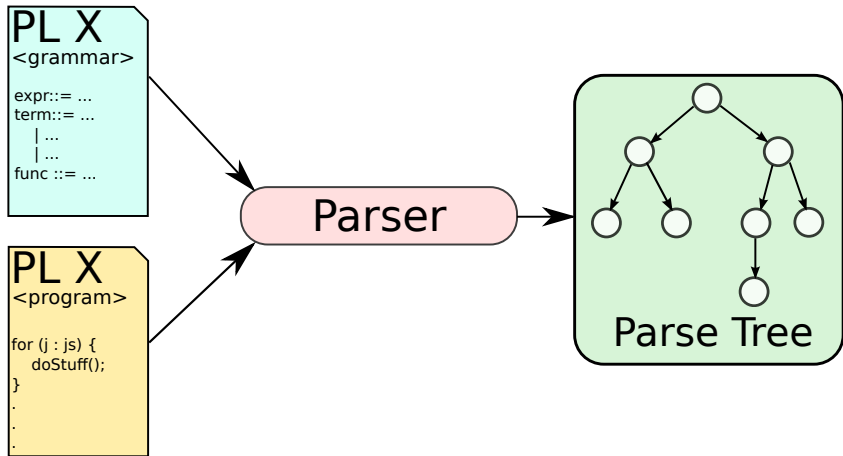
Parsing



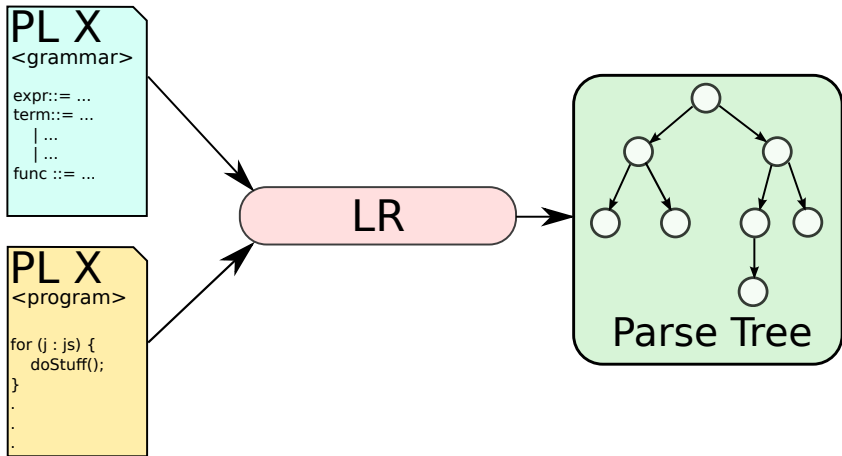
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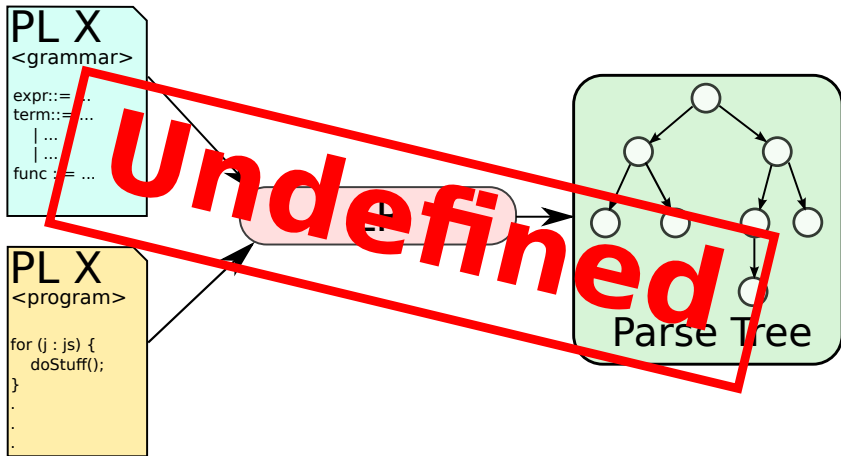
Parsing composition



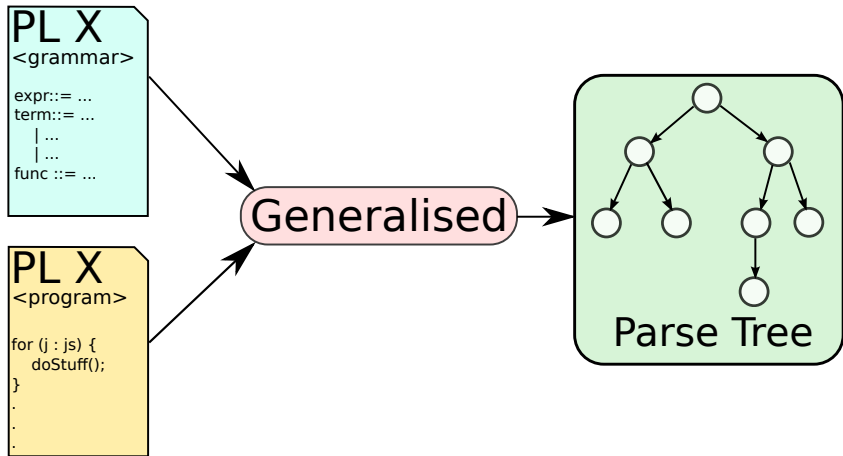
Parsing composition



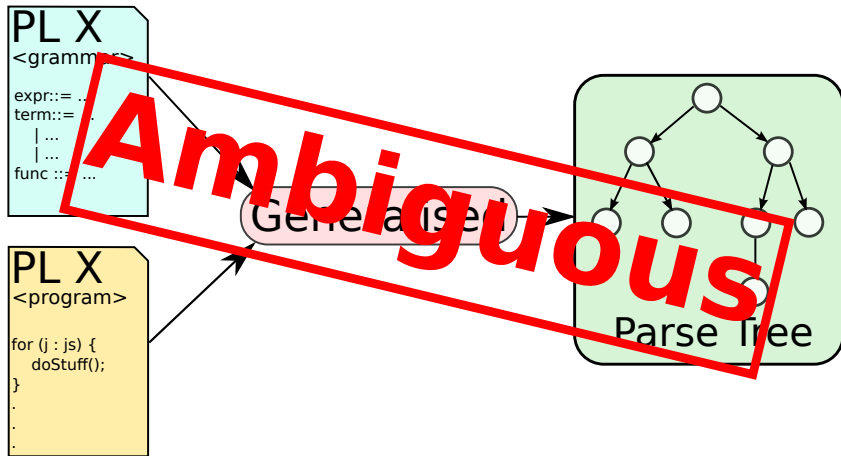
Parsing composition



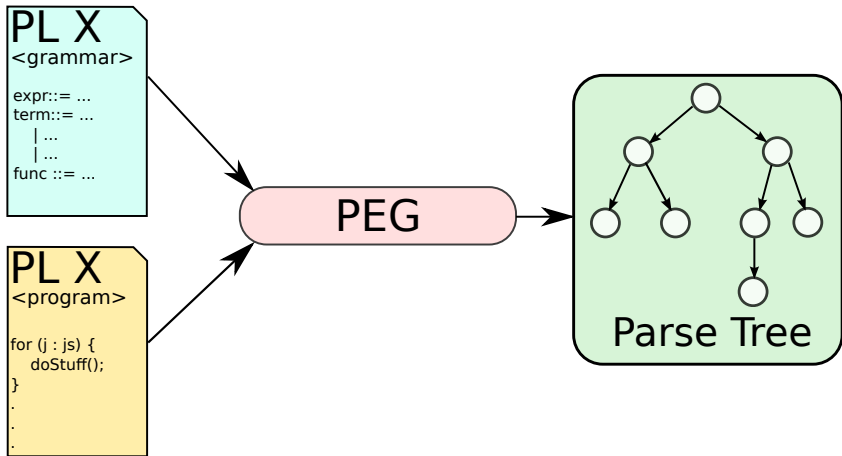
Parsing composition



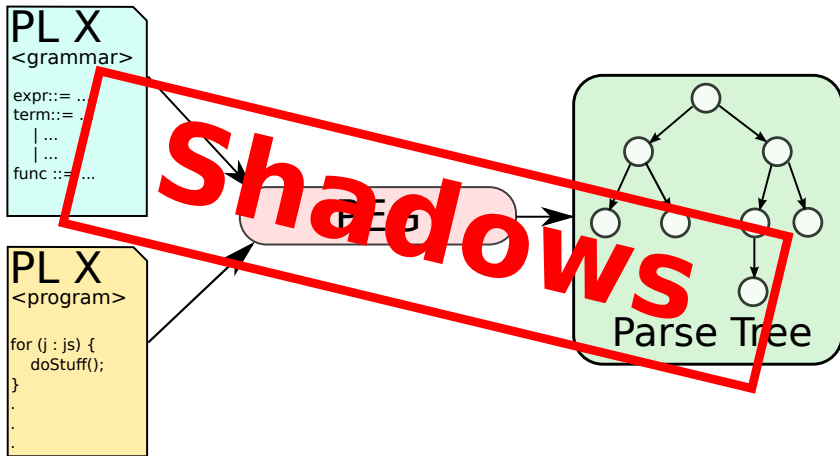
Parsing composition



Parsing composition



Parsing composition



Syntax-directed editing (SDE)

Challenge:
SDE's power +
a text editor feel?

Demo

Challenges

- Whitespace-sensitive languages
- Incremental AST

Indentation

The traditional way to parse indentation based languages is too slow.

Indentation

```
def calc_indent1(l):
    if prev(l) == None:
        l.indent1 = 0
    elif prev(l).wsl == l.wsl:
        l.indent1 = prev(l).indent1
    elif prev(l).wsl < l.wsl:
        l.indent1 = prev(l).indent1 + 1
    else:
        assert prev(l).wsl > l.wsl
        prevl = prev(prev(l))
        while prevl != None:
            if prevl.wsl == l.wsl:
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            prevl = prev(prevl)
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- Editing whitespace of a line recalculates its indentation level by looking at previous lines

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- Editing whitespace of a line recalculates its indentation level by looking at previous lines
- Afterwards, affected succeeding lines need to be updated as well

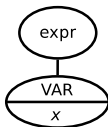
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- Worst-case: $O(n)$

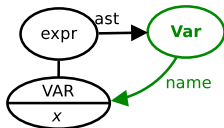
Incremental ASTs

```
print x
```



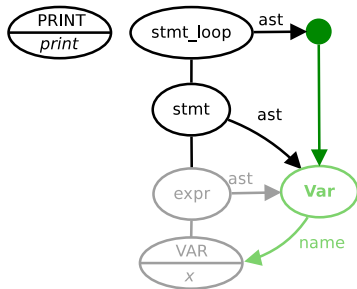
Incremental ASTs

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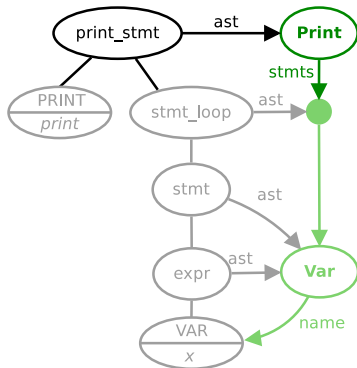
Incremental ASTs

print x



Incremental ASTs

print x



What is it good for?

Unipycation

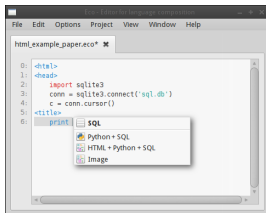
Recent experiment

Gradual migration

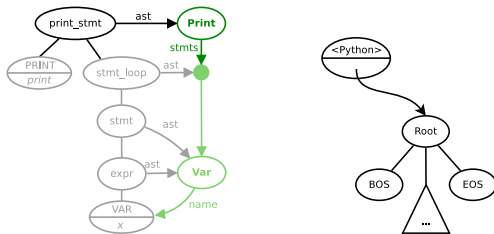


Incremental semantic analysis on ASTs and
code generation

Thanks for listening



```
0: <html>
1: <head>
2:     <script> sqlite3
3:     conn = sqlite3.connect('sql.db')
4:     c = conn.cursor()
5: </title>
6: <pre>
7:     print SQL
8: </pre>
9: </body>
10: </html>
```



<http://soft-dev.org/>