Syntax Directed Translation

Syntax directed translation

- Yacc can do a simple kind of syntax directed translation from an input sentence to C code
- We can also think of it as compilation
- Each node in a parse tree produces a value
  - That value depends on the type of the node
  - And on the values produced by its children
- The value is usually produced by a *rule* associated with the node
- This is just the rules in Yacc, e.g.:
  - { $$ = $1 + $3; }

Why is *a* == 200 after this?

```
pcalc> calc
331 Calculator
(type ? for help and . to exit)

>> a = 1
1

>> if 1 (a = 100)  (a = 200)
100

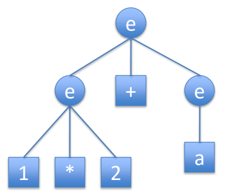
>> a
200

>>
```

Example

```
e: e '+' e      {$$ = $1+$3;}
  |e '*' e      {$$ = $1*$3;}
  | NAME        {$$ = $1->value;}
  | NUMBER {$$ = $1;}
```

```
1 * 2 + a
```



grammar + input string => parse tree

Example

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e: e '+' e      {$$ = $1+$3;}
  |e '*' e      {$$ = $1*$3;}
  | NAME        {$$ = $1->value;}
  | NUMBER {$$ = $1;}
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1 * 2 + a
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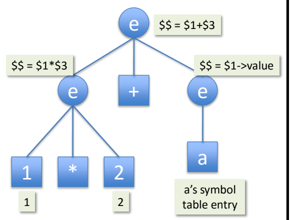

grammar + input string => parse tree + annotations

Example

```
e: e '+' e      {$$ = $1+$3;}
  |e '*' e      {$$ = $1*$3;}
  | NAME        {$$ = $1->value;}
  | NUMBER {$$ = $1;}
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1 * 2 + a
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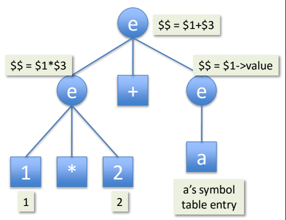
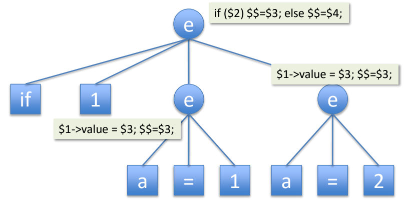


Do a post order traversal of the annotated parse tree to determine the execution order of the nodes.

Conditionals



- If evaluates all three args and selects the value to return
- Evaluation is bottom up, left to right
- Watch out for side effects!