Syntax Analysis

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L-values and R-values

There is a distinction between the meaning of identifiers on the left
and right hand side of an assignment

- $i = 1$
- $a = b + 5$

L-values and R-values refer to the values appropriate for left and
right side of an assignment

Advanced parsing techniques

▶ Extra informations are kept in the state by redefining items to include a terminal symbol as the second component

▶ The general form is $[A \rightarrow \alpha.\beta, a]$ where $A \rightarrow \alpha\beta$ is a production and a is a terminal symbol (lookahead)

▶ The lookahead has no effect if the item is of the form $A \rightarrow [\alpha.\beta, a]$. It only has effect when $A \rightarrow [\alpha\beta., a]$

▶ Instead of $FOLLOW(A)$, the reduction is put in $[i, a]^{th}$ position of the table

▶ Such objects are called $LR(1)$ items

▶ Parsing method is the same

Constructing $LR(1)$ sets of items

```
void items(G'){
initialize C to {Closure({[S' → .S, $]})};
repeat
 for(each set of items I in C)
  for(each grammar symbol X){
   if(GOTO(I, X) is not empty and not in C)
    add GOTO(I, X) to C;
until no new sets of items are added to C; }
```

Closure(I)

```
SetOfItems Closure(I){
repeat
for (each item A → α.Bβ, a in I)
 for (each production B → γ in G′)
  for (each terminal b in FIRST(βa))
   add [B → .γ, b to set I];
until no more items are added to I;
return I; }
```

GOTO(I, X)

```
SetOfItems GOTO(I, X){
Initialize J to be the empty set;
for (each item A → α.Xβ, a in I)
  add item [A → αX.β, a] to set J;
return CLOSURE(J)}
```