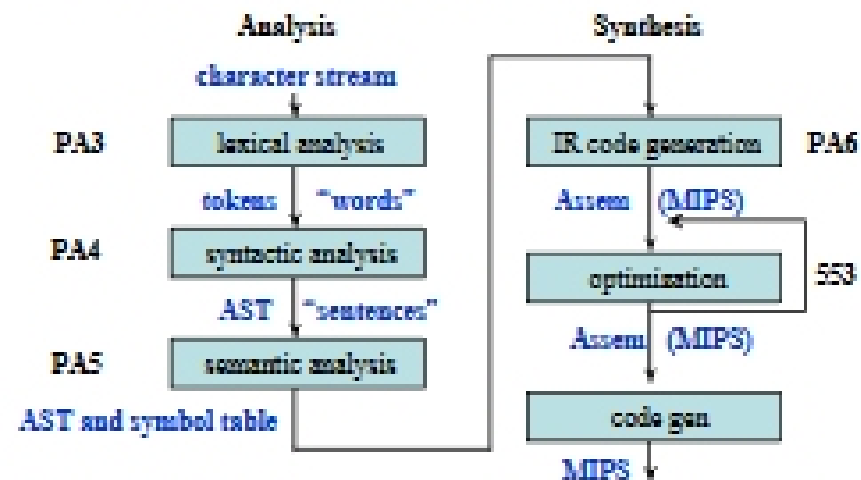


Structure of the MiniJava Compiler



CS453 Lecture

Midterm review

1

Plan for Today

Studying for the midterm

- review all slides and notes taken in class
- do suggested exercises
- redo any examples we did in class
- reread assigned reading
- the midterm WILL NOT have anything about MIPS

Lexical Analysis, or scanning

Syntactic Analysis, or parsing

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Lexical Analysis, or scanning

Terminology

- regular expressions
- tokens
- DFA
- NFA
- longest match and priority

Techniques

- creating a scanner for a set of tokens

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3

Syntactic Analysis, or parsing

Terminology

- context-free grammars, terminal, non-terminal, symbol, derivation
- syntax-directed translation, actions, attributes
- LR(0) versus LR(1) grammars
- parse trees versus abstract syntax trees
- ambiguity
- LL(k) and left recursion
- top-down and bottom-up parsing
- precedence and associativity
- pre- and post-order depth-first traversals
- error handling

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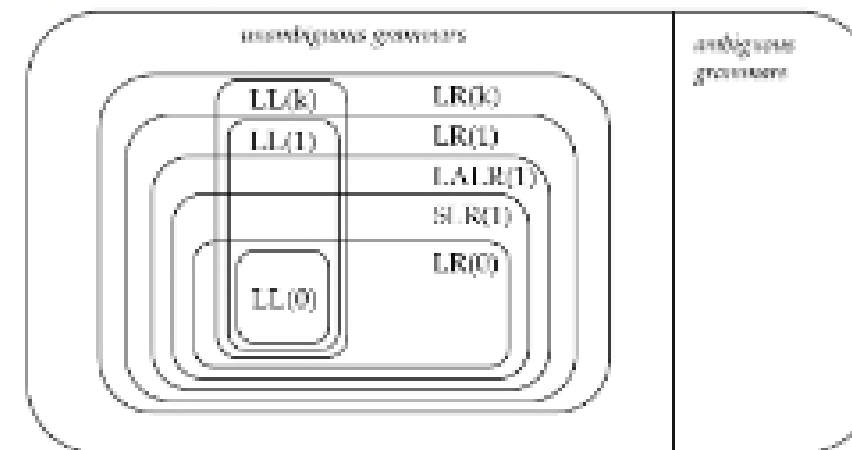
4

Syntactic Analysis, or parsing cont...

Techniques

- rewrite a grammar so that it is LL(1)
- calculate FIRST and FOLLOW sets
- write a predictive parser with panic mode error handling
- disambiguate expressions and list grammars
- create an LR(0) or LR(1) parse table
- parse a string of tokens with an LR parse table

Grammar Hierarchy



Predictive parser for Float Assignment Grammar

```

void S() { switch (lookahead) {
  case ID:
    case EOF: // the 2 characters in the FIRST(SemLise EOF)
      try { SemLise(); match(EOF); } catch { panic(S); } break;
    default: panic(S); break;
}}
void SemLise() { switch (lookahead) {
  case ID: // FIRST(Sem SemLise) = { ID }
    try { Sem(); SemLise(); } catch { panic(SemLise); } break;
  case EOF: // FOLLOW(SemLise) = { EOF }
    break;
  default: panic(SemLise); break;
}}
void Sem() { switch (lookahead) {
  case ID: try { match(ID); match(ASSIGN); match(FLOAT);
    } catch { panic(Sem); } break;
  default: panic(Sem); break;
}}
    
```

Example LR Parse Table

- (1) $S \rightarrow S (S)$
- (2) $S \rightarrow \text{epsilon}$

State	Action			Goto
	()	\$	S
0	r2	r2	r2	1
1	s2		accept	
2	r2	r2	r2	3
3	s2	s4		
4	r1	r1	r1	