

Plan for Today

Error recovery goals

Review panic mode error recovery for predictive parsers

Panic mode for LR parsers

Error recovery using error symbol in productions

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1

Error Handling Goals

Provide program with a list of as many errors as possible

Provide USEFUL error messages

- appropriate line and position information
- guidance for fixing the error

Avoid infinite loops or recursion

Add minimal overhead to the processing of correct programs

Find “all” errors in program before translation begins

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2

Predictive parser for Float Assignment Grammar

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

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3

Grammar 3.1 from Tiger book

```
(0) S' -> S $
(1) S -> S ; S
(2) S -> id := E
(3) S -> print (L)
(4) E -> id
(5) E -> num
(6) E -> E + E
(7) E -> (S,E)
(8) L -> E
(9) L -> L, E
```

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4

LR parse table (Table 3.19 from Tiger Book)

	id	num	print	;	,	+	:=	()	\$	S	E	L
1	s4		s7								g2		
2				s3						a			
3	s4		s7								g5		
4							s6						
5				r1	r1					r1			
6	s20	s10					s8				g11		
7							s9						
8	s4		s7								g12		
9	s20	s10					s8				g15	g14	
10				r5	r5	r5		r5	r5				
11				r2	r2	s16				r2			
12				s3	s18								
13				r3	r3					r3			
14					s19					s13			
15					r8					r8			

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5

LR parse table (Table 3.19 from Tiger book) cont...

	id	num	print	;	,	+	:=	()	\$	S	E	L
16	s20	s10						s8					g17
17				r6	r6	s16			r6	r6			
18	s20	s10						s8					g21
19	s20	s10						s8					g23
20				r4	r4	r4			r4	r4			
21										s22			
22				r7	r7	r7			r7	r7			
23					r9	s16			r9				

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6

Error recovery using an error symbol

```
exp -> ( error )
exps -> error ; exp
```

Steps taken when error occurs

- (0) generate error indicating expected token(s)
- (1) pop off stack until have state with shift action for error token
- (2) shift the error token
- (3) throw away input tokens until hit token with non-error action
- (4) resume parsing

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7

Suggested Exercises

Show the Stack, Input, and Action table (see Figure 3.18 in handout) using the parse table on slides 5 and 6 where the parser is using panic mode recovery for the following inputs

```
:= b + c - ; $
( d := 5 + 6, 3 ) $
( ( ) ) $
```

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8