TDT4205 Compiler Construction (2019)

Assignment 2

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1 LL(1) Parsing table construction

1.1 Starting grammar

```
/* Specified in bison notation */
S: c L E;
L: L E | l E;
E: E s | U;
U: b | c | n | %empty;
```

1.2 Modified grammar, without left recursion

```
/* Specified in bison notation */
S:  c L E;
L:  l E L1; /* alpha=E, beta=lE */
L1: E L1 | %empty;
E:  U E1;   /* alpha=s, beta=U */
E1: S E1 | %empty;
U:  b | c | n | %empty;
```

1.3 Table of First(α), Follow(α) and Nullable(α)

	First	Follow	Nullable
S	c	$	No
L	l	{b, c, n, s}	No
L1	{b, c, n, s}	$	Yes
E	{b, c, n, s}	{b, c, n, s}	Yes
E1	s	$	Yes
U	{b, c, n}	$	Yes

The grammar is ambiguous, as is seen in the table above, because $First(E) = Follow(E)$.

1.4 Parsing table of the ambiguous LL(1) grammar

	c	l	b	n	s
S	S $\rightarrow$ cLE				
L		L $\rightarrow$ lEL'			
L'	L' $\rightarrow$ EL'		L' $\rightarrow$ EL'	L' $\rightarrow$ EL'	L $\rightarrow$ EL'
E	E $\rightarrow$ UE' / E $\rightarrow \epsilon$		E $\rightarrow$ UE' / E $\rightarrow \epsilon$	E $\rightarrow$ UE' / E $\rightarrow \epsilon$	E $\rightarrow$ UE'
E'					E' $\rightarrow$ sE'
U	U $\rightarrow$ c		U $\rightarrow$ b	U $\rightarrow$ n	