Homework Series 1

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Some parsers:

1.1 ANTLR4

Written in	Java
Target Language	C#, Java, Python
Algorithm*s*	LL
Source	https://theantlrguy.atlassian.net/wiki/display/ANTLR4/

1.2 JFLAP

Written in	Java
Target Language	Java
Algorithm*s*	LL1 and LALR1
Source	http://en.wikipedia.org/wiki/Compiler-compiler

1.3 Parsec

Written in	Haskell
Target Language	Haskell
Algorithm*s*	LL and Backtracking
Source	Lennart

1.4 PLY

Written in	Python
Target Language	Python
Algorithm*s*	LALR1
Source	Experience with this parser generator

1.5 Racc

Written in Ruby

Target Language Ruby

Algorithms LALR1

Source https://github.com/tenderlove/racc

1.6 Bison

Written in C

Target Language C, C++, Java

Algorithms LALR1, LR1, IELR1, GLR

Source http://www.gnu.org/software/bison/

1.7 Yapps

Written in Python

Target Language Python

Algorithms LL1

Source Experience with this parser generator

1.8 Citrus

Written in Ruby

Target Language Ruby

Algorithms PEG

Source https://github.com/mjackson/citrus

1.9 Jison

Written in Javascript

Target Language Javascript

Algorithms LALR1, LR0, SLR1, LR1, LL1

Source https://zaach.github.io/jison/docs/

1.10 Happy

Written in Haskell

Target Language Haskell

Algorithms Generalized LR

Source https://www.haskell.org/happy/#what

2

2.1

literal	int	long
binary	/0b[0-1]+/	/0b[0-1]+(l—L)/
octal	$/0(0\|[1-7][0-7])+/$	/0(0—[1-7][0-7])+(l—L)/
hexadecimal	$/0x[0-9a-f]+/$	$/0x[0-9a-f]+(l\|L)/$
decimal	$/(0\|[1-9][0-9]*)/$	$/(0\|[1-9][0-9]*(l\|L))/$

2.2

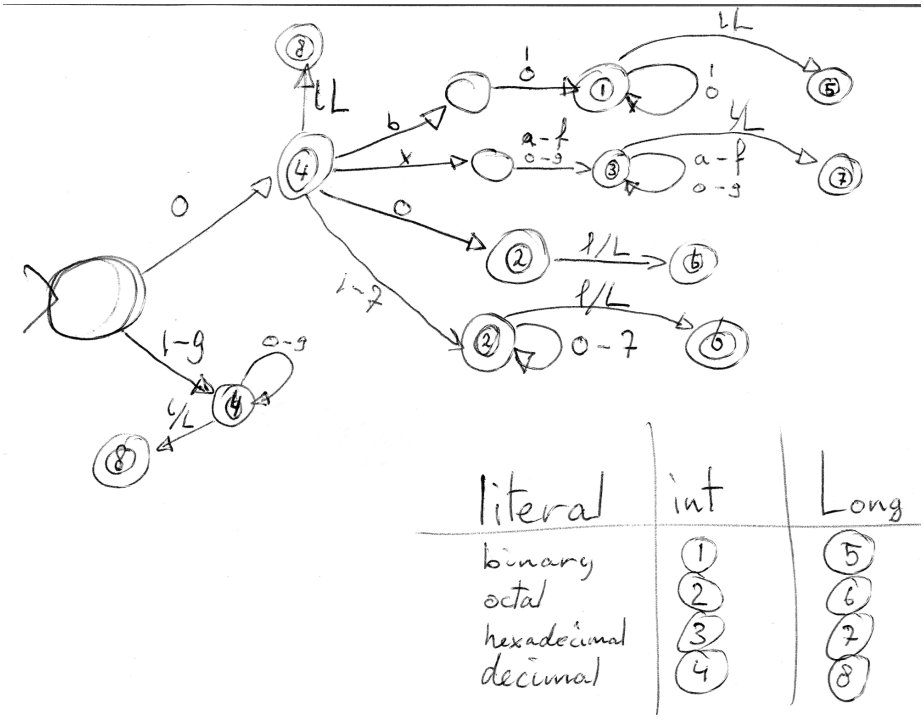

Figure 1: A DFA combining the token types

2.3

See the code in `pp.s1378791.q1_2.Numbers.g4` and `pp.s1378791.q1_2.NumbersTest`

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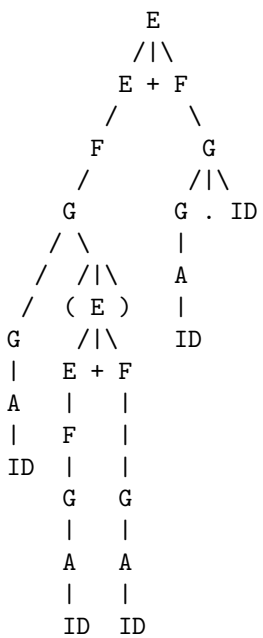
3.1

3.1.1 a[i+1] + b.field

E
E + F

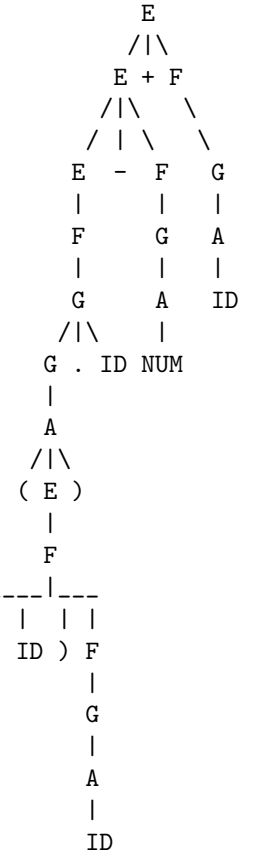
F + F
G + F
G [E] + F
A [E] + F
ID [E + F] + F
ID [F + F] + F
ID [G + F] + F
ID [A + F] + F
ID [ID + F] + F
ID [ID + G] + F
ID [ID + A] + F
ID [ID + NUM] + F
ID [ID + NUM] + G
ID [ID + NUM] + G . ID
ID [ID + NUM] + A . ID
ID [ID + NUM] + ID . ID



3.1.2 ((Type) x).i - 10 + y

E
E + F
E - F + F
F - F + F
G - F + F
G . ID - F + F
A . ID - F + F
(E) . ID - F + F
(F) . ID - F + F
((ID) F) . ID - F + F

((ID) G) . ID - F + F
((ID) A) . ID - F + F
((ID) ID) . ID - F + F
((ID) ID) . ID - G + F
((ID) ID) . ID - A + F
((ID) ID) . ID - NUM + F
((ID) ID) . ID - NUM + G
((ID) ID) . ID - NUM + A
((ID) ID) . ID - NUM + ID



3.2

See `pp.s1378791.q1_3`

3.3

```
E -> F E'
E' -> "+" F E'
   |  "-" F E'
   |  epsilon
F  -> "(" ID ")" F
   |  G
```

```
G  -> A G'
G' -> "[" E "] G'
   |  "." ID G'
   |  epsilon
 A -> "(" E ")"
   |  NUM
   |  ID
```

3.4

3.4.1 FIRST

	1	2	3	4
E	Ø	(	(	(, num, id
E'	+, -, epsilon	+, -, epsilon	+, -, epsilon	+, -, epsilon
F	(	(	(, num, id	(, num, id
G	Ø	(, num, id	(, num, id	(, num, id
G'	[, ., epsilon	[, ., epsilon	[, ., epsilon	[, ., epsilon
A	(, num, id	(, num, id	(, num, id	(, num, id

3.4.2 FOLLOW

-	init	1	2
E	eof	eof],)	eof,],)
E'	Ø	eof],)	eof,],)
F	Ø	eof],), +, -	eof,],), +, -
G	Ø	eof],), +, -	eof,],), +, -
G'	Ø	eof],), +, -	eof,],), +, -
A	Ø	eof],), +, -, [, .	eof,],), +, -, [, .

3.4.3 FIRST+

Regel	first	follow	first+
$E \rightarrow FE'$	(, num, id	eof,],)	(, num, id
$E' \rightarrow$"+"FE'	+	eof,],)	+
$E' \rightarrow$"-"FE'	-	eof,],)	-
$E' \rightarrow epsilon$	epsilon	eof,],)	eof,],)
$F \rightarrow$ "("ID")"F	(	eof,],), +, -	(
$F \rightarrow G$	(, num, id	eof,],), +, -	(, num, id
$G \rightarrow AG'$	(, num, id	eof,],), +, -	(, num, id
$G' \rightarrow$ "["E"]"G'	[	eof,],), +, -	[
$G' \rightarrow$ "."IDG'	.	eof,],), +, -	.
$G' \rightarrow epsilon$	epsilon	eof,],), +, -	eof, +, -,],)
$A \rightarrow$ "("E")"	(	eof,],), +, -, [, .	(
$A \rightarrow NUM$	num	eof,],), +, -, [, .	num
$A \rightarrow ID$	id	eof,],), +, -, [, .	id

3.5

For example the F rules (rules with F in the lhs.) can both be chosen if a '(' is encountered.

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See lab files in `pp.s1378791.q1_5`