2016/10/19

Ex1. Derive

(9+7)*(5-6)

from G_3 and construct a parse tree.

G_3:

① ② S → expr | (expr)

③ expr → expr + expr

④ expr → expr - expr

⑤ expr → expr * expr

⑥ expr → digit

⑦ digit → 0 | 1 | ... | 9

Start S

① (expr)

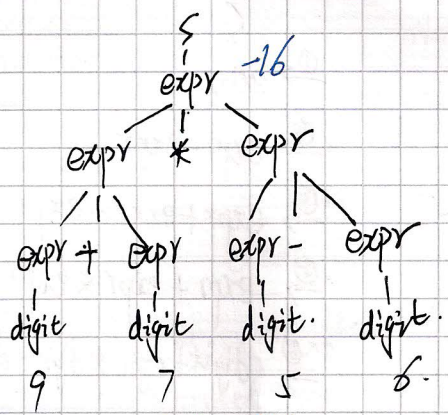
⑤ expr * expr

②② (expr) * (expr)

③④ (expr + expr) * (expr - expr)

⑥×4 (digit + digit) * (digit - digit)

⑦×4 (9 + 7) * (5 - 6).



There is only one parse tree for (9+7)*(5-6).

Nevertheless the grammar is still ambiguous on the second example. show as:

Ex2. Derive 9+7*5-6. from G_3 and construct a parse tree.

First,

S

① expr

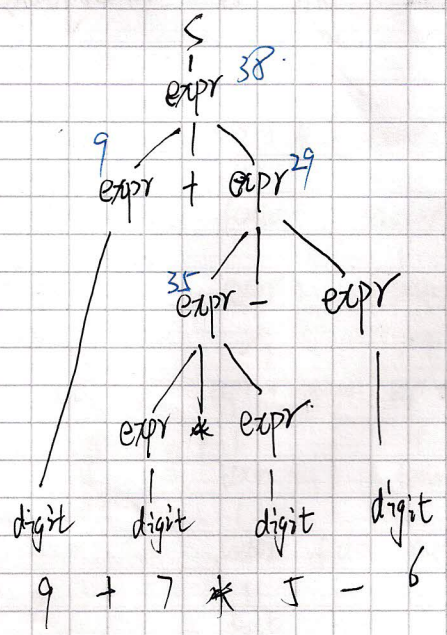
③ expr * expr

④ expr + expr - expr

⑤ expr + expr * expr - expr

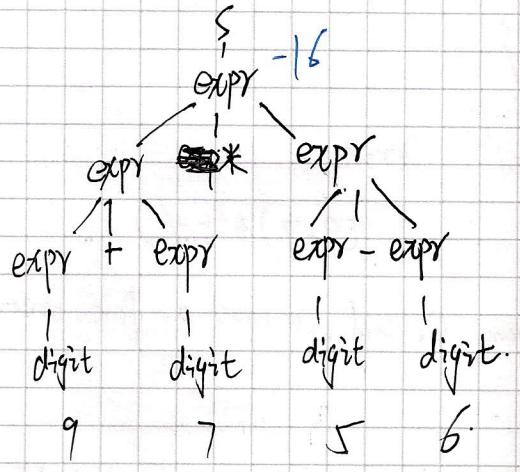
⑥×4 digit + digit * digit - digit

⑦×4 9 + 7 * 5 - 6.



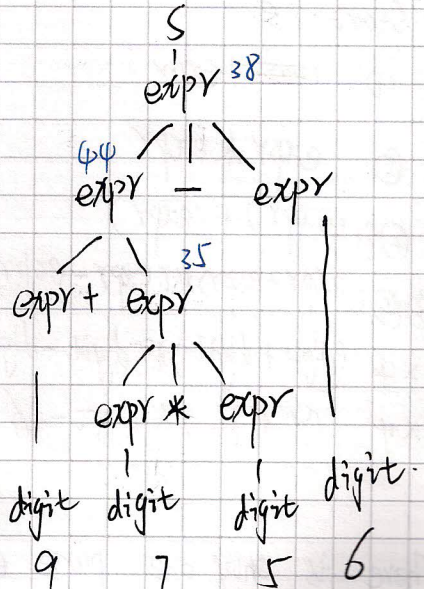
Second,

S
① → expr
② → expr * expr
③ → expr + expr * expr
④ → expr + expr * expr - expr
④ × ⑥ → digit + digit * digit - digit
⑥ × ⑦ → 9 + 7 * 5 - 6



Third,

S
① → expr
④ → expr - expr
③ → expr + expr - expr
⑤ → expr + expr * expr - expr
④ × ⑥ → digit + digit * digit - digit
⑥ × ⑦ → 9 + 7 * 5 - 6



There are five situation for ~~these~~ this string
This is ambiguous.

Strategy

	operator	nonterminal
level I	+ -	expr, term
level II	* /	term, factor

} define new non-terminals.

grammar for ~~arithm~~ arithmetic expressions II.

G_4:

① $S \to expr$

② $expr \to expr + term$

③ $\quad | \ expr - term$

④ $\quad | \ term$

⑤ $term \to ~~factor~~ term * factor$

⑥ $\quad | \ term / factor$

⑦ $\quad | \ factor$

⑧ $factor \to digit$

⑨ $\quad | \ (expr)$

⑩ $digit \to 0 | 1 | \cdots | 9$

Notice:

(1) ambiguity = more than 1 parse trees for one string.

(2) more than 1 ~~der~~ derivation with one parse tree → not ambiguous.

Ex1. $(9+7)*(5-6)$

S

① → expr

④ → term

⑤ → term * factor

⑦ → factor * factor

⑨⑨ → (expr) * (expr)

② → (expr + term) * (expr)

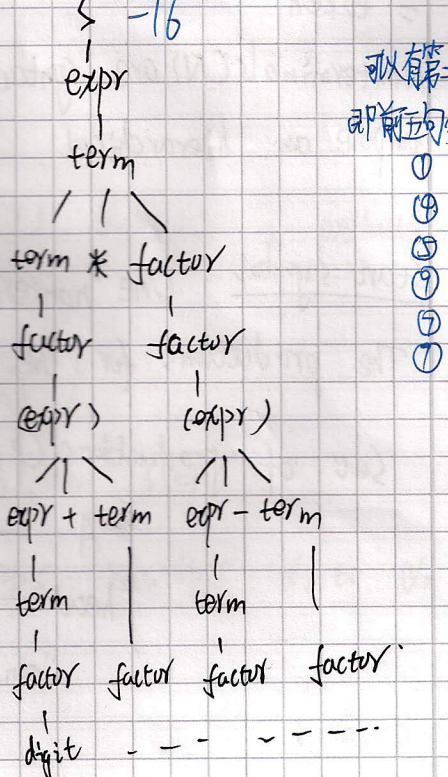
③ → (expr + term) * (expr - term)

④ → (term + term) * (term - term)

⑦ → (factor + factor) * (factor - factor)

⑧ → (digit + digit) * (digit - digit)

⑩ → (9 + 7) * (5 - 6).



S → 16

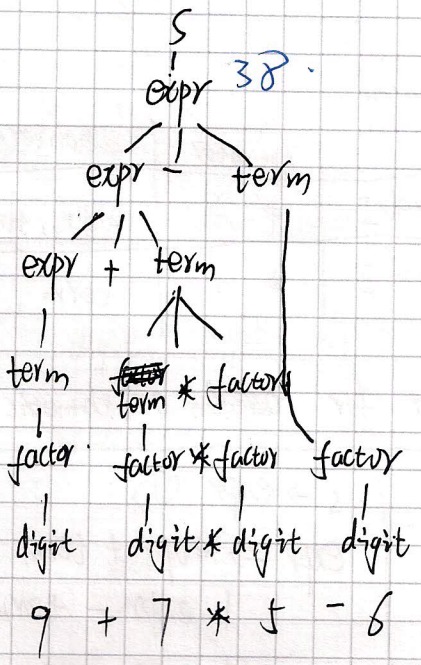
或能=种分解式即前后变为

① ④ ⑤ ⑨ ⑦ ⑦

Result: There is more than one derivation, but all the derivations generate the same parse tree. ⇒ The grammar is not ambiguous.

Ex2. 9+7*5-6.

① S
② → expr
③ → expr - term
④ → expr + term - term
⑤ → term + term - term
⑥ → term + term * factor - term
⑦ → factor + factor * factor - factor
⑧ → digit ~~~~~
⑩ → 9 + 7 * 5 6



38.

2016/10/25.

Definition context-free grammar

A context-free grammar consists of a start symbol, nonterminals, terminals and a set of productions.

1. Terminals (T) are the basic symbols from which strings are formed.
   e.g. "a", "b", "if", "else", "for"
   = token
2. Nonterminals (N) are syntactic variables that denote sets of strings impose an hierarchical structure on the language (expr, term, factor
3. Start symbol. One nonterminal is distinguished as start symbol (S). The productions for the start symbol, conventionally, are listed first.
4. Set of productions (P)

   A ⟶ B

   head ⟶ body

   "can have the form"

Notice: A → B
        | C
(two alternatives)