Complier Homework 6

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Exercise 4.6.2

Problem

1. Construct the SLR set of items for grammar S.
2. Compute the GOTO function for these sets of items.
3. Show the parsing table for this grammar.
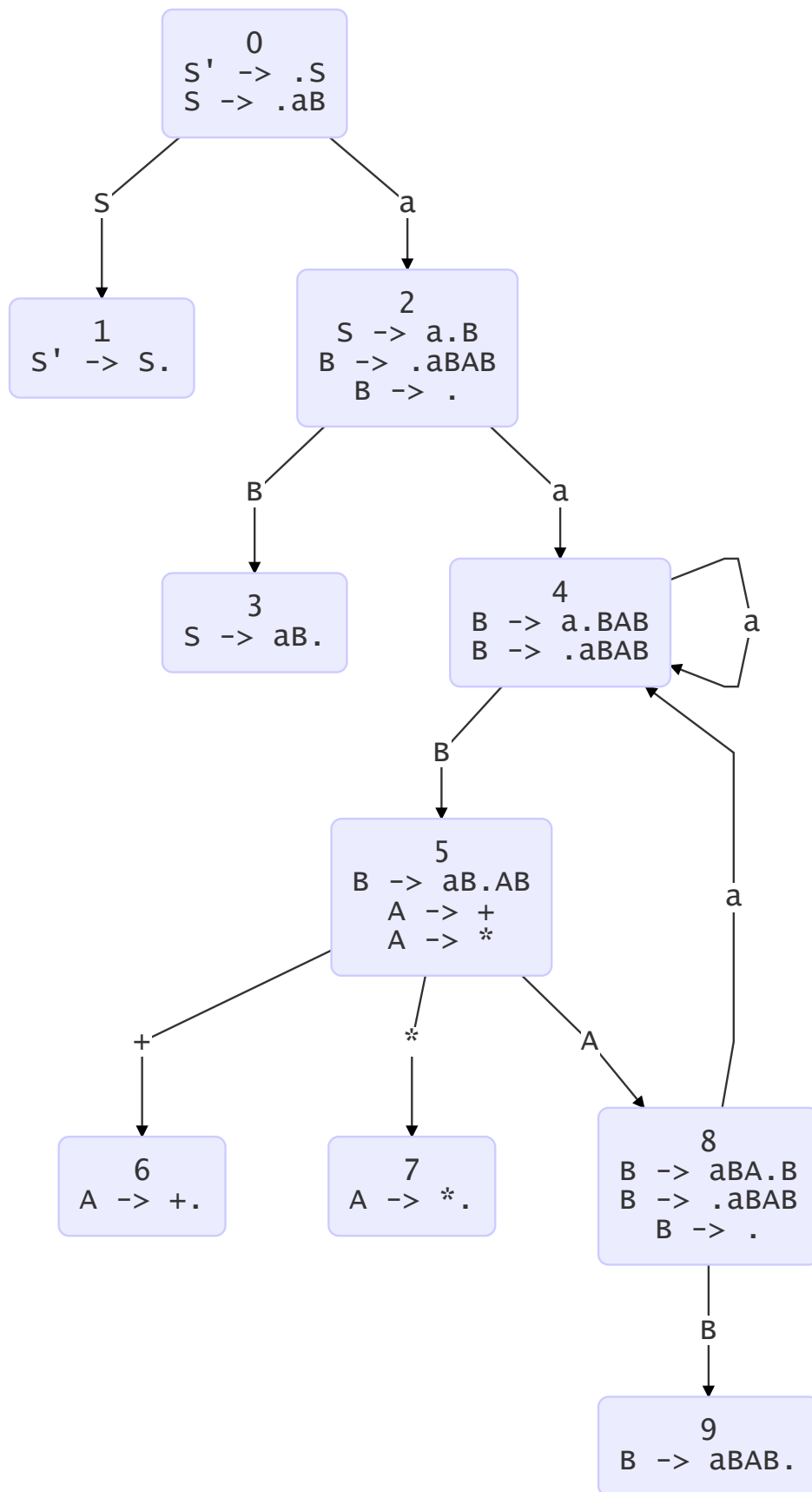4. Is the grammar SLR?

$$S \rightarrow SS+ |SS*|a \tag{1}$$

Answer

eliminate left-fector and left-recursion

$S' \rightarrow S$
$S \rightarrow aB$
$A \rightarrow +|*$
$B \rightarrow aBAB|\varepsilon$

LR(0) Automaton

```
          ┌─────────────┐
          │      0      │
          │  S' -> .S   │
          │  S -> .aB   │
          └─────────────┘
           S          a
           │          │
           ▼          ▼
  ┌─────────────┐  ┌─────────────┐
  │      1      │  │      2      │
  │  S' -> S.   │  │  S -> a.B   │
  └─────────────┘  │  B -> .aBAB │
                   │   B -> .    │
                   └─────────────┘
                    B          a
                    │          │
                    ▼          ▼
          ┌─────────────┐  ┌─────────────┐
          │      3      │  │      4      │◄──┐
          │  S -> aB.   │  │  B -> a.BAB │   │ a
          └─────────────┘  │  B -> .aBAB │───┘
                           └─────────────┘
                            B
                            │
                            ▼
                   ┌─────────────┐
                   │      5      │
                   │  B -> aB.AB │
                   │   A -> +    │
                   │   A -> *    │
                   └─────────────┘
              +         *         A
              │         │         │
              ▼         ▼         ▼
   ┌─────────────┐ ┌─────────────┐ ┌─────────────┐
   │      6      │ │      7      │ │      8      │
   │  A -> +.    │ │  A -> *.    │ │  B -> aBA.B │
   └─────────────┘ └─────────────┘ │  B -> .aBAB │
                                   │   B -> .    │
                                   └─────────────┘
                                    B
                                    │
                                    ▼
                           ┌─────────────┐
                           │      9      │
                           │  B -> aBAB. │
                           └─────────────┘
```

SLR set and **GOTO function** are showed in the graph above.

parsing table

Status	Action	Action	Action	Action	GOTO	GOTO	GOTO
	a	+	*	$	S	A	B
0	s2				s1		
1				acc			
2	s4	r3	r3	r3			s3
3				r1			
4	s4	r3	r3	r3			s5
5		s6	s7			s8	
6	r4			r4			
7	r5			r5			
8	s4	r3	r3	r3			s9
9		r2	r2	r2			

Since there doesn't exist conflict, it's a SLR grammar.

Exercise 4.6.3

Problem

Show the actions of your parsing table for Exercise 4.6.2 on the input aa*a+.

Answer

num	Stack	Symbols	Input	Action
1	0		aa*a+$	move
2	02	a	a*a+$	move
3	024	aa	*a+$	reduce by B->ε
4	0245	aaB	*a+$	move
5	02457	aaB*	a+$	reduce by A->*
6	02458	aaBA	a+$	move
7	024584	aaBAa	+$	reduce by B->ε
8	0245845	aaBAaB	+$	move
9	02458456	aaBAaB+	$	reduce by A->*
10	02458458	aaBAaBA	$	reduce by B->ε
11	024584589	aaBAaBAB	$	reduce by B->aBAB
12	024589	aaBAB	$	reduce by B->aBAB

num	Stack	Symbols	Input	Action
13	023	aB	$	reduce by S->aB
13	01	S	$	acc