CS 415 Compilers: Problem Set 5

Spring 2022

Due date: Monday, April 18, 11:59pm

Problem 1 – LR(1) Parsing

1	S'	::=	S
2	S	::=	L = R
3		|	R
4	L	::=	∗R
5		|	**id**
6	R	::=	L

1. Compute the canonical collection of sets of $LR(1)$ items
2. Construct the $LR(1)$ parse table (ACTION and GOTO)
3. Is the grammar $LR(1)$ or not? Justify your answer.
4. If the grammar is $LR(1)$, show the behavior of the $LR(1)$ parser on input
   `*id = id`, i.e., show stack content, current input, and selected action for each move of the machine.

Problem 2 – LR(0)

Show that the above grammar (Problem 1) is not LR(0). Note that it is sufficient to show one state where there is a conflict (Hint: you don't need to enumerate *all* states).

Problem 3 – Type Systems

Assume a type system with the following inference rules

$$Rule_{A1}: \quad \frac{E \vdash e_1 : integer \quad E \vdash e_2 : integer}{E \vdash (e_1 + e_2) : integer}$$

$$Rule_{A2}: \quad \frac{E \vdash e : \alpha}{E \vdash \&e : pointer(\alpha)}$$

$$Rule_{A3}: \quad \frac{E \vdash e : pointer(\alpha)}{E \vdash *e : \alpha}$$

Assuming that variable **a** and constant **3** are of type integer, and variable **b** is of type boolean. Use the inference rules to determine the types of the following expressions. Note: if a proof does not exist, the type system reports a type error.

1. &a
2. &b
3. (&a + 5)
4. *a
5. &3
6. *(a + b)
7. &&a