

CS164: Written Assignment 4 (On Syntax-Directed Translation)

Assigned: Thursday, Oct 7, 2004
Due: Thursday, Oct 14, 2004, at the beginning of class.

Grading and Submission

Your answers must be brief and easy to understand. Your grade (credit/no credit) will depend partly on how easy it is for us to understand and verify your answer. Submit your written assignments either in the classroom (before the lecture) or in 283 Soda. *No late homeworks are accepted.* **Please indicate your login name and Section number.**

All subproblems in this homework will be graded.

1 Syntax-directed translation based on an $LL(1)$ -parser.

This question asks you to work out an example of how LL-based syntax-directed translation works. You will use the grammar from the attached write-up.

(a) The handout sketches one semantic action. Your task in this part of the question is to complete the four semantic actions so that the translation builds an AST for the parsed expression.

(b) For the non-left-recursive version of this grammar shown on the section handout, draw the step-by-step progress of LL-based syntax-directed translation on the input $2 * 3 + (4)$. What you draw should have the format of slide 36 in Lecture 10 (you will need to modify how to present the content of the semantic stack).

(c) Show the parse tree (not the AST!) for the given input and the given non-left-recursive grammar. Your parse tree must include the action numbers, as if they were symbols in the grammar.

(d) Show how the actions in the parse tree communicate values. Specifically, if an instance a of an action shown in the tree pushed a value onto the semantic stack that was later in the translation popped by an action b , draw an arc from a to b .

(e) Draw the AST constructed by the translation. Also, connect each arc drawn in part (d) to the appropriate node in the AST. *Draw neatly! Use a different color or pattern for each kind of arc.*