

CS 442/542 Homework 3

“Due” Friday March 10

Homework 3 Grammar

Prog \rightarrow StmtSeq
StmtSeq \rightarrow Stmt StmtSeq
StmtSeq \rightarrow ϵ
Stmt \rightarrow Id = Expr ;
Expr \rightarrow Expr + Term
Expr \rightarrow Term
Term \rightarrow Term * Factor
Term \rightarrow Factor
Factor \rightarrow (Expr)
Factor \rightarrow Id
Factor \rightarrow SetLit
Id \rightarrow Ident

Homework 3

- Build an interpreter for the set grammar shown on the previous slide.
- The + operator means union and the * operator means intersection.
- As in the boolean expression grammar (yacc1 lecture) use the symbol table to remember the values of variables. In this case the value of a variable is a set. Store the value of a variable (i.e. a set) in a symbol table. For example the values of a variable x (i.e. the elements of the set x) will be stored in a symbol table associated with x.
- When the program is finished, print the values of the variables to standard output

Homework 3 Example Input

```
x = {a,b,c} + {d,e,f};  
y = {};  
z = {x};  
w = x + z;  
a = x + y + z + w;  
b = (x + y + z + w) * y;
```

Homework 3 Example Output

w: {f,x,a,b,c,d,e}
x: {f,a,b,c,d,e}
y: {}
z: {x}
a: {f,x,a,b,c,d,e}
b: {}

Homework 3 a Few Hints

Prog -> StmtSeq
StmtSeq -> Stmt StmtSeq
StmtSeq -> ϵ
Stmt -> Id = Expr ;
Expr -> Expr + Term

The data type of Id should be a char *

The data type of Expr, Term and Factor should be a SymTab * or a type that includes a SymTab *. Consider how to recover space used by temporary results.

Expr -> Term
Term -> Term * Factor
Term -> Factor
Factor -> (Expr)
Factor -> Id
Factor -> SetLit
Id -> Ident

If a variable is used before it is initialized assume its value is the empty set

Make a new set (i.e. a new symbol table from the set literal)

Make a copy of yytext since in lex yytext is a statically allocated array

Homework 3 a Few Hints

Prog \rightarrow StmtSeq When this production is used call the function to print the values of the variables

StmtSeq \rightarrow Stmt StmtSeq

StmtSeq \rightarrow ϵ

Stmt \rightarrow Id = Expr ; Each set is stored in its own symbol table. The main symbol table stores the variables (i.e. ids) and each variable has an attribute that is a SymTab * that points to the current value of the variable.

Expr \rightarrow Expr + Term

Expr \rightarrow Term

Term \rightarrow Term * Factor

Term \rightarrow Factor

Factor \rightarrow (Expr)

Factor \rightarrow Id

Factor \rightarrow SetLit A SetLit is either {}, the empty set, or a {comma delimited list of letters}

Id \rightarrow Ident A Ident is a letter followed by one or more letters or digits

Homework 3 Submission

- You will demo homework 3 to me online. sometime.
- After you demo you will upload your homework to Canvas (see next slide)
- The homework is worth 40 points. This includes points for IOMngr
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Homework 3 Submission

- Upload one zip file to Canvas
- The file must contain some test programs on which your h3 program works and the following files: h3.l, h3.y, SymTab.h, SymTab.c, IOMngr.h, IOMngr.c, semantics.h, semantics.c, main.c
- Please use the exact file names shown above