Programming Assignment 3

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1.1 Pros

- We wrote a script to automatically test that our parser passes the given test cases
- We wrote our own parse table generator since the suggested tool was broken
- We refactored our scanner to improve its readability

1.2 Cons

- Our parser has has almost 300 lines of hard coded lists and tables in the start. It would be better to have them in separate files, but since we are supposed to turn in only the README, scanner.py and parser.py they need to be included that way.

2 First

Col1	Col2
"Program"	["void", "EPSILON", "int"]
"Declaration-list"	["void", "EPSILON", "int"]
"Declaration"	["void", "int"]
"Declaration-initial"	["void", "int"]
"Declaration-prime"	["(", "[", ";"]
"Var-declaration-prime"	["[", ";"]
"Fun-declaration-prime"	["("]
"Type-specifier"	["void", "int"]
"Params"	["void", "int"]
"Param-list-void-abtar"	["EPSILON", "ID"]
"Param-list"	["EPSILON", ","]
"Param"	["void", "int"]
"Param-prime"	["EPSILON", "["]
"Compound-stmt"	["{"]
"Statement-list"	["NUM", "switch", ";", "{", "(", "ID", "EPSILON", "return", "if", "while", "continue", "break"]
"Statement"	["return", "NUM", "switch", ";", "{", "(", "ID", "continue", "if", "while", "break"]
"Expression-stmt"	["NUM", ";", "(", "ID", "continue", "break"]
"Selection-stmt"	["if"]
"Iteration-stmt"	["while"]
"Return-stmt"	["return"]
"Return-stmt-prime"	["(", "NUM", "ID", ";"]
"Switch-stmt"	["switch"]
"Case-stmts"	["case", "EPSILON"]
"Case-stmt"	["case"]
"Default-stmt"	["EPSILON", "default"]
"Expression"	["(", "NUM", "ID"]
"B"	["*", "-", "==", "<", "+", "=", "(", "EPSILON", "["]
"H"	["*", "-", "==", "<", "+", "=", "EPSILON"]
"Simple-expression-zegond"	["(", "NUM"]
"Simple-expression-prime"	["*", "-", "==", "<", "+", "(", "EPSILON"]
"C"	["==", "<", "EPSILON"]
"Relop"	["==", "<"]
"Additive-expression"	["(", "NUM", "ID"]
"Additive-expression-prime"	["*", "-", "+", "(", "EPSILON"]
"Additive-expression-zegond"	["(", "NUM"]
"D"	["-", "EPSILON", "+"]
"Addop"	["-", "+"]
"Term"	["(", "NUM", "ID"]
"Term-prime"	["(", "EPSILON", "*"]
"Term-zegond"	["(", "NUM"]
"G"	["EPSILON", "*"]
"Factor"	["(", "NUM", "ID"]
"Var-call-prime"	["(", "EPSILON", "["]
"Var-prime"	["EPSILON", "["]
"Factor-prime"	["(", "EPSILON"]
"Factor-zegond"	["(", "NUM"]
"Args"	["(", "EPSILON", "NUM", "ID"]
"Arg-list"	["(", "NUM", "ID"]
"Arg-list-prime"	["EPSILON", ","]

3 Follow

Col1	Col2
"Program"	["$"]
"Declaration-list"	["break", "switch", "(", "default", "}", ";", "ID", "{", "if", "return", "case", "while", "$", "continue", "NUM"]
"Declaration"	["void", "int", "switch", "(", "break", "default", "while", "NUM", ";", "ID", "{", "if", "return", "}", "$", "continue", "case"]
"Declaration-initial"	[";", "(", "[", ")", ";"]
"Declaration-prime"	["void", "int", "switch", "(", "break", "default", "while", "NUM", ";", "ID", "{", "if", "return", "}", "$", "continue", "case"]
"Var-declaration-prime"	["void", "int", "switch", "(", "break", "default", "while", "NUM", ";", "ID", "{", "if", "return", "}", "$", "continue", "case"]
"Fun-declaration-prime"	["void", "int", "switch", "(", "break", "default", "while", "NUM", ";", "ID", "{", "if", "return", "}", "$", "continue", "case"]
"Type-specifier"	["ID"]
"Params"	[")"]
"Param-list-void-abtar"	[")"]
"Param-list"	[")"]
"Param"	[",", ")"]
"Param-prime"	[",", ")"]
"Compound-stmt"	["void", "int", "switch", "(", "break", "else", "default", "while", ";", "ID", "{", "if", "return", "case", "}", "$", "continue", "NUM"]
"Statement-list"	["}", "default", "case"]
"Statement"	["break", "else", "switch", "(", "default", "while", "NUM", ";", "ID", "{", "if", "return", "}", "continue", "case"]
"Expression-stmt"	["break", "else", "switch", "(", "default", "}", ";", "ID", "{", "if", "return", "case", "while", "continue", "NUM"]
"Selection-stmt"	["break", "else", "switch", "(", "default", "}", ";", "ID", "{", "if", "return", "case", "while", "continue", "NUM"]
"Iteration-stmt"	["break", "else", "switch", "(", "default", "}", ";", "ID", "{", "if", "return", "case", "while", "continue", "NUM"]
"Return-stmt"	["break", "else", "switch", "(", "default", "}", ";", "ID", "{", "if", "return", "case", "while", "continue", "NUM"]
"Return-stmt-prime"	["break", "else", "switch", "(", "default", "while", ";", "ID", "{", "if", "return", "case", "}", "continue", "NUM"]
"Switch-stmt"	["break", "else", "switch", "(", "default", "}", ";", "ID", "{", "if", "return", "case", "while", "continue", "NUM"]
"Case-stmts"	["}", "default"]
"Case-stmt"	["}", "default", "case"]
"Default-stmt"	["}"]
"Expression"	[";", ",", ")", "]"]
"B"	[";", ",", ")", "]"]
"H"	[";", ",", ")", "]"]
"Simple-expression-zegond"	[";", ",", ")", "]"]
"Simple-expression-prime"	[";", ",", ")", "]"]
"C"	[";", ",", ")", "]"]
"Relop"	["ID", "(", "NUM"]
"Additive-expression"	[";", ",", ")", "]"]
"Additive-expression-prime"	[",", ")", "==", "]", ";", "<"]
"Additive-expression-zegond"	[",", ")", "==", "]", ";", "<"]
"D"	[",", ")", "==", "]", ";", "<"]
"Addop"	["ID", "(", "NUM"]
"Term"	["-", ",", "]", "==", ")", ";", "+", "<"]
"Term-prime"	["-", ",", "]", "==", ")", ";", "+", "<"]
"Term-zegond"	["-", ",", "]", "==", ")", ";", "+", "<"]
"G"	["-", ",", "]", "==", ")", ";", "+", "<"]
"Factor"	["-", ",", "*", ")", "==", "]", ";", "+", "<"]
"Var-call-prime"	["-", ",", "*", ")", "==", "]", ";", "+", "<"]
"Var-prime"	["-", ",", "*", ")", "==", "]", ";", "+", "<"]
"Factor-prime"	["-", ",", "*", ")", "==", "]", ";", "+", "<"]
"Factor-zegond"	["-", ",", "*", ")", "==", "]", ";", "+", "<"]
"Args"	[")"]
"Arg-list"	[")"]
"Arg-list-prime"	[")"]

4 Parse Table

4.1 parsetable no.1

	ID	NUM	=	;	:
Program	None	None	None	None	None
Declaration-list	EPSILON	EPSILON	EPSILON	None	None
Declaration	SYNCH	SYNCH	SYNCH	None	None
Declaration-initial	None	None	SYNCH	None	SYNCH
Declaration-prime	SYNCH	SYNCH	Var-declaration-prime	None	None
Var-declaration-prime	SYNCH	SYNCH	;	None	None
Fun-declaration-prime	SYNCH	SYNCH	SYNCH	None	None
Type-specifier	SYNCH	None	None	None	None
Params	None	None	None	None	None
Param-list-void-abtar	ID Param-prime Param-list	None	None	None	None
Param-list	None	None	None	None	, Param Param-list
Param	None	None	None	None	SYNCH
Param-prime	None	None	None	None	EPSILON
Compound-stmt	SYNCH	SYNCH	SYNCH	None	None
Statement-list	Statement Statement-list	Statement Statement-list	Statement Statement-list	None	None
Statement	Expression-stmt	Expression-stmt	Expression-stmt	None	None
Expression-stmt	Expression ;	Expression ;	;	None	None
Selection-stmt	SYNCH	SYNCH	SYNCH	None	None
Iteration-stmt	SYNCH	SYNCH	SYNCH	None	None
Return-stmt	SYNCH	SYNCH	SYNCH	None	None
Return-stmt-prime	Expression ;	Expression ;	;	None	None
Switch-stmt	SYNCH	SYNCH	SYNCH	None	None
Case-stmts	None	None	None	None	None
Case-stmt	None	None	None	None	None
Default-stmt	None	None	None	None	None
Expression	ID B	Simple-expression-zegond	SYNCH	None	SYNCH
B	None	None	Simple-expression-prime	None	Simple-expression-prime
H	None	None	G D C	None	G D C
Simple-expression-zegond	None	Additive-expression-zegond C	SYNCH	None	SYNCH
Simple-expression-prime	None	None	Additive-expression-prime C	None	Additive-expression-prime C
C	None	None	EPSILON	None	EPSILON
Relop	SYNCH	SYNCH	None	None	None
Additive-expression	Term D	Term D	SYNCH	None	SYNCH
Additive-expression-prime	None	None	Term-prime D	None	Term-prime D
Additive-expression-zegond	None	Term-zegond D	SYNCH	None	SYNCH
D	None	None	EPSILON	None	EPSILON
Addop	SYNCH	SYNCH	None	None	None
Term	Factor G	Factor G	SYNCH	None	SYNCH
Term-prime	None	None	Factor-prime G	None	Factor-prime G
Term-zegond	None	Factor-zegond G	SYNCH	None	SYNCH
G	None	None	EPSILON	None	EPSILON
Factor	ID Var-call-prime	NUM	SYNCH	None	SYNCH
Var-call-prime	None	None	Var-prime	None	Var-prime
Var-prime	None	None	EPSILON	None	EPSILON
Factor-prime	None	None	EPSILON	None	EPSILON
Factor-zegond	None	NUM	SYNCH	None	SYNCH
Args	Arg-list	Arg-list	None	None	None
Arg-list	Expression Arg-list-prime	Expression Arg-list-prime	None	None	None
Arg-list-prime	None	None	None	None	, Expression Arg-list-prime

4.2 parsetable no.2

	,	[	]	(	)
Program	None	None	None	None	None
Declaration-list	None	None	EPSILON	None	EPSILON
Declaration	None	None	SYNCH	None	SYNCH
Declaration-initial	SYNCH	None	SYNCH	SYNCH	None
Declaration-prime	Var-declaration-prime	None	Fun-declaration-prime	None	SYNCH
Var-declaration-prime	[NUM] ;	None	SYNCH	None	SYNCH
Fun-declaration-prime	None	None	(Params) Compound-stmt	None	SYNCH
Type-specifier	None	None	None	None	None
Params	None	None	None	SYNCH	None
Param-list-void-abtar	None	None	None	EPSILON	None
Param-list	None	None	None	EPSILON	None
Param	None	None	None	SYNCH	None
Param-prime	[ ]	None	None	EPSILON	None
Compound-stmt	None	None	SYNCH	None	{ Declaration-list Statement-list }
Statement-list	None	None	Statement Statement-list	None	Statement Statement-list
Statement	None	None	Expression-stmt	None	Compound-stmt
Expression-stmt	None	None	Expression ;	None	SYNCH
Selection-stmt	None	None	SYNCH	None	SYNCH
Iteration-stmt	None	None	SYNCH	None	SYNCH
Return-stmt	None	None	SYNCH	None	SYNCH
Return-stmt-prime	None	None	Expression ;	None	SYNCH
Switch-stmt	None	None	SYNCH	None	SYNCH
Case-stmts	None	None	None	None	None
Case-stmt	None	None	None	None	None
Default-stmt	None	None	None	None	None
Expression	None	SYNCH	Simple-expression-zegond	SYNCH	None
B	[Expression] H	Simple-expression-prime	Simple-expression-prime	Simple-expression-prime	None
H	None	G D C	None	G D C	None
Simple-expression-zegond	None	SYNCH	Additive-expression-zegond C	SYNCH	None
Simple-expression-prime	None	Additive-expression-prime C	Additive-expression-prime C	Additive-expression-prime C	None
C	None	EPSILON	None	EPSILON	None
Relop	None	None	SYNCH	None	None
Additive-expression	None	SYNCH	Term D	SYNCH	None
Additive-expression-prime	None	Term-prime D	Term-prime D	Term-prime D	None
Additive-expression-zegond	None	SYNCH	Term-zegond D	SYNCH	None
D	None	EPSILON	None	EPSILON	None
Addop	None	None	SYNCH	None	None
Term	None	SYNCH	Factor G	SYNCH	None
Term-prime	None	Factor-prime G	Factor-prime G	Factor-prime G	None
Term-zegond	None	SYNCH	Factor-zegond G	SYNCH	None
G	None	EPSILON	None	EPSILON	None
Factor	None	SYNCH	(Expression)	SYNCH	None
Var-call-prime	Var-prime	Var-prime	(Args)	Var-prime	None
Var-prime	[Expression]	EPSILON	None	EPSILON	None
Factor-prime	None	EPSILON	(Args)	EPSILON	None
Factor-zegond	None	SYNCH	(Expression)	SYNCH	None
Args	None	None	Arg-list	EPSILON	None
Arg-list	None	None	Expression Arg-list-prime	SYNCH	None
Arg-list-prime	None	None	None	EPSILON	None

4.3 parsetable no.3

	{	}	+	-	*
Program	None	None	None	None	None
Declaration-list	EPSILON	None	None	None	None
Declaration	SYNCH	None	None	None	None
Declaration-initial	None	None	None	None	None
Declaration-prime	SYNCH	None	None	None	None
Var-declaration-prime	SYNCH	None	None	None	None
Fun-declaration-prime	SYNCH	None	None	None	None
Type-specifier	None	None	None	None	None
Params	None	None	None	None	None
Param-list-void-abtar	None	None	None	None	None
Param-list	None	None	None	None	None
Param	None	None	None	None	None
Param-prime	None	None	None	None	None
Compound-stmt	SYNCH	None	None	None	None
Statement-list	EPSILON	None	None	None	None
Statement	SYNCH	None	None	None	None
Expression-stmt	SYNCH	None	None	None	None
Selection-stmt	SYNCH	None	None	None	None
Iteration-stmt	SYNCH	None	None	None	None
Return-stmt	SYNCH	None	None	None	None
Return-stmt-prime	SYNCH	None	None	None	None
Switch-stmt	SYNCH	None	None	None	None
Case-stmts	EPSILON	None	None	None	None
Case-stmt	SYNCH	None	None	None	None
Default-stmt	EPSILON	None	None	None	None
Expression	None	None	None	None	None
B	None	Simple-expression-prime	Simple-expression-prime	Simple-expression-prime	= Expression
H	None	G D C	G D C	G D C	= Expression
Simple-expression-zegond	None	None	None	None	None
Simple-expression-prime	None	Additive-expression-prime C	Additive-expression-prime C	Additive-expression-prime C	None
C	None	None	None	None	None
Relop	None	None	None	None	None
Additive-expression	None	None	None	None	None
Additive-expression-prime	None	Term-prime D	Term-prime D	Term-prime D	None
Additive-expression-zegond	None	None	None	None	None
D	None	Addop Term D	Addop Term D	None	None
Addop	None	+	-	None	None
Term	None	SYNCH	SYNCH	None	None
Term-prime	None	Factor-prime G	Factor-prime G	Factor-prime G	None
Term-zegond	None	SYNCH	SYNCH	None	None
G	None	EPSILON	EPSILON	* Factor G	None
Factor	None	SYNCH	SYNCH	SYNCH	None
Var-call-prime	None	Var-prime	Var-prime	Var-prime	None
Var-prime	None	EPSILON	EPSILON	EPSILON	None
Factor-prime	None	EPSILON	EPSILON	EPSILON	None
Factor-zegond	None	SYNCH	SYNCH	SYNCH	None
Args	None	None	None	None	None
Arg-list	None	None	None	None	None
Arg-list-prime	None	None	None	None	None

4.4 parsetable no.4

	<	==	if	else	void
Program	None	None	None	None	Declaration-list
Declaration-list	None	None	EPSILON	None	Declaration Declaration-list
Declaration	None	None	SYNCH	None	Declaration-initial Declaration-prime
Declaration-initial	None	None	None	None	Type-specifier ID
Declaration-prime	None	None	SYNCH	None	SYNCH
Var-declaration-prime	None	None	SYNCH	None	SYNCH
Fun-declaration-prime	None	None	SYNCH	None	SYNCH
Type-specifier	None	None	None	None	void
Params	None	None	None	None	void Param-list-void-abtar
Param-list-void-abtar	None	None	None	None	None
Param-list	None	None	None	None	None
Param	None	None	None	None	Declaration-initial Param-prime
Param-prime	None	None	None	None	None
Compound-stmt	None	None	SYNCH	SYNCH	SYNCH
Statement-list	None	None	Statement Statement-list	None	None
Statement	None	None	Selection-stmt	SYNCH	None
Expression-stmt	None	None	SYNCH	SYNCH	None
Selection-stmt	None	None	if (Expression) Statement else Statement	SYNCH	None
Iteration-stmt	None	None	SYNCH	SYNCH	None
Return-stmt	None	None	SYNCH	SYNCH	None
Return-stmt-prime	None	None	SYNCH	SYNCH	None
Switch-stmt	None	None	SYNCH	SYNCH	None
Case-stmts	None	None	None	None	None
Case-stmt	None	None	None	None	None
Default-stmt	None	None	None	None	None
Expression	None	None	None	None	None
B	Simple-expression-prime	Simple-expression-prime	None	None	None
H	G D C	G D C	None	None	None
Simple-expression-zegond	None	None	None	None	None
Simple-expression-prime	Additive-expression-prime C	Additive-expression-prime C	None	None	None
C	Relop Additive-expression	Relop Additive-expression	None	None	None
Relop	<	==	None	None	None
Additive-expression	None	None	None	None	None
Additive-expression-prime	Term-prime D	Term-prime D	None	None	None
Additive-expression-zegond	SYNCH	SYNCH	None	None	None
D	EPSILON	EPSILON	None	None	None
Addop	None	None	None	None	None
Term	SYNCH	SYNCH	None	None	None
Term-prime	Factor-prime G	Factor-prime G	None	None	None
Term-zegond	SYNCH	SYNCH	None	None	None
G	EPSILON	EPSILON	None	None	None
Factor	SYNCH	SYNCH	None	None	None
Var-call-prime	Var-prime	Var-prime	None	None	None
Var-prime	EPSILON	EPSILON	None	None	None
Factor-prime	EPSILON	EPSILON	None	None	None
Factor-zegond	SYNCH	SYNCH	None	None	None
Args	None	None	None	None	None
Arg-list	None	None	None	None	None
Arg-list-prime	None	None	None	None	None

4.5   parsetable no.5

	int	while	break	continue	switch
Program	Declaration-list	None	None	None	None
Declaration-list	Declaration Declaration-list	EPSILON	EPSILON	EPSILON	EPSILON
Declaration	Declaration-initial Declaration-prime	SYNCH	SYNCH	SYNCH	SYNCH
Declaration-initial	Type-specifier ID	None	None	None	None
Declaration-prime	SYNCH	SYNCH	SYNCH	SYNCH	SYNCH
Var-declaration-prime	SYNCH	SYNCH	SYNCH	SYNCH	SYNCH
Fun-declaration-prime	SYNCH	SYNCH	SYNCH	SYNCH	SYNCH
Type-specifier	int	None	None	None	None
Params	int ID Param-prime Param-list	None	None	None	None
Param-list-void-abtar	None	None	None	None	None
Param-list	None	None	None	None	None
Param	Declaration-initial Param-prime	None	None	None	None
Param-prime	None	None	None	None	None
Compound-stmt	SYNCH	SYNCH	SYNCH	SYNCH	SYNCH
Statement-list	None	Statement Statement-list	Statement Statement-list	Statement Statement-list	Statement Statement-list
Statement	None	Iteration-stmt	Expression-stmt	Expression-stmt	Switch-stmt
Expression-stmt	None	SYNCH	break ;	continue ;	SYNCH
Selection-stmt	None	SYNCH	SYNCH	SYNCH	SYNCH
Iteration-stmt	None	while (Expression) Statement	SYNCH	SYNCH	SYNCH
Return-stmt	None	SYNCH	SYNCH	SYNCH	SYNCH
Return-stmt-prime	None	SYNCH	SYNCH	SYNCH	SYNCH
Switch-stmt	None	SYNCH	SYNCH	SYNCH	switch (Expression) { Case-stmts Default-stmt }
Case-stmts	None	None	None	None	None
Case-stmt	None	None	None	None	None
Default-stmt	None	None	None	None	None
Expression	None	None	None	None	None
B	None	None	None	None	None
H	None	None	None	None	None
Simple-expression-zegond	None	None	None	None	None
Simple-expression-prime	None	None	None	None	None
C	None	None	None	None	None
Relop	None	None	None	None	None
Additive-expression	None	None	None	None	None
Additive-expression-prime	None	None	None	None	None
Additive-expression-zegond	None	None	None	None	None
D	None	None	None	None	None
Addop	None	None	None	None	None
Term	None	None	None	None	None
Term-prime	None	None	None	None	None
Term-zegond	None	None	None	None	None
G	None	None	None	None	None
Factor	None	None	None	None	None
Var-call-prime	None	None	None	None	None
Var-prime	None	None	None	None	None
Factor-prime	None	None	None	None	None
Factor-zegond	None	None	None	None	None
Args	None	None	None	None	None
Arg-list	None	None	None	None	None
Arg-list-prime	None	None	None	None	None

4.6 parsetable no.6

	default	case	return	$
Program	None	None	None	Declaration-list
Declaration-list	EPSILON	EPSILON	EPSILON	EPSILON
Declaration	SYNCH	SYNCH	SYNCH	SYNCH
Declaration-initial	None	None	None	None
Declaration-prime	SYNCH	SYNCH	SYNCH	SYNCH
Var-declaration-prime	SYNCH	SYNCH	SYNCH	SYNCH
Fun-declaration-prime	SYNCH	SYNCH	SYNCH	SYNCH
Type-specifier	None	None	None	None
Params	None	None	None	None
Param-list-void-abtar	None	None	None	None
Param-list	None	None	None	None
Param	None	None	None	None
Param-prime	None	None	None	None
Compound-stmt	SYNCH	SYNCH	SYNCH	SYNCH
Statement-list	EPSILON	EPSILON	Statement Statement-list	None
Statement	SYNCH	SYNCH	Return-stmt	None
Expression-stmt	SYNCH	SYNCH	SYNCH	None
Selection-stmt	SYNCH	SYNCH	SYNCH	None
Iteration-stmt	SYNCH	SYNCH	SYNCH	None
Return-stmt	SYNCH	SYNCH	return Return-stmt-prime	None
Return-stmt-prime	SYNCH	SYNCH	SYNCH	None
Switch-stmt	SYNCH	SYNCH	SYNCH	None
Case-stmts	EPSILON	Case-stmt Case-stmts	None	None
Case-stmt	SYNCH	case NUM : Statement-list	None	None
Default-stmt	default : Statement-list	None	None	None
Expression	None	None	None	None
B	None	None	None	None
H	None	None	None	None
Simple-expression-zegond	None	None	None	None
Simple-expression-prime	None	None	None	None
C	None	None	None	None
Relop	None	None	None	None
Additive-expression	None	None	None	None
Additive-expression-prime	None	None	None	None
Additive-expression-zegond	None	None	None	None
D	None	None	None	None
Addop	None	None	None	None
Term	None	None	None	None
Term-prime	None	None	None	None
Term-zegond	None	None	None	None
G	None	None	None	None
Factor	None	None	None	None
Var-call-prime	None	None	None	None
Var-prime	None	None	None	None
Factor-prime	None	None	None	None
Factor-zegond	None	None	None	None
Args	None	None	None	None
Arg-list	None	None	None	None
Arg-list-prime	None	None	None	None