

Design an original programming language and provide a syntactic analyzer for it, using YACC. Your language should be statically typed and should include:

- variable declarations, constant declarations (different kind of constants) , function declarations and definitions
- user defined data types (similar to classes in object orientated languages, but with your own syntax); provide specific syntax for working with these types
- array types
- control statements (if, for, while, etc.), assignment statements
- arithmetic and boolean expressions with complex operands
- operations with string types
- function calls which can have as parameters: expressions, other function calls, identifiers, constants, etc.
- A predefined function called *print* which has a parameter of an integer type

Besides the syntactic analysis of the program, you should also provide semantic analysis as follows:

- you should check that any variable that appears in a program has been previously defined;
- a variable should not be declared more than once;
- a variable appearing in the right side of an expression should have been initialized explicitly.
- a function is not defined more than once with the same signature
- a function that is called in the program has been defined
- type checking - make sure that:
 - the left side of an assignment has the same type as the right side
 - the parameters of a function call have the types from the function definition

Error messages should be provided if these conditions do not hold;

You must provide the evaluation of arithmetic expressions in a program ; if a program is syntactically and semantically correct, for every call of the form *print(expr)*, the actual value of *expr* will be printed, otherwise only the errors will be showed .

The homework will be graded as follows:

- 5 points the syntactic part (the grammar describing your programming language)
- 5 points the semantic part and the evaluation of expressions

Besides the homework presentation, students should be able to answer specific questions regarding grammars and parsing algorithms (related to the first part of your homework) or yacc details related to the second part (the answers will also be graded).