PROGRAMMING LANGUAGES (COL226)

DIPEN KUMAR
2018CS50098
ASSIGNMENT4

I have modular implementation of all the backend functions in a file named func.ml.
I have handled error in input with just returning the same sheet (with no change).
I have submitted following files-

1. lexer.mll
2. parser.mly
3. func.ml
4. assignment4.ml
5. Makefile
6. sheet.csv
7. input.txt

lexer.mll – This is the Lex file with all the rules of the token which were used in formulae. I have introduced one extra token apart from specification i.e. 'INVALID' this matches to all other useless token. If we encounter this token implies we came across lexical error.

parser.mly – This is the Yacc file with grammar rules defined in rule section. Based on the function I encounter I have called backend function to execute the formulae on given sheet with given range/ranges and index and constant(in some case). In the declaration section I have declared all the tokens used in our formula. For lexer.mll it was declared here and in lexer.mll file we have open Parser module. In the header section I have taken help of the helper code given to us on piazza to read csv file and initialize array of array of data which is sheet, where type data = NUM of float | NA. I have also written a function to print sheet on console which take a single argument i.e. sheet and print the sheet. I have declared a sheet s0 in header section which I initialized with sheet.csv file and passed to backend function along with the range/ranges and index depending on the function. I have declared a

```
type exp = A of string * (int * int * int * int)
         |  B of string * (int * int * int * int) * (int * int * int * int)
         |  C of string * (int * int * int * int) * float
```

This is the type of return value of E in
T : I ASSIGN E SEMI where is further broken into-

E : UNARY R	$$=$1,$2	string*(int*int*int*int)
| BINARY R R	$$=$1,$2,$3	string*(int*int*int*int) *(int*int*int*int)
| BINARY N R	$$=$1,$3,$2	string*(int*int*int*int)*float
| BINARY R N	$$=$1,$2,$3	string*(int*int*int*int)*float
| BINARY I R	$$=$1,$3,s0@$2	string*(int*int*int*int)*float
| BINARY R I	$$=$1,$2,s0@$3	string*(int*int*int*int)*float

Where N is the float value and I is index
I have used modular implementation so I open Func to access simply all the backend function I have written in func.ml.

func.ml – This contains all my backend function. I have introduced following types for smooth implementation-

1. type data = NUM of float | NA
2. type sheet = data array array
3. type range = int * int * int * int
4. type index = int * int
5. type constant = float

In all functions I have implemented I have taken care of range i.e range should be valid that means ([x1,y1]:[x2,y2]) will be a valid range if x2>=x1 and y2>=y1. Also range should be with in sheet i.e. array of array of data. Also have take care of index falls within sheet where data is written and if data to be written is a range then I have ensured it should be in range. If any of the above condition is not satisfied then I don't process formulae and return the same sheet with no change. In case of Binary function in case of divide by constant I have ensured that the constant is not zero. In case of dual range I have also checked if the ranges are of are of consistent dimensions if not I returned the same sheet with no change else did formula in the given sheet.

assignment4.ml – This file calls parser till input.txt which contains all instructions to be done on sheet is completed.

Makefile – Shell command for smooth compilation and execution.
I have used the format instructed on piazza.
./assignment4 sheet.csv m n input.txt

sheet.csv – This file contain the initial value of the sheet i.e. array of array of data.

input.txt – This file contains all the formulas/instructions to be done on sheet.

NOTE: I have used console to show result after each instruction. I have printed the sheet at first i.e. initialized sheet and then after every instruction I have printed the updated sheet on the console. Whenever there is some biased input which cannot be performed I have printed a note to user notifying them about the problem and printed the same old sheet with no change.