<https://github.com/ComanacDragos/ToyLanguageCompiler>

**Statement:**

Write a program that:

1. Reads the elements of a FA (from file)

2. Displays the elements of a finite automata, using a menu: the set of states, the alphabet, all the transitions, the set of final states.

3. For a DFA, verify if a sequence is accepted by the FA.

**Deliverables:**

1. FA.in - input file (*on Github*)
2. Source code (*on Github*)
3. Documentation. It should also include in BNF or EBNF format the form in which the FA.in file should be written (*on Moodle and Github*)

FA.in structure:

id ::= letter{letter|digit|symbol}  
letter ::= "a"|"b"|...|"z"|"A"|...|"Z"  
digit ::= "0"|"1"|"2"|...|"9"  
symbols ::= "\_"  
character = letter|digit|symbol|">"|"<"|"="|"!"|"-"|"+"|"\*"|"/"|"%"|";"|"^"|","|"}"|"{"|"("|")"|"["|"]"  
  
fa ::= states"\n"alphabet"\n"initial\_state"\n"final\_states"\n"transitions  
  
states ::= id | id","id  
alphabet ::= character | character","character  
initial\_state ::= id  
final\_states ::= id | id","id  
  
transitions ::= transition | transition"\n"transition  
transition ::= id","set\_of\_chars","set\_of\_transitions  
set\_of\_chars ::= character | character{"."character}  
set\_of\_transitions ::= id | id"."id

**Implementation:**

**Text

Description automatically generated**

class FiniteAutomaton   
 //states of the FA  
 List<String> states;  
 //final states of the FA  
 List<String> finalStates;  
 //the alphabet  
 List<String> alphabet;  
 //Map of transitions: the key is composed of the start state and the character  
 // and the value is a set of the destination states  
 Map<Map.Entry<String, String>, Set<String>> transitions = new HashMap<>();

//initial state  
 String initialState;

//Constructor that reads the FA from a file  
public FiniteAutomaton(String file)

//Wrapper that calls the recursive function that accepts the sequence with the initial state  
public Boolean isAccepted(String sequence)

//Recursive function that accepts the sequence  
//if the sequence is empty and the current state is in the final states it returns true, otherwise false  
//if there is no transition available from the current state then returns false

//if there are transitions available it checks recursive all possible transitions available with the given char  
Boolean isAcceptedRecursive(String sequence, String currentState)

class Scanner

//similar to patterns but each value is a function that returns true if the string is of the type in the key

//replaces the patterns map in the implementation of the scanner

Map<Type, Function<String, Boolean>> acceptors = Map.ofEntries(  
 new AbstractMap.SimpleEntry<Type, Function<String, Boolean>>(Type.ID, (s)-> idFA.isAccepted(s)),  
 new AbstractMap.SimpleEntry<Type, Function<String, Boolean>>(Type.INT, (s)-> integerFA.isAccepted(s)),  
 new AbstractMap.SimpleEntry<Type, Function<String, Boolean>>(Type.CHAR, (s)->s.matches("^'[a**-**zA**-**Z0**-**9\_]'$")),  
 new AbstractMap.SimpleEntry<Type, Function<String, Boolean>>(Type.BOOL, (s)->s.matches("^true|false$")),  
 new AbstractMap.SimpleEntry<Type, Function<String, Boolean>>(Type.STRING, (s)->s.matches("^**\"**[a**-**zA**-**Z0**-**9\_\\s]\***\"**$")),  
 new AbstractMap.SimpleEntry<Type, Function<String, Boolean>>(Type.FLOAT, (s)->s.matches("^[+-]?(([1**-**9][0**-**9]\*)|0)\\.([0**-**9][0**-**9]\*)$"))  
);

**Testing**

FA\_id.in

q0,q1  
a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z,0,1,2,3,4,5,6,7,8,9,\_  
q0  
q1  
q0,a.b.c.d.e.f.g.h.i.j.k.l.m.n.o.p.q.r.s.t.u.v.w.x.y.z.A.B.C.D.E.F.G.H.I.J.K.L.M.N.O.P.Q.R.S.T.U.V.W.X.Y.Z,q1  
q1,a.b.c.d.e.f.g.h.i.j.k.l.m.n.o.p.q.r.s.t.u.v.w.x.y.z.A.B.C.D.E.F.G.H.I.J.K.L.M.N.O.P.Q.R.S.T.U.V.W.X.Y.Z.0.1.2.3.4.5.6.7.8.9.\_,q1

FA\_integer.in

q0,q1,q2,q3  
+,-,0,1,2,3,4,5,6,7,8,9  
q0  
q1,q3  
q0,0,q1  
q0,+.-,q2  
q0,1.2.3.4.5.6.7.8.9,q3  
q2,1.2.3.4.5.6.7.8.9,q3  
q3,0.1.2.3.4.5.6.7.8.9,q3

Sequence: 0

Is accepted: true

Sequence: +0

Is accepted: false

Sequence: 1230

Is accepted: true

Sequence: +1

Is accepted: true

Sequence: -123

Is accepted: true