

Raul-Mihai Rusu

Group 937

Github Link: <https://github.com/RaulRusu/FLCD2023/tree/feature/FA>

FA class representation:

States: list of string

InputSymbols: List<string>

InitialStates: string

FinalStates: List<string>

TransitionFunction: List<Transition> where a

Transition has a StartingState (string), EndingState (string),  
and Symbol (string)

Helper data structures for the function that verifies if a sequence is accepted by the FA:

StatesToIndexMapping: Dictionary<string, int> stores the mapping of the states from strings to a give unique index represented as an int. This is used to make the make the algorithm access data faster on a 2d array.

GraphRepresentation: List<List<NodeSymbolPair>> where a

NodeSymbolPair Node(int) Symbol(string)

This is a graph representation of the FA where:

looking at a data structure as a 2d array with dynamic size for each row:

each value j in a row i represents the transitions from the node i to node j with a specific symbol.

Accepts function (verifies if a sequence is accepted by the FA)

Params: sequence (**string**) the given sequence to match.

$dp[row, col]$  is true if for the given sequence:

row takes value from 0 to  $\text{len}(\text{sequence})$

col takes value from 0 to the number of states -1

if a continuous subsequence of length row (starting at the first element of the sequence) is partially accepted, and we end up in the State with the index col.

False otherwise.

We observe that for a given row and col  $dp[row, col]$  can be calculated using  $dp[row - 1, x]$  where x takes value from the set of number  $\{0 \dots \text{number of states} - 1\}$ .

$dp[0, ST]$  is set to true, where ST is the index of the Starting State

Or for a given row and col using  $dp[row, col]$  we can calculate values of  $dp[row + 1, tx]$  where tx is the set formed from the indexes of the states after applying the transition function on state col that match the symbol on the position row+1 in the sequence with the symbol of the transition.

The sequence is accepted by the FA if on  $dp[\text{len}(\text{sequence}), FS]$  there is found at least a true, FS takes value from the set of indexes corresponding to the Final States of the FA.

FA-in ebnf:

Letter = "a" | "b" | ... | "z" | "A" | "B" | ... | "Z"

Digit = "0" | "1" | ... | "9"

Sign = "-" | "+" | "\_"

Character = Letter | Digit

Word = {Character}

AllCharacters = Letter | Digit | Sign

File = States "\n" Alphabet "\n" StartingState "\n" FinalStates "\n"  
Transitions

State = Word

Transition = State " " State " " Symbol

Symbol = AllCharacters | 0...9 | 1...9 | a...z | A...Z

States = {State " "}

Alphabet = { AllCharacters " "}

StartingState = State

FinalStates = {State " "}

Transitions = { Transition "\n"}