**ECE374 Assignment 3**

Due 02/13/2023

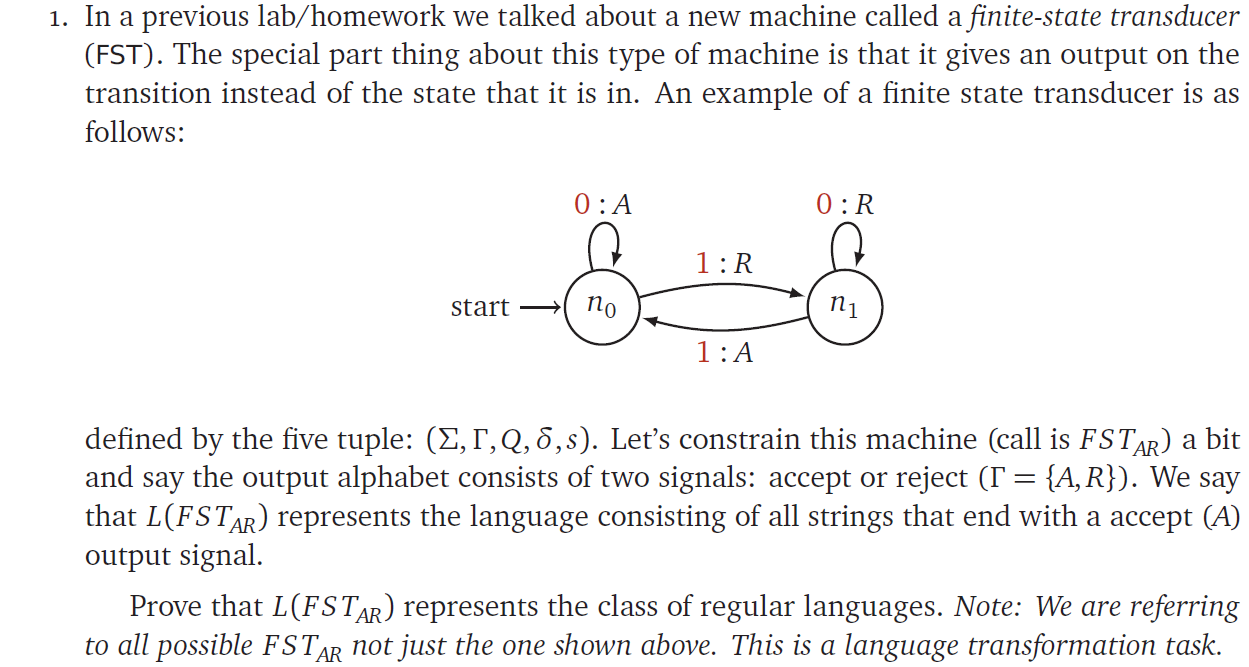
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**Problem 1**

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Solution:

**I.**

For a , we have the following definition:

in which

is the set of input symbols in this language;

represents whether entering this state via a certain transition is considered accepting;

is the set of states;

is the starting state;

is the set of all transitions, where:

, which indicates that this takes in a symbol *a* at state and transitions to the new state while outputting a signal indicating whether it’s accepting or rejecting.

Therefore, we could construct a DFA based on this that

is the set of input symbols in this language;

is the set of states that represents both the current in the and also whether this state is considered accepting or not.

, marking the start state to be “Rejecting” when the hasn’t taken in any input symbols.

, marking the accepting state of this DFA to be all states with the ***Accept*** flag, which indicates that in the original , the input string finally arrives at the last state via a final transition outputting “Accept”.

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For arbitrary

(1)

If in the transition rules of we have ;

(2)

If in the transition rules of we have ;

(3)

If in the transition rules of we have ;

(4)

If in the transition rules of we have ;

Therefore, we could determine that is regular, that is, given a language that is represented with a , we could prove that it’s regular.

**II.**

Reversely thinking, we could also transform an arbitrary regular language, in the form of a DFA, to a with the following method.

Given an arbitrary regular language L in the form of a DFA

We have

is the set of input symbols in this language;

is the set of states;

is the starting state;

is the set of all accepting states;

is the set of all transitions, where:

, which indicates that M takes in a symbol *a* at state and transitions to the new state .

We could construct a based on M that

is the set of input symbols;

is the set of states in the ;

is the starting state;

, marking whether this transition, if as the last transition of the input string, would take it to an accepting state or a rejecting state.

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For

(1) , if

If the next state lead by this transition is accepting, output accepting;

(1) , if

If the next state lead by this transition is not accepting, output rejecting;

Therefore, we could determine that is regular, that is, given an arbitrary regular language, we could prove that it could be represented in the form of a .

In a nutshell, we could prove that represents the class of regular languages.