**ECE374 Assignment 3**

Due 02/13/2023

**Group & netid**

*Chen Si chensi3*

*Jie Wang jiew5*

*Shitian Yang sy39*

**Problem 4**

文本

中度可信度描述已自动生成

**Solution:**

To prove that all-NFAs recognize the class of regular languages, we turn this statement into two statements:

1. ***all-NFA can accept all regular languages.***
2. ***if language belongs to all-NFA, then it is regular.***

**I. regular DFA -> all-NFA**

These can be proved easily, because for a DFA , we have the following definition:

DFA

in which,

is the set of states,

is the set of input symbols in this language,

is the set of all transitions,

is the starting state,

*A* is the set of accepting states.

Since every regular language has a DFA, which can be transformed into NFA, and by the definition of all-NFA, this NFA must be an all-NFA,

Then, we could determine that is regular, that is, given a regular language that is represented with a DFA, we could prove that it’s all-NFA i.e. all-NFA accepts regular languages.

**II. *all-NFA***

Reversely thinking, we could also transform an arbitrary all-NFA language into the form of a DFA with the following method:

Given an arbitrary regular language L in the form of M

We have

is the set of input symbols in this languae,

is the set of states,

is the starting state,

is the set of all states transferring to acceptable state,

is the set of all transitions, where:

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

We could construct a DFA based on M that：

***Ø*** is the set of states in the all-NFA, P(Q) is a power set of Q, Ø is the empty set (the rejecting state),

is the set of input symbols,

is the starting state,

where all for all

=

For

(1) for some **, because the original all-NFA may not fit in every transition. So , we deal with those -reach paths by simply rejecting them into**

(2)

Therefore, we could determine that is regular, that is, given an arbitrary all-NFA, we can turn it into DFA and prove its regularity.

In a nutshell, we could prove that ***all-NFA*** recognize the class of regular languages.