Monash University Faculty of Information Technology

程序代写代做 CS编程辅导
FIT201台 Theory of Computation

Computation

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Assignment Project Exam Help slides by Graham Farr based in parting prayious slides by David Albrecht

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Overview

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- Definition
- ► How they are used to define languages
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- Representations
- Complement Languages

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➤ Comparison with Regular Expresisionsrcs@163.com

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Finite Automaton (FA)

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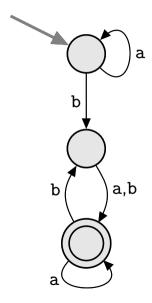


- ► Sometimes known as a **Deline Lic Finite Automaton (DFA)**.
- Used for determining whether a word does or does not belong to a Regular Language.
- ► Used for defining a Regula Assignment Project Exam Help
- Used in Lexical Analysers. Email: tutorcs@163.com

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Notation and terminology

...and Alternative notation



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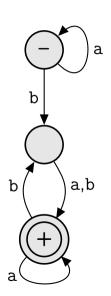
state repressed to the second second

- ► Start State
- ► WeChat; estutores

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transitions 49389476
represented as directed edges, https://tutorcs.com
labelled by letters



Finite automaton: definition

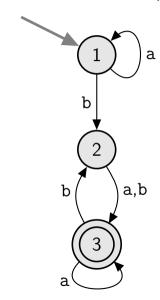
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- A finite set of states
 - One called the Start Stall 3 3 3
 - Some (maybe none) called Final States
- An alphabet of possible input letters
- ► A finite set of transitions Assignment Project Exam Help
 - that tell, for each state Endailschulenter@1the.cophabet, which state to go to next.
 - There is a unique transition from any state for each letter in the alphabet.

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Finite automaton: representations



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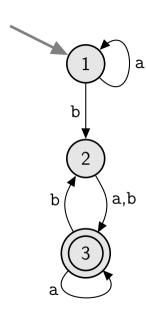


Every string traces a unique path in the automaton, starting from the Start State and following the transitions, letter by letter.

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Algorithm 1: Execution of a First matter matter			
Input: a string			
Begin at the Start State.	E315 WAC#2		
while there is another input Read the next letter of the Move along the directed e			
if you're in a Final State the Accept input string.			
else	QQ: 749389476		
Reject input string.	https://tutores.com		

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Every string traces a unique partial automaton, starting from the Start State and following the transitions, letter

Definitions

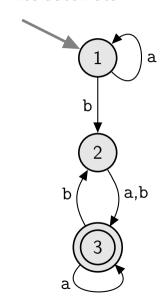
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A string is accepted by a FA if its path ends on a Final State.

Otherwise the string is **rejected**.

The language recognised by FAils the set of fall strings it accepts.

We say the FA recognises the language or accepts the language.



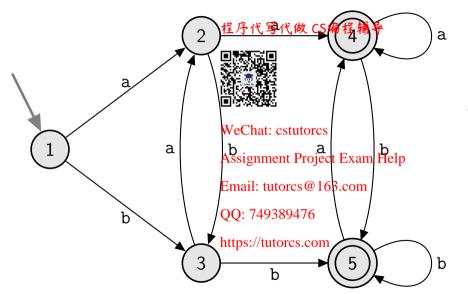
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		a	b
Start	1	2	3
	2	4	3
	3	2	5
Final	4	4	5
Final	5	4	5

Special Cases

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- ► All words accepted.
- No words accepted.

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- Only the empty word accepted.
- Only non-empty words accepted nment Project Exam Help
- ► A single word accepted. Email: tutorcs@163.com

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Complements

If L is a language over an alphabet, then its complement \overline{L} is the set of words over the alphabet that are not in L.

$$\square = \Sigma^* \setminus L$$

The complement of L is sometiment ted by L' or L^c .

Examples

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$$\overline{\emptyset} = \Sigma^* \qquad \qquad \overline{\Sigma^*} = \emptyset \qquad \text{Assign} \overline{\text{(word Project 3-letters)}} \text{ {words of } \geq 4 \text{ letters}}$$

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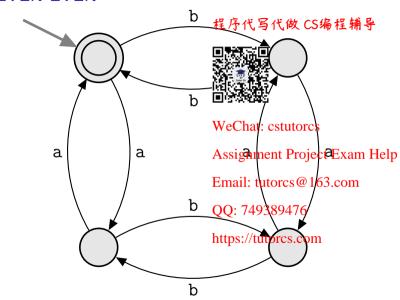
EVEN-EVEN := { strings that contain an even number of a's and an even number of b's } = {
$$\varepsilon$$
, aa, bb, aaaa, aabb, abab, abab, abab, ... }.

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$$\overline{\text{EVEN-EVEN}} := \{ \text{strings which contain an odd number of a's or an odd number of b's} \}$$

$$= \{ a, b, ab, ba, aaa, aab, aba, abb, baa, \dots \}$$

EVEN-EVEN



Complement Finite Automaton (FA)

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Suppose some FA accepts the I

Change all the final states in the states, and all the non-final states to final states.

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This new FA now accepts all the strings not accepted by the original FA (i.e., all the words in \overline{L}), Assignment Project Exam Help

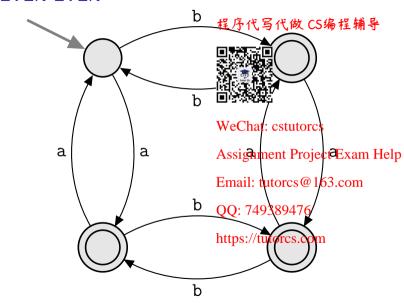
and rejects all the words that the noriginal accepted.com

(i.e., the words in L).

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So the new FA accepts \overline{L} .

EVEN-EVEN



Comparison with Regular Expressions

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It is (usually) easier

to write down a regular won that defines a language

than

than

to design a FA to accep

It is easier

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to check whether a given string is accepted by a **FA**Assignment Project Exam Help

to see whether it matches a regular expression

It is easier

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to find complements using a FA

than

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by using a regular expression.

Some Generalizations of Finite Automata

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This week:

- ▶ It is *not* required that, for **!** te and letter, there is a *unique* transition.
- It can change state withou a letter.
- It can read more than one least at a time

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It can read strings which nasting Pexistes Holpust single letters.

Later:

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- Each transition can produce Quitput letters as well as changing state. (transducer)
- Transitions can read and writes etters from some kind of memory.
- ► For a given state and letter, the next state is chosen *probabilistically*.

Nondeterministic Finite Automaton (NFA)

NFA are defined like a Finite A 推场流域 (代徵) & 编程 精丹 ransitions.

Transitions

- For some states and letter at a transition.
- ▶ The labels may include the empty word ε .

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So for a given letter and state there may be:
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No transition

More than one transition Email: tutorcs@163.com

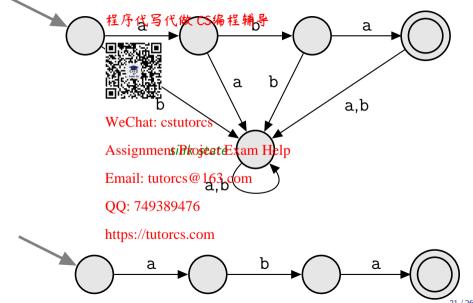
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For a given string, the path it takes https://tiutorcs.com

- might not exist
- might not be unique

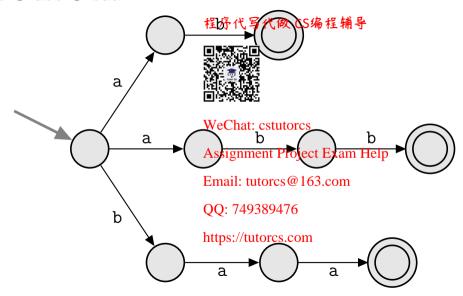
aba

FA

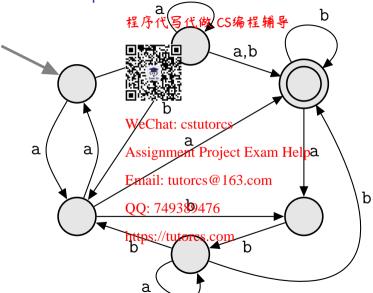


NFA

$ab \cup abb \cup baa$



Is abbbabbabba accepted?



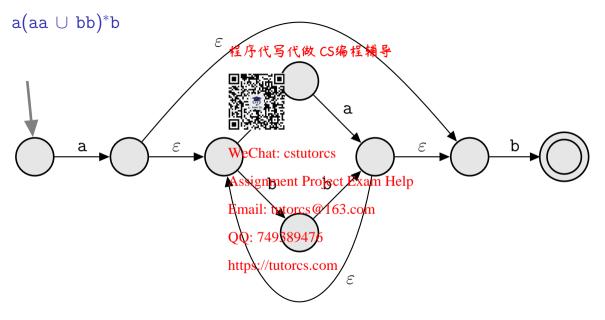
Properties

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- If there is no transition for the state the machine crashes.
- Paths from the Start State 🖫 🛪 🎢 al State for a given input:
 - One
 - None

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- Several (Nondeterministic) signment Project Exam Help
- Accept a string if there is at least one path from the Start State to a Final State.
- Reject a string if there are **no** paths from the Start State to a Final State.
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Revision

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Finite Automata (FA)

- Definition. How to use the
- ► How to construct a Finite on to accept a language.

Complement Languages

► What they are. Designing FA to accept them.

Nondeterministic Finite Automatasian Project Exam Help

- Definition. How to use the mail: tutorcs@163.com
- How to construct a Nondeterministic Finite Automaton to accept a language.

https://tutorcs.com Reading: Sipser Ch 1.