CPSC-406 Report

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Abstract

Contents

1 Introduction

2 Week by Week

2.1 Week 1

1. Automata

- machine model which has variety of computations without memory - traversal (trees, graphs, nodes) - Turing machine - traffic light

- parking machine - mechanical calculators - streaming - regular expressions (regex): such as NLP, parsing, coding theory, file management

automata: implement algorithms, admit algorithmic instructions.

2. Computability And complexity

- universal language to analyze algorithms/problems/computations for: - efficiency/(runtime, spacetime, etc) resource/scaling - comparison between complexity, hardness of problems - complexity classes - big-o-notation - reducing problems - P vs NP, sat problems

3. Graph Algorithms

- network theory (data, mechanical, chemical, operations)

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1. Automata theory

states: positions: (head) $\overrightarrow{l}$ () $\overrightarrow{t}$ (end)

ex.1 parking machine: charge/hr = 25c accepted: coins, no change, no 1, 2c coins

states: - value paid so far (0) 0 -> [5,10,25]

ex.2 valid var names: 1. index 0: letter? 2. index n > 0: letter or digit or symbol

2.2 Week 2

Notes

Chapter 2.1 of ITALC discusses the basic model of computation that demonstrates the structure and components of finite automata. It explains that a finite automaton is a simple computational machine which is composed of a set of states, including a start state, and one or more end states. As the automaton reads an input, it transitions between states based on a set of rules, the transition functions. The section uses examples with simple intuition, such as an on/off switch, to show how a system can 'remember' essential information despite its simplicity. Also, it talks about the difference between deterministic and non-deterministic models. A deterministic model is one in which each state has a unique transition for each input, and a non-deterministic model is one where multiple transitions may be possible for one input. Although these two models are very different in practice, they recognize the same set of basic regular language.

Homework

Introduction to Automata Theory:

Homework: Characterize all the accepted words (i.e., describe exactly those words that get recognized).
Answer: [5, 5, 5, 5, 5], [5, 5, 5, 10], [5, 5, 10, 5], [5, 10, 5, 5], [5, 10, 10], [10, 5, 5, 5], [10, 5, 10], [10, 10, 5]

Homework: Characterize all the accepted words. Can you describe them via a regular expression?
Answer: Any word which ends in 'pay' will result in end state being unlocked

Deterministic and Non-Deterministic Finite Automata:

Homework: Determine for the following words, if they are contained in L_1, L_2, or L_3.
Answer:

word	A_1	A_2
aaa	no	yes
aab	yes	no
aba	no	no
abb	no	no
baa	no	yes
bab	no	no
bba	no	no
bbb	no	no

Homework: Consider the DFA from above: Consider the paths corresponding to the words w_1 = 0010, w_2 = 1101, w_3 = 1100.
Answer: w_1 and w_2 both achieve the end state

Comments and Questions

Because finite automata have limited memory, their ability to recognize more complex language patterns is restricted. Will the range of what is categorized as a finite automaton broaden over time? How could we modify automata to recognize more complex language?

2.3 Week 3

Notes

Homework

Comments and Questions

3 Synthesis

4 Evidence of Participation

5 Conclusion

References

[BLA] Author, Title, Publisher, Year.