

Kleene Algebra With Tests

Lecture 1 (Monday)

Topics

- Regular expressions
- Deterministic Automata
- Kleene's Theorem
- Brzowski Derivatives

Supporting material

See the Languages and Automata notes I posted on slack for intro material on the first 3 topics.

See Chapter 3 of <https://alexandrasilva.org/files/thesis.pdf> for a coinductive account of these concepts. It contains a proof of minimal steps to make the Brzowski automaton finite.

Additional references

This is a nice paper on derivatives
<https://www.khoury.northeastern.edu/home/turon/re-deriv.pdf>

A blog post on Antimirov:

<https://semantic-domain.blogspot.com/2013/11/antimirov-derivatives-for-regular.html#:~:text=However%2C%20in%201995%20Valentin%20Antimirov,%24c%20%5Ccdot%20s%24.>

Lecture 2 (Tuesday)

Topics

- Kleene Algebra — axioms and equivalence proofs
- Completeness proof (sketch) - Kleene Algebra with Tests - definition

Supporting

material: <https://www.cs.cornell.edu/~kozen/Papers/ka.pdf>

<https://www.cs.cornell.edu/kozen/Papers/kat.pdf>

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Additional references

To look at equivalence of DFAs and NFAs I recommend reading this POPL'14 paper or the CACM version:

<https://perso.ens-lyon.fr/denis.kuperberg/CR18/hkc.pdf> [POPL 14]

<https://cacm.acm.org/research/hacking-nondeterminism-with-induction-and-coinduction/>

Lecture 3 (Wednesday)

Topics

- Kleene Algebra with Tests
 - semantics with guarded strings
 - axioms and equivalence proofs
- NetKAT: definitions

Supporting material

<https://www.cs.cornell.edu/kozen/Papers/kat.pdf>

<https://www.cs.cornell.edu/kozen/Papers/ChenPucella.pdf>

<https://dl.acm.org/doi/10.1145/2578855.2535862#sec-supp>

Lecture 4 (Thursday) *Topics* NetKAT - axioms and semantics - Modelling a network and policy using NetKAT

Supporting

material <https://dl.acm.org/doi/10.1145/2578855.2535862#sec-supp>

<https://www.cs.cornell.edu/~jnfoster/papers/netk-at-coalgebra.pdf>

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