

Verification in Isabelle/HOL of Hopcroft's algorithm for minimizing DFAs including runtime analysis

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September 2023

Outline

1. Living in Munich

- 1.1 The city
- 1.2 Technical University of Munich

2. Hopcroft's algorithm

- 2.1 DFA minimization by example
- 2.2 To be named

3. The Refinement Framework

- 3.1 Principle
- 3.2 Application to Hopcroft's algorithm



Figure: Location of Munich



Figure: Some photos of Munich



Figure: Technical University of Munich (TUM), Garching campus



Figure: Technical University of Munich (TUM), Garching campus

















1. Living in Munich

1.1 The city

1.2 Technical University of Munich

2. Hopcroft's algorithm

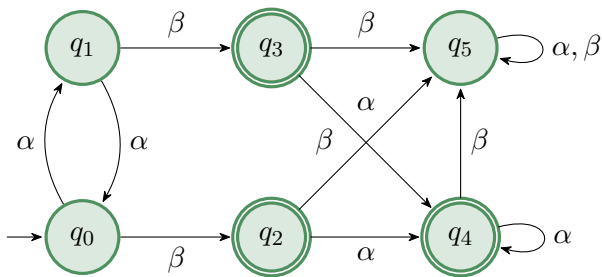
2.1 DFA minimization by example

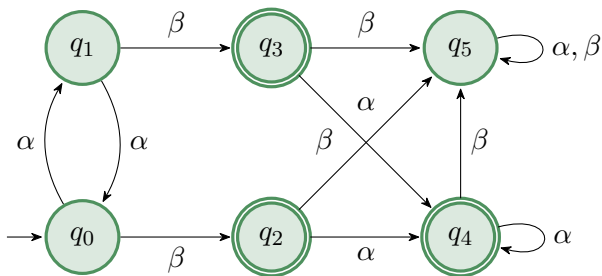
2.2 To be named

3. The Refinement Framework

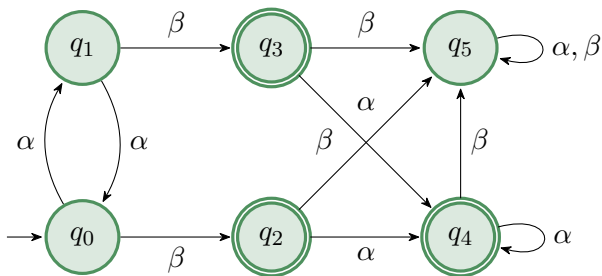
3.1 Principle

3.2 Application to Hopcroft's algorithm

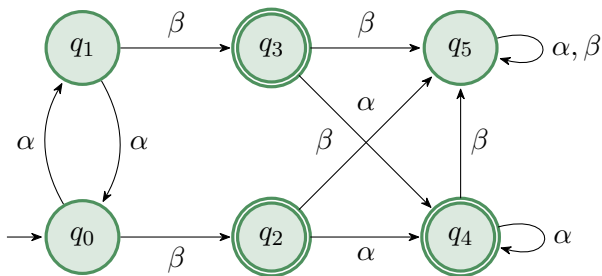




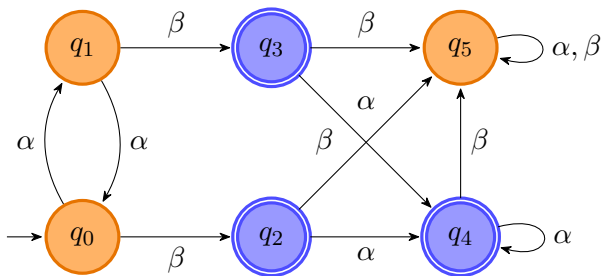
- Successively partitions the set of states into equivalence classes



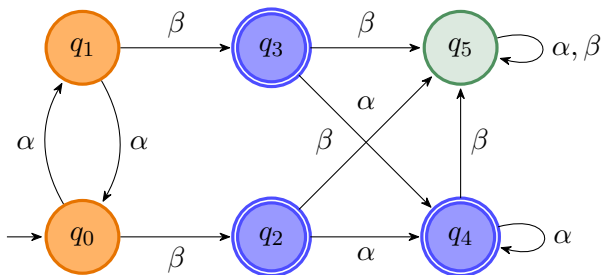
- Successively partitions the set of states into equivalence classes
- Initial partition: accepting and non-accepting states



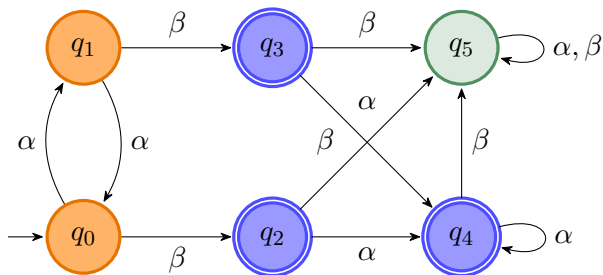
- Successively partitions the set of states into equivalence classes
- Initial partition: accepting and non-accepting states
- Each iteration: pick a splitter and split all blocks of the current partition



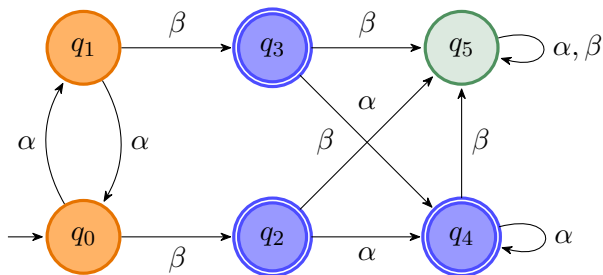
Splitter	Partition	Workset
—	$\{q_0, q_1, q_5\} \{q_2, q_3, q_4\}$	$(\alpha, \{q_0, q_1, q_5\}) (\beta, \{q_0, q_1, q_5\})$



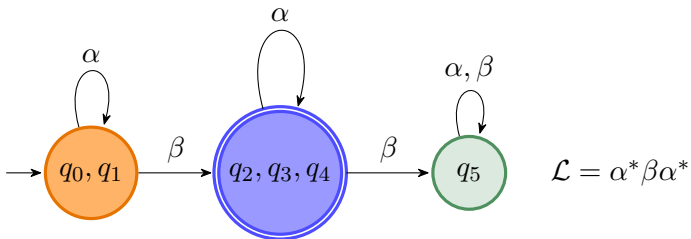
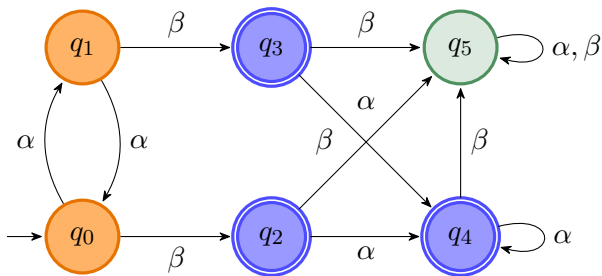
Splitter	Partition	Workset
—	$\{q_0, q_1, q_5\} \{q_2, q_3, q_4\}$	$(\alpha, \{q_0, q_1, q_5\}) (\beta, \{q_0, q_1, q_5\})$
$(\beta, \{q_0, q_1, q_5\})$	$\{q_0, q_1\} \{q_5\} \{q_2, q_3, q_4\}$	$(\alpha, \{q_0, q_1\}) (\alpha, \{q_5\})$



Splitter	Partition	Workset
—	$\{q_0, q_1, q_5\} \{q_2, q_3, q_4\}$	$(\alpha, \{q_0, q_1, q_5\}) (\beta, \{q_0, q_1, q_5\})$
$(\beta, \{q_0, q_1, q_5\})$	$\{q_0, q_1\} \{q_5\} \{q_2, q_3, q_4\}$	$(\alpha, \{q_0, q_1\}) (\alpha, \{q_5\})$
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Splitter	Partition	Workset
—	$\{q_0, q_1, q_5\} \{q_2, q_3, q_4\}$	$(\alpha, \{q_0, q_1, q_5\}) (\beta, \{q_0, q_1, q_5\})$
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$(\alpha, \{q_5\})$	$\{q_0, q_1\} \{q_5\} \{q_2, q_3, q_4\}$	\emptyset



Formalization

Coming soon

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