Adiar:

Binary Decision Diagrams in External Memory

Steffan Christ Sølvsten, Jaco van de Pol,
Anna Blume Jakobsen, and Mathias Weller Berg Thomasen

TACAS 2022

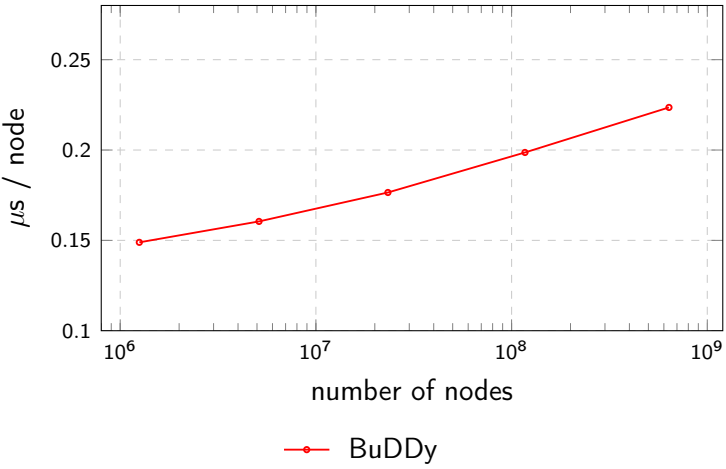


Figure 1: Minimal running time for the *Queens* problems.

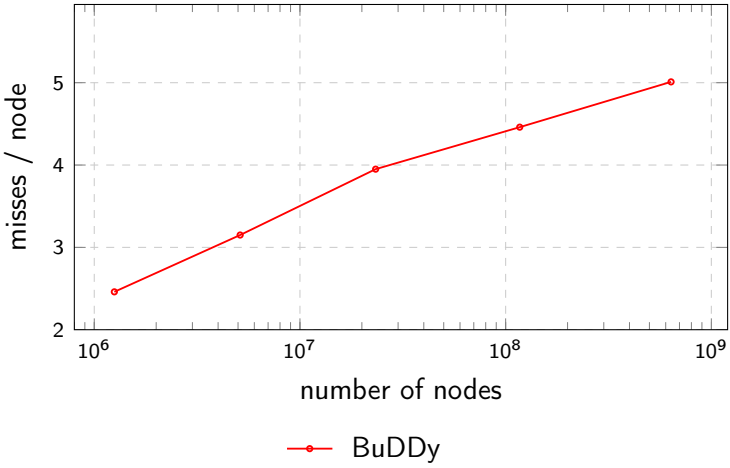
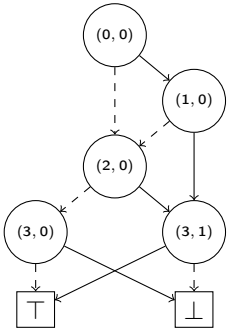


Figure 2: Cache-misses for the *Queens* problems.



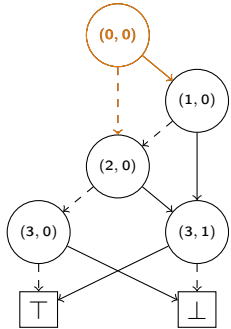
(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

Priority Queue: Q_{count}:

[

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

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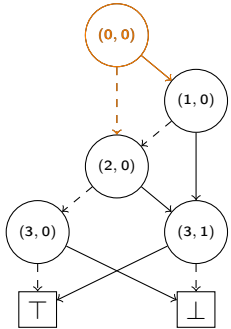
Priority Queue: Q_{count}:

[

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

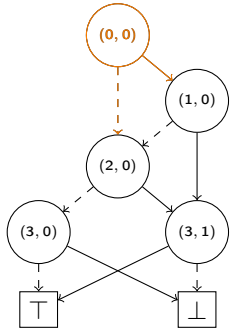
Figure 3: In-order traversal of BDD

Priority Queue: Q_{count}:

[$((0,0) \xrightarrow{\top} (1,0), \quad 1)$,

$((0,0) \xrightarrow{\bot} (2,0), \quad 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

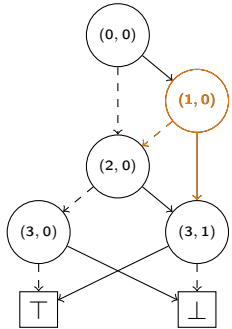
Seek	Sum	Result
$(1, 0)$	0	0

Priority Queue: Q_{count}:

[$((0,0) \xrightarrow{\top} (1,0),\ 1)$,

$((0,0) \xrightarrow{\bot} (2,0),\ 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

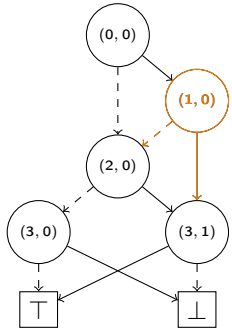
Seek	Sum	Result
$(1, 0)$	0	0

Priority Queue: Q_{count}:

[$((0,0) \xrightarrow{\top} (1,0),\ 1)$,

$((0,0) \xrightarrow{\bot} (2,0),\ 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

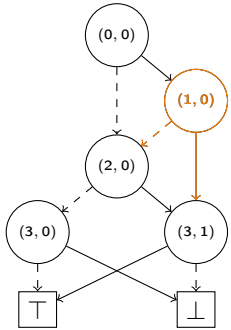
Seek	Sum	Result
$(1, 0)$	1	0

Priority Queue: Q_{count}:

[

$((0, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(1, 0)$	1	0

Priority Queue: Q_{count}:

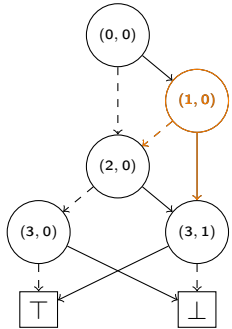
[

$((0, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

$((1, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(2, 0)$	0	0

Priority Queue: Q_{count}:

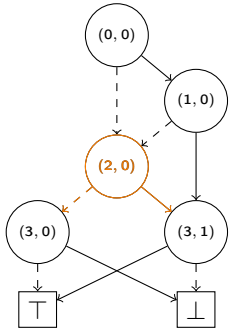
[

$((0, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

$((1, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(2, 0)$	0	0

Priority Queue: Q_{count}:

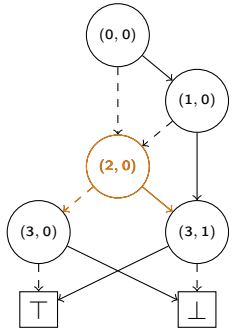
[

$((0, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

$((1, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(2, 0)$	1	0

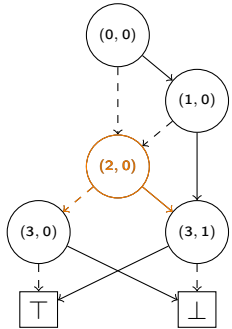
Priority Queue: $Q_{\textbf{count}}$:

[

$((1, 0) \xrightarrow{\perp} (2, 0), \quad 1)$,

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

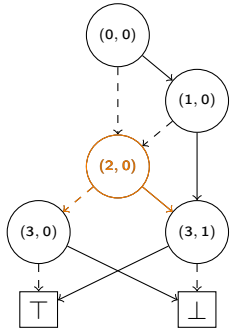
Seek	Sum	Result
$(2, 0)$	2	0

Priority Queue: Q_{count}:

[

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,

]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

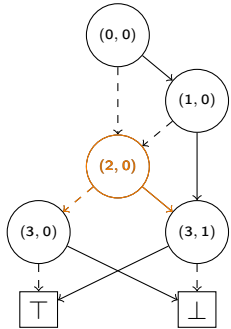
Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(2, 0)$	2	0

Priority Queue: Q_{count}:

[

$((2,0) \xrightarrow{\perp} (3,0), \quad 2)$,
$((1,0) \xrightarrow{\top} (3,1), \quad 1)$,
$((2,0) \xrightarrow{\top} (3,1), \quad 2)$]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

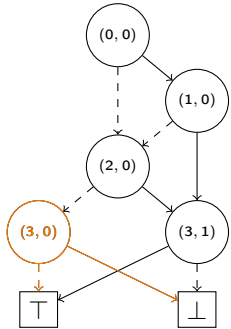
Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(3, 0)$	0	0

Priority Queue: Q_{count}:

[

$((2,0) \xrightarrow{\perp} (3,0), \quad 2)$,
$((1,0) \xrightarrow{\top} (3,1), \quad 1)$,
$((2,0) \xrightarrow{\top} (3,1), \quad 2)$]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

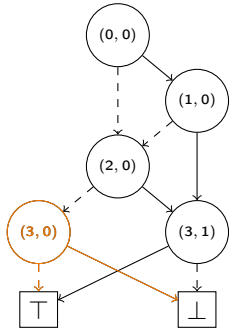
Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(3, 0)$	0	0

Priority Queue: Q_{count}:

[

$((2, 0) \xrightarrow{\perp} (3, 0), \quad 2)$,
$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,
$((2, 0) \xrightarrow{\top} (3, 1), \quad 2)$]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

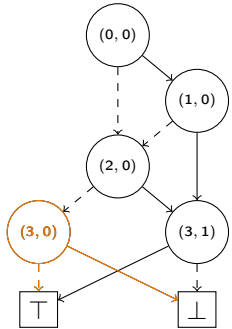
Seek	Sum	Result
$(3, 0)$	2	0

Priority Queue: Q_{count}:

[

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,

$((2, 0) \xrightarrow{\top} (3, 1), \quad 2)$]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

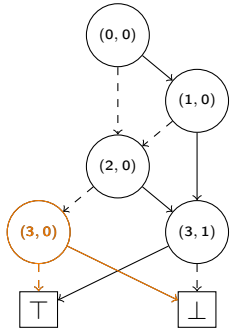
Seek	Sum	Result
$(3, 0)$	2	2

Priority Queue: Q_{count}:

[

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,

$((2, 0) \xrightarrow{\top} (3, 1), \quad 2)$]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

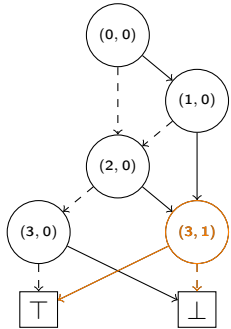
Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(3, 1)$	0	2

Priority Queue: Q_{count}:

[

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,
$((2, 0) \xrightarrow{\top} (3, 1), \quad 2)$]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

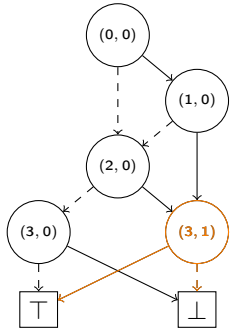
Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(3, 1)$	0	2

Priority Queue: Q_{count}:

[

$((1, 0) \xrightarrow{\top} (3, 1), \quad 1)$,
$((2, 0) \xrightarrow{\top} (3, 1), \quad 2)$]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

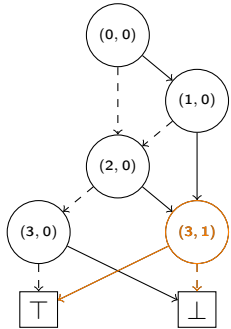
Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(3, 1)$	1	2

Priority Queue: Q_{count}:

[

$((2, 0) \xrightarrow{\top} (3, 1), \quad 2)$]



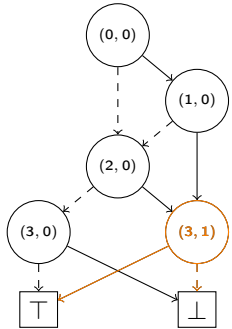
(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(3, 1)$	3	2

Priority Queue: Q_{count}:

[ ]



(a) $(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$

Figure 3: In-order traversal of BDD

Seek	Sum	Result
$(3, 1)$	3	5

Priority Queue: Q_{count}:

[ ]

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github.com/ssoelvsten/adiar

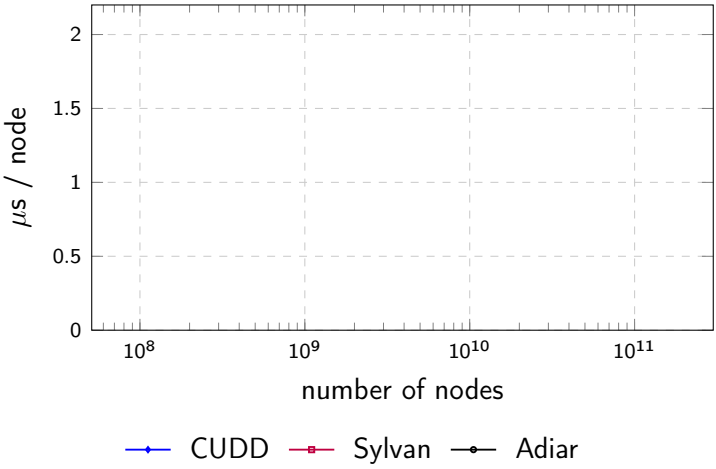

Figure 4: Minimal running time for the *Queens* problems.

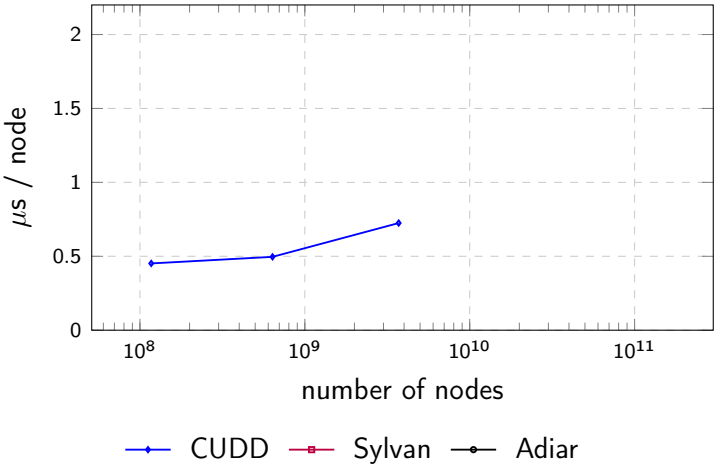

Figure 4: Minimal running time for the *Queens* problems.

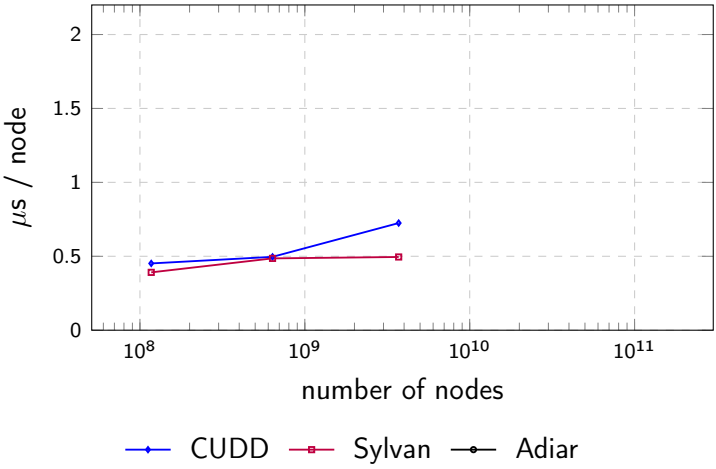

Figure 4: Minimal running time for the *Queens* problems.

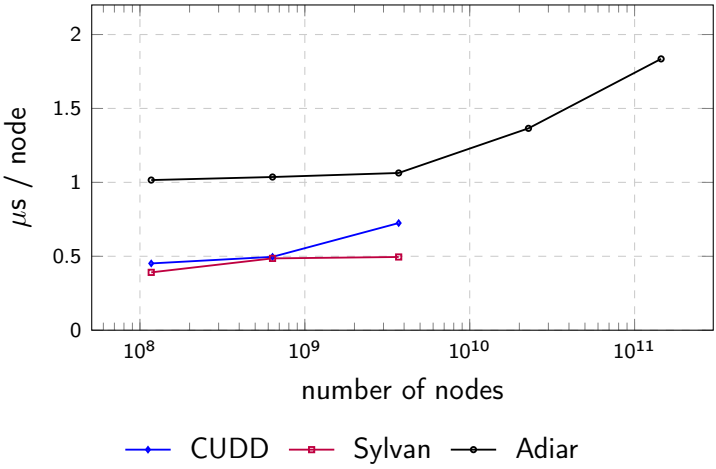

Figure 4: Minimal running time for the *Queens* problems.

Steffan Christ Sølvsten

soelvsten@cs.au.dk

@ssoelvsten

Adiar

github.com/ssoelvsten/adiar

ssoelvsten.github.io/adiar

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