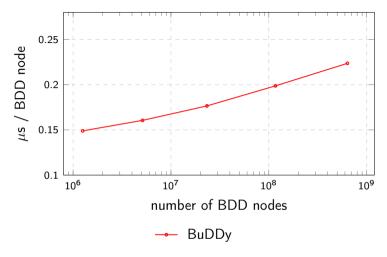
## **Adiar**

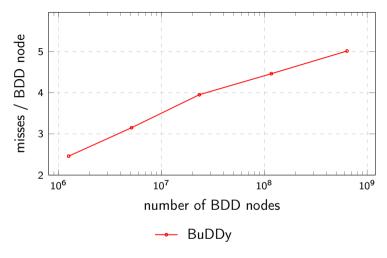
Binary Decision Diagrams in External Memory

**Steffan Christ Sølvsten**, Jaco van de Pol, Anna Blume Jakobsen, and Mathias Weller Berg Thomasen TACAS 2022

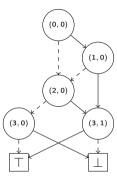




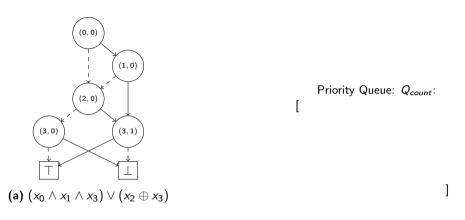
Minimal running time for the Queens problems.

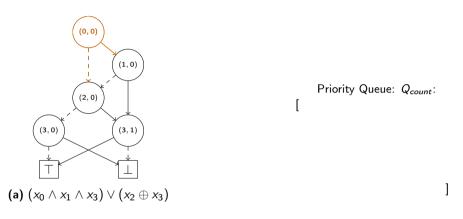


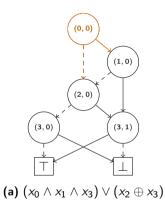
Cache-misses for the Queens problems.

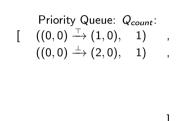


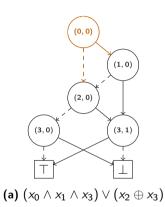
(a)  $(x_0 \land x_1 \land x_3) \lor (x_2 \oplus x_3)$ 







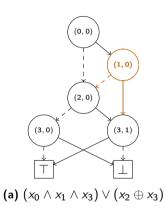




Seek	Sum	Result
(1,0)	0	0

Priority Queue: 
$$Q_{count}$$
:
$$[ ((0,0) \xrightarrow{\top} (1,0), 1), ((0,0) \xrightarrow{\perp} (2,0), 1),$$

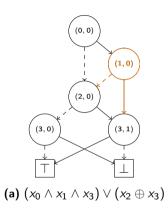
]



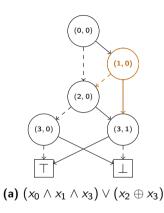
Seek	Sum	Result
(1,0)	0	0

Priority Queue: 
$$Q_{count}$$
:
$$[ ((0,0) \xrightarrow{\top} (1,0), 1), ((0,0) \xrightarrow{\perp} (2,0), 1),$$

]



See (1,0		um 1	Re	sul 0
[	Priority Q $((0,0) \xrightarrow{\perp}$			,
				]

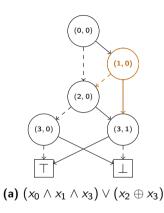


Seek	Sum	Result
(1,0)	1	0

Priority Queue: 
$$Q_{count}$$
:
$$((0,0) \xrightarrow{\perp} (2,0), \quad 1) \quad ,$$

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

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

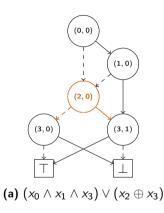


Priority Queue: 
$$Q_{count}$$
:

[

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

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

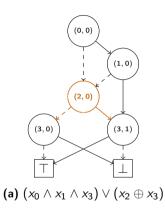


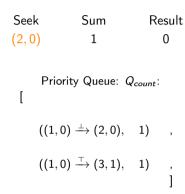
Seek Sum Result 
$$(2,0)$$
 0 0

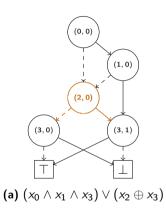
Priority Queue: 
$$Q_{count}$$
:
$$((0,0) \xrightarrow{\perp} (2,0), \quad 1) \quad ,$$

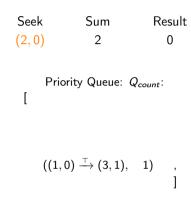
$$((1,0) \xrightarrow{\top} (2,0), \quad 1) \quad ,$$

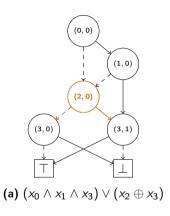
$$((1,0) \xrightarrow{\top} (3,1), \quad 1) \quad ,$$



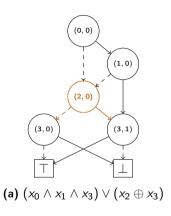




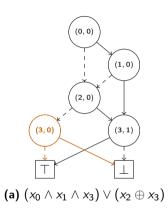




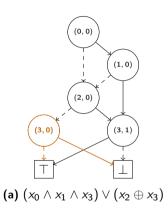
Seek (2, 0)	Sum 2	Result 0
Pri [	ority Queue: 0	Q <sub>count</sub> :
((2	0) 1, (3.0)	2)

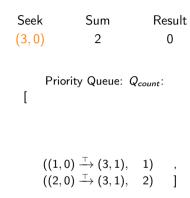


Seek (3, 0)		Result 0
[	Priority Queue	: Q <sub>count</sub> :
	$((2,0) \xrightarrow{\perp} (3,0)$ $((1,0) \xrightarrow{\top} (3,1)$ $((2,0) \xrightarrow{\top} (3,1)$	), 1) ,

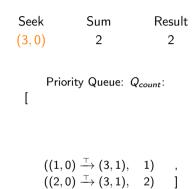


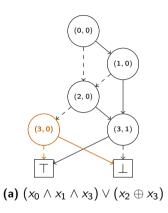
Seek (3, 0)	Sum 0	R	esul 0
Prio [	rity Queue:(	Rcount	:
((1,	$0) \xrightarrow{\perp} (3,0),$ $0) \xrightarrow{\top} (3,1),$ $0) \xrightarrow{\top} (3,1).$	2) 1) 2)	, , 1

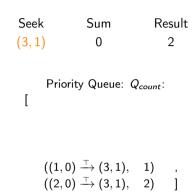


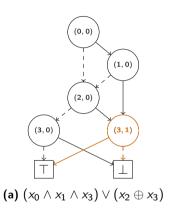


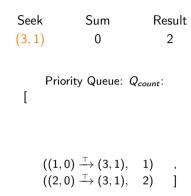


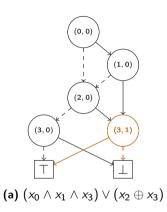








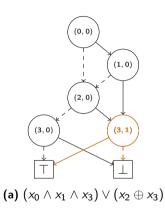


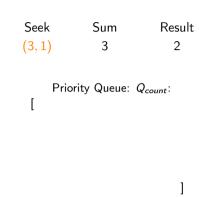


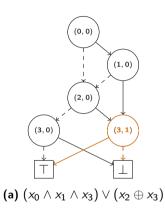


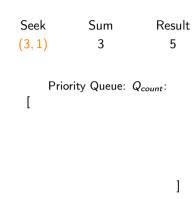
Priority Queue: Q<sub>count</sub>:

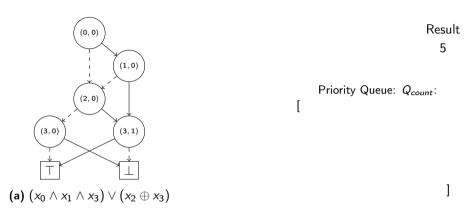
$$((2,0) \xrightarrow{\top} (3,1), \quad 2) \qquad ]$$





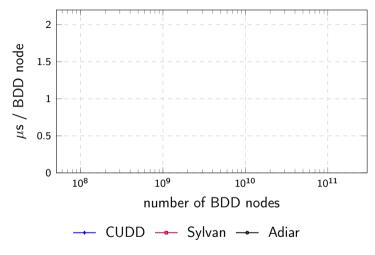




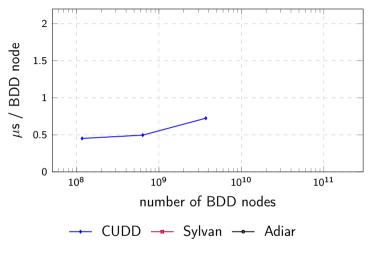


## **A**diar

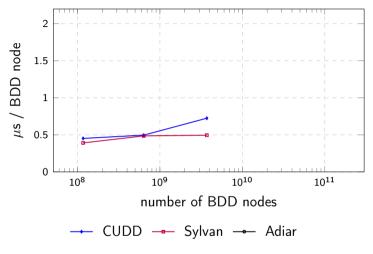
github.com/ssoelvsten/adiar



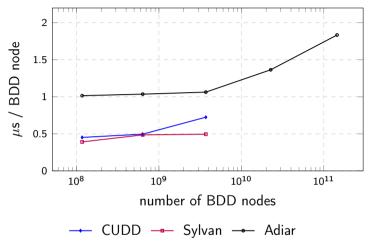
Minimal running time for the Queens problems.



Minimal running time for the *Queens* problems.



Minimal running time for the Queens problems.



Minimal running time for the *Queens* problems.

Algorithm	Time (s)
$f\leftrightarrow g\equiv \top$	0.38

Checking the (EPFL Benchmark) voter circuit's single output gate ( $|N_f| = |N_g| = 5.76$  MiB).

Algorithm	Time (s)
$f \leftrightarrow g \equiv \top$	0.38
$O(N \log N)$	0.058

Checking the (EPFL Benchmark) voter circuit's single output gate ( $|N_f| = |N_g| = 5.76$  MiB).

Algorithm	Time (s)		
$f\leftrightarrow g\equiv \top$	0.38		
$O(N \log N)$	0.058		
O(N)	0.006		

Checking the (EPFL Benchmark) *voter* circuit's single output gate ( $|N_f| = |N_g| = 5.76$  MiB).

## Steffan Christ Sølvsten

- soelvsten@cs.au.dk
- **y** @ssoelvsten

## **Adiar**

- github.com/ssoelvsten/adiar
- ssoelvsten.github.io/adiar

