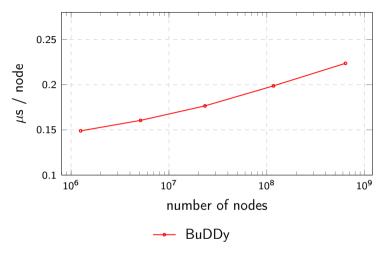
Adiar:

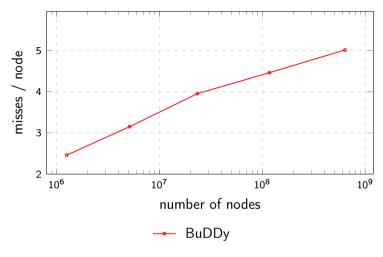
Binary Decision Diagrams in External Memory

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

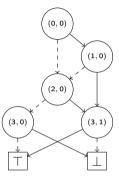




Minimal running time for the Queens problems.

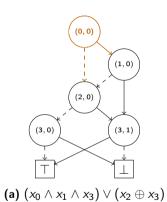


Cache-misses for the Queens problems.



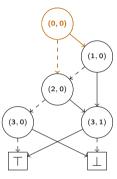
(a) $(x_0 \land x_1 \land x_3) \lor (x_2 \oplus x_3)$

Priority Queue: Q_{count} :



Priority Queue: Qcount:

•

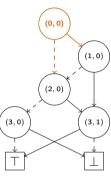


(a) $(x_0 \land x_1 \land x_3) \lor (x_2 \oplus x_3)$

Priority Queue: Qcount:

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

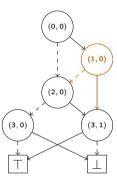
J



(3,0)	(3,1)
T	
(a) $(x_0 \wedge x_1 \wedge x_2 \wedge x_3 \wedge x_4 \wedge$	$(x_3) \vee (x_2 \oplus x_3)$

Seek	Sum	Result
(1,0)	0	0

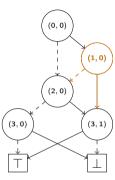
Priority Queue:
$$Q_{count}$$
:
$$[((0,0) \xrightarrow{\top} (1,0), 1) , ((0,0) \xrightarrow{\bot} (2,0), 1) ,$$



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

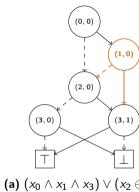
Seek	Sum	Result
(1,0)	0	0

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



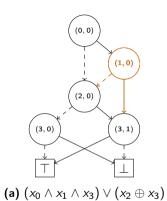
(a)	(x_0)	$\land x_1$	$\wedge x_3$)	\vee ((x_2)	\oplus	<i>X</i> 3
-----	---------	-------------	----------------	----------	---------	----------	------------

Seek (1, 0)	Sum 1	Resul 0	t
]	Priority Queue: Q_{co} $((0,0) \xrightarrow{\perp} (2,0),$		
		1	

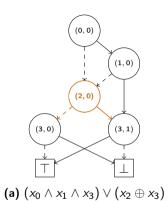


(3,1)	
$(x_3) \lor (x_2 \oplus x_3)$	

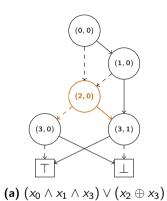
eek L, 0)	Sum 1		Result 0
]	Priority Queue: Q_c $((0,0) \xrightarrow{\perp} (2,0),$ $((1,0) \xrightarrow{\perp} (2,0),$	1)	: , ,
	$((1,0) \xrightarrow{\top} (3,1),$	1)	,]



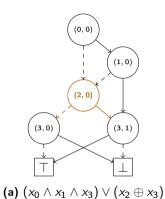
Seek 2, 0)	Sum 0		Resul 0
I	Priority Queue: Q_c $((0,0) \xrightarrow{\perp} (2,0), \\ ((1,0) \xrightarrow{\perp} (2,0), \\ ((1,0) \xrightarrow{\top} (3,1), \\$	1) 1)	:



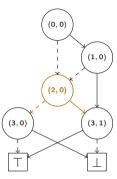
eek	Sum		Result
(2,0)	0		0
	Priority Queue: <i>Q</i>	ount	:
[$((0,0) \xrightarrow{\perp} (2,0),$ $((1,0) \xrightarrow{\perp} (2,0),$	1) 1)	,
	$((1,0) \xrightarrow{\top} (3,1),$	1)	, 1
			•



Seek (2, 0)	Sum 1		Resul 0
Į	Priority Queue: Q_c	ount	:
	$((1,0) \xrightarrow{\perp} (2,0),$	1)	,
	$((1,0) \xrightarrow{\top} (3,1),$	1)	, 1

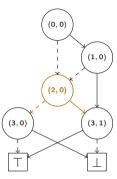


Seek Sum Result (2,0) 2 0



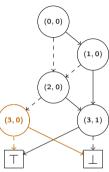
(a) $(x_0 \land x_1 \land x_3) \lor (x_2 \oplus x_3)$

Seek (2,0)	Sum 2	Result 0
ſ	Priority Queue: Q _{cour}	nt:
	$((2,0) \xrightarrow{\perp} (3,0), 2)$ $((1,0) \xrightarrow{\top} (3,1), 1)$ $((2,0) \xrightarrow{\top} (3,1), 2)$) ,



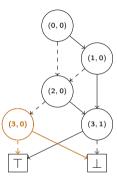
(a)
$$(x_0 \land x_1 \land x_3) \lor (x_2 \oplus x_3)$$

Seek (3,0)	Sum 0	Result 0
]	Priority Queue: <i>Qcoun</i>	ŧ:
	$((2,0) \xrightarrow{\perp} (3,0), 2)$ $((1,0) \xrightarrow{\top} (3,1), 1)$ $((2,0) \xrightarrow{\top} (3,1), 2)$,



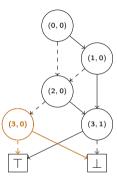
(a)
$$(x_0 \land x_1 \land x_3) \lor (x_2 \oplus x_3)$$

Seek (3, 0)	Sum 0	Result 0
[Priority Queue: Q _{co}	unt:
	$((2,0) \xrightarrow{\perp} (3,0),$ $((1,0) \xrightarrow{\top} (3,1),$ $((2,0) \xrightarrow{\top} (3,1),$	



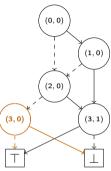
(a)
$$(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$$

Seek (3,0)	Sum 2	Result 0
]	Priority Queue: <i>Qcount</i>	;:
	$((1,0) \xrightarrow{\top} (3,1), 1)$ $((2,0) \xrightarrow{\top} (3,1), 2)$,]



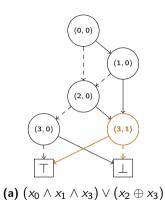
(a)
$$(x_0 \wedge x_1 \wedge x_3) \vee (x_2 \oplus x_3)$$

Seek (3,0)	Sum 2	Result 2
]	Priority Queue: <i>Q_{coun}</i>	ę:
	$((1,0) \xrightarrow{\top} (3,1), 1)$ $((2,0) \xrightarrow{\top} (3,1), 2)$, 1



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

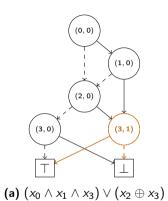
Seek Sum Result (3,1)0 2 Priority Queue: Qcount: $((1,0) \xrightarrow{\top} (3,1), \quad 1) \qquad ,$ $((2,0) \xrightarrow{\top} (3,1), \quad 2) \qquad]$



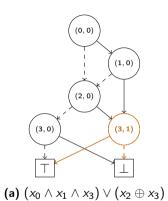
Seek Sum Result (3,1) 0 2

Priority Queue: Q_{count} :

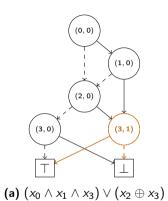
[$((1,0) \xrightarrow{\top} (3,1), 1) ((2,0) \xrightarrow{\top} (3,1), 2)]$



Seek	Sum	Result
(3,1)	1	2
]	Priority Queue: <i>Q_{coun}</i>	ie:
	$((2,0) \xrightarrow{\top} (3,1), 2)$)]



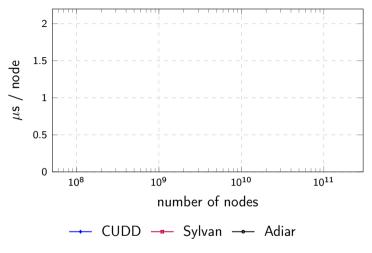
Seek (3, 1)	Sum 3	Result 2
]	Priority Queue: <i>Qcou</i>	int:
		1



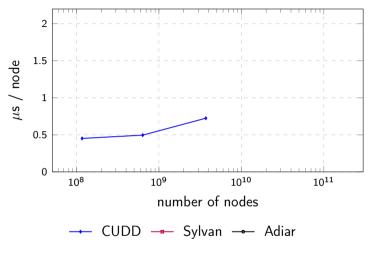
Seek (3, 1)	Sum 3	Result 5
[Priority Queue:	Q _{count} :
		1

Adiar

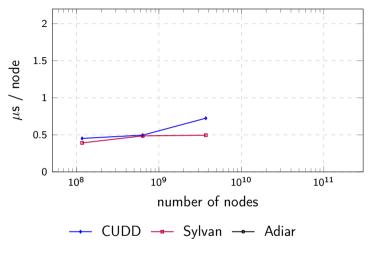
github.com/ssoelvsten/adiar



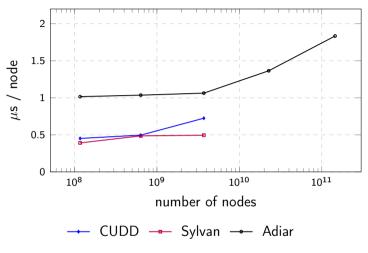
Minimal running time for the *Queens* problems.



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Minimal running time for the *Queens* problems.

Steffan Christ Sølvsten

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y @ssoelvsten

Adiar

github.com/ssoelvsten/adiar

