

NEW HEX PATTERNS FOR FILL AND PRUNE

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computing.science university of alberta

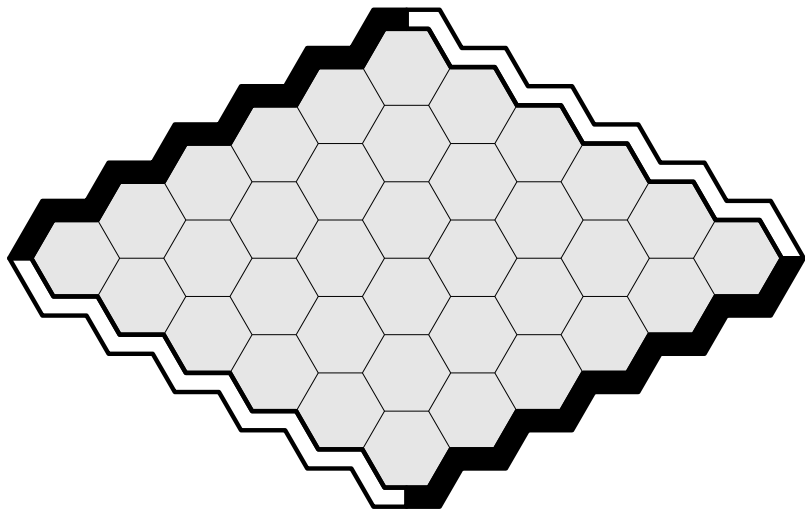
ACG 2019

THANKS

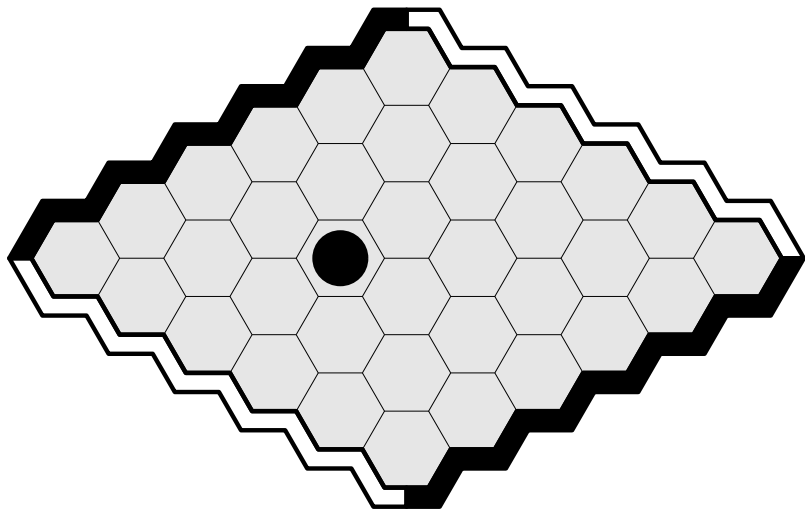
- Chao Gao, Martin Müller
- NSERC
- Abdallah Saffidine for giving this talk in Macau

HEX

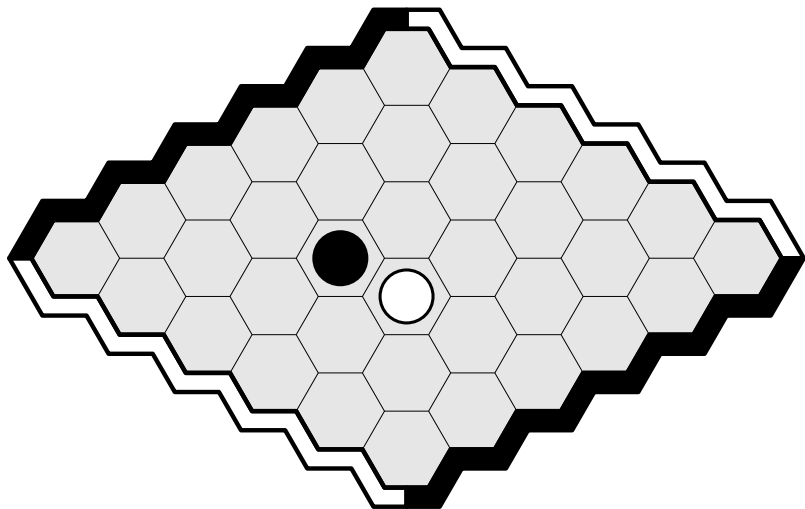
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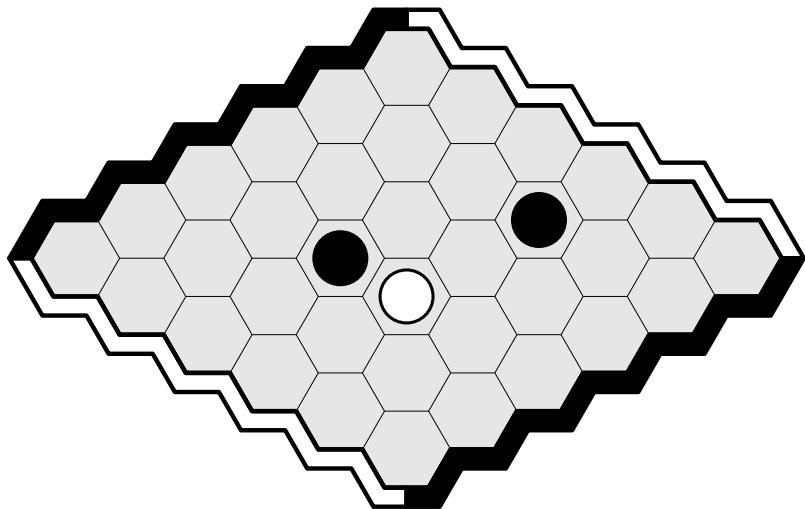
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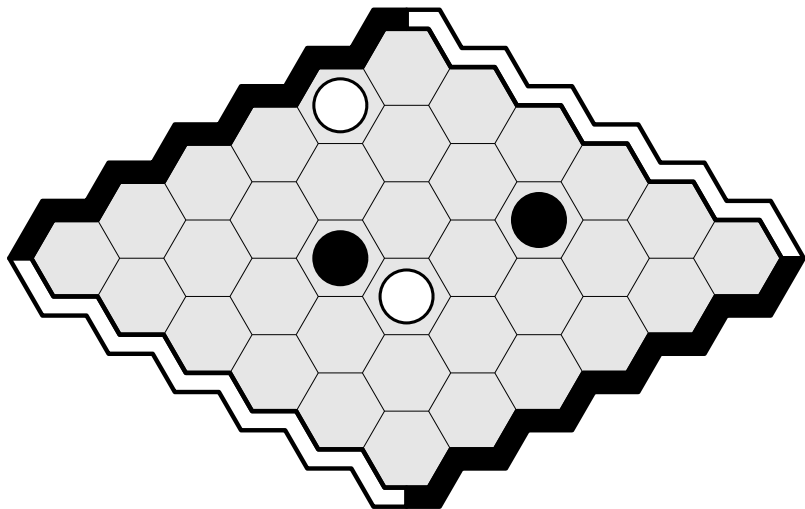
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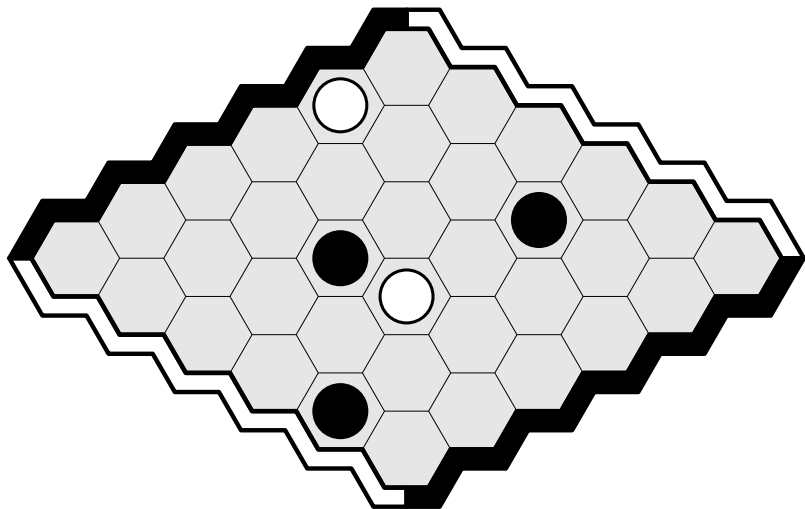
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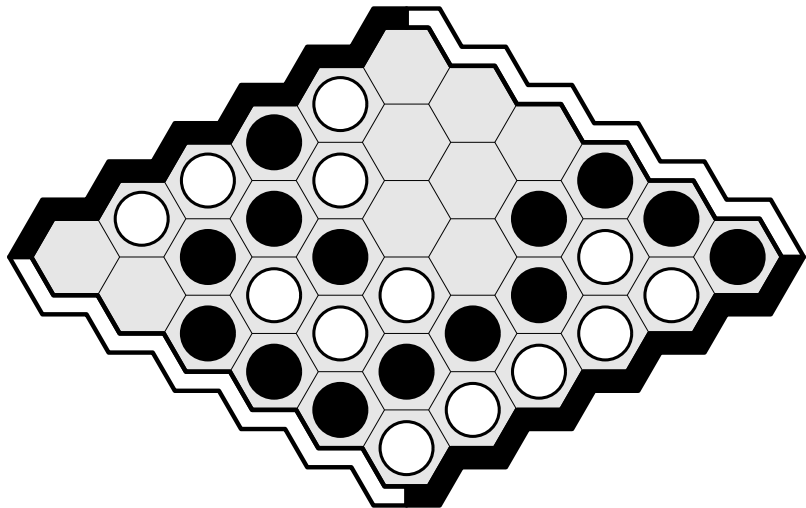
HEX



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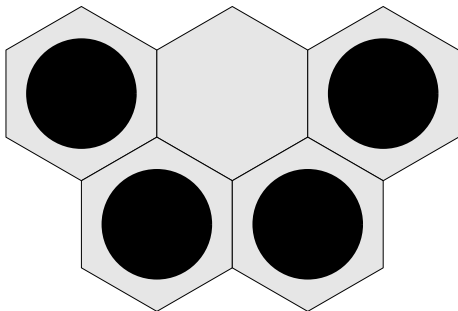


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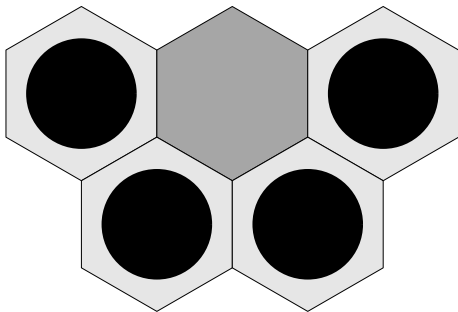


DEAD: FILL

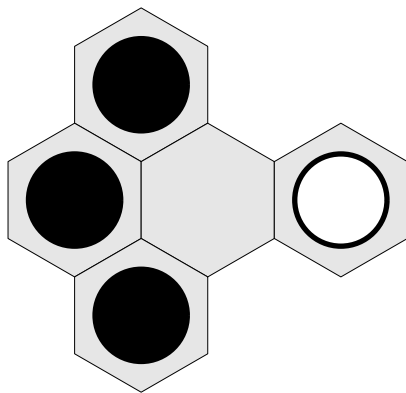
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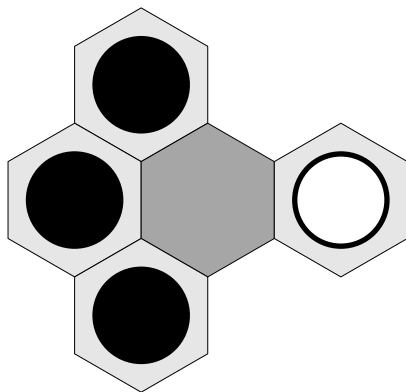
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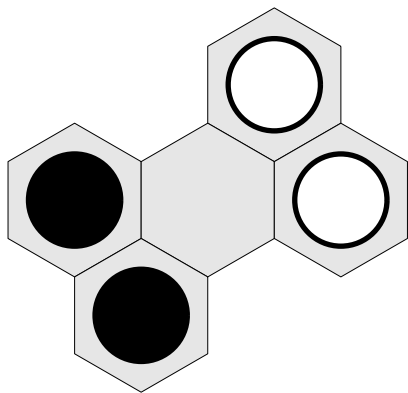
DEAD: FILL



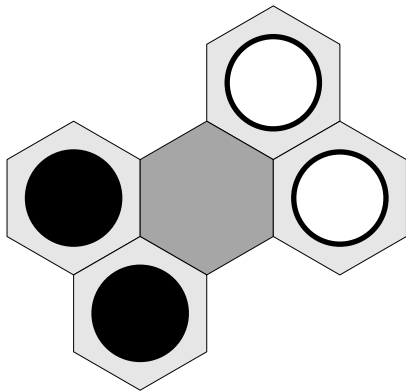
DEAD: FILL



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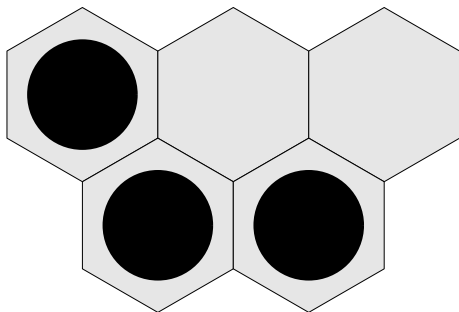


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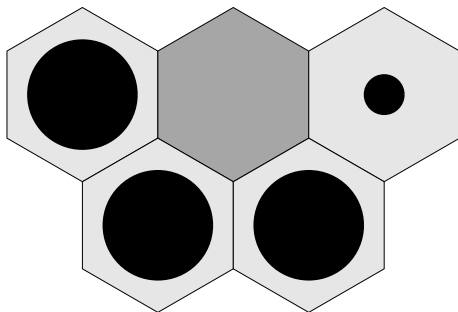


VULNERABLE: PRUNE

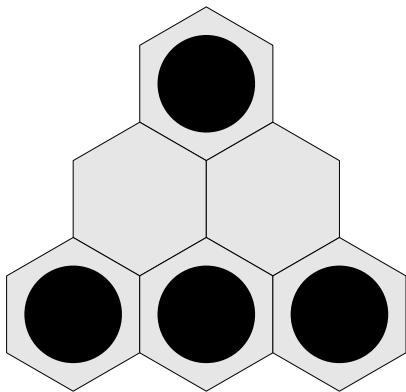
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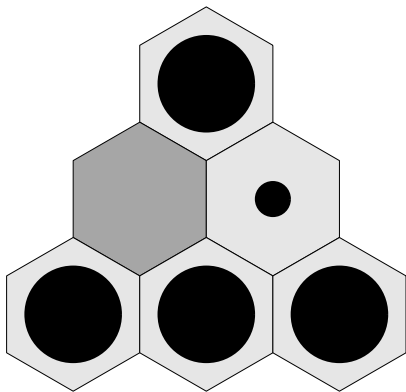
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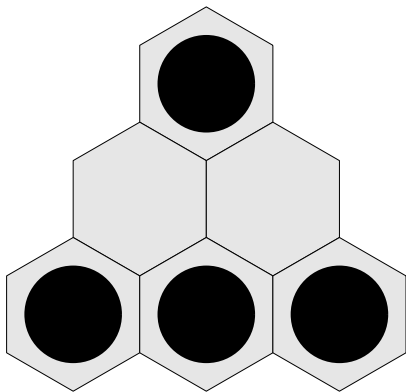
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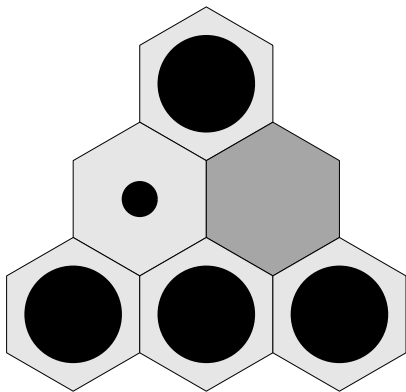
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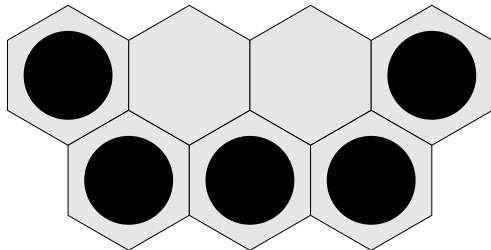
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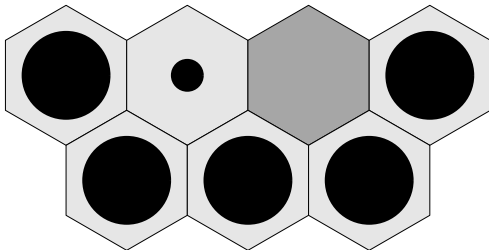
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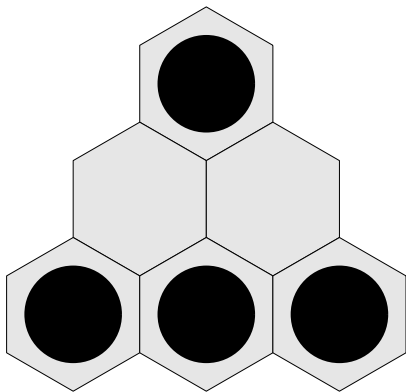


VULNERABLE: PRUNE

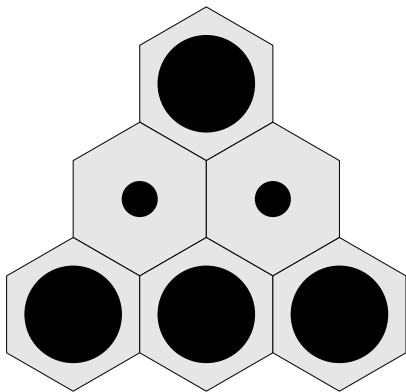


CAPTURED: FILL

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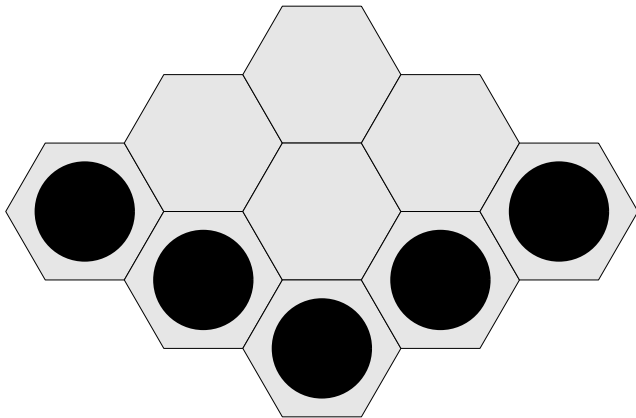


CAPTURED: FILL

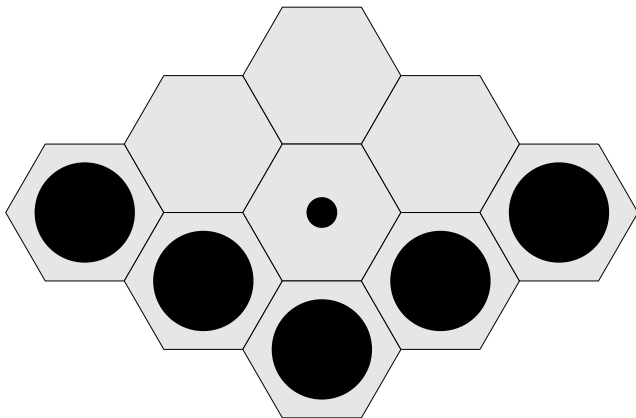


PERMANENTLY INFERIOR: FILL

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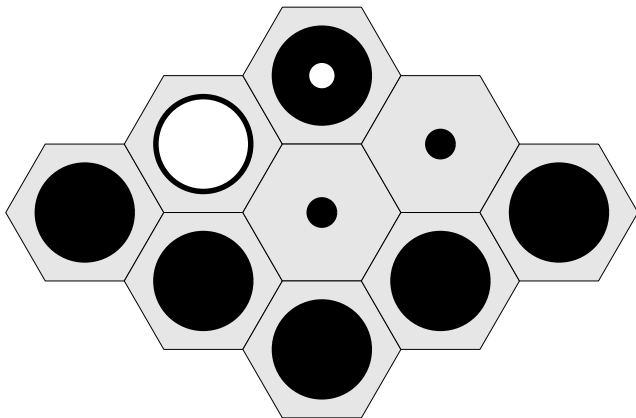


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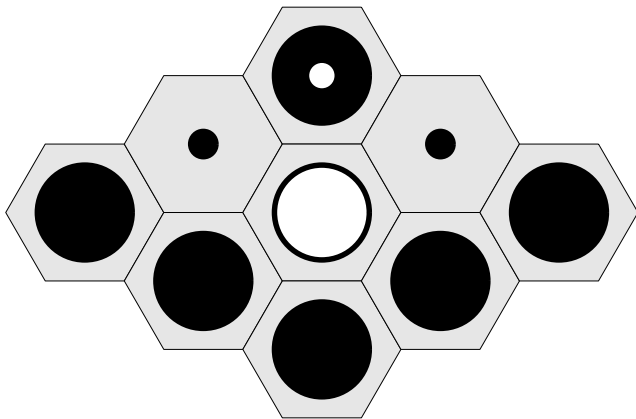


PERMANENTLY INFERIOR: FILL

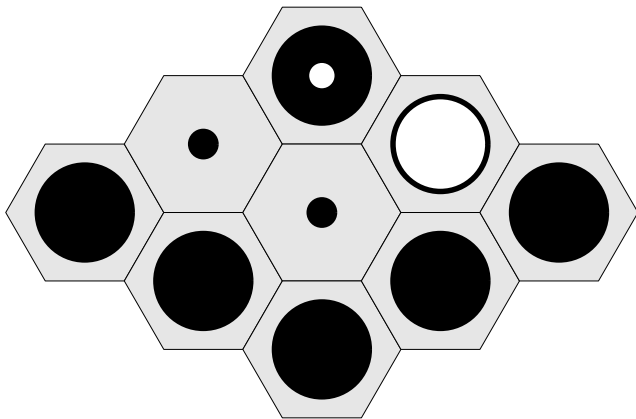
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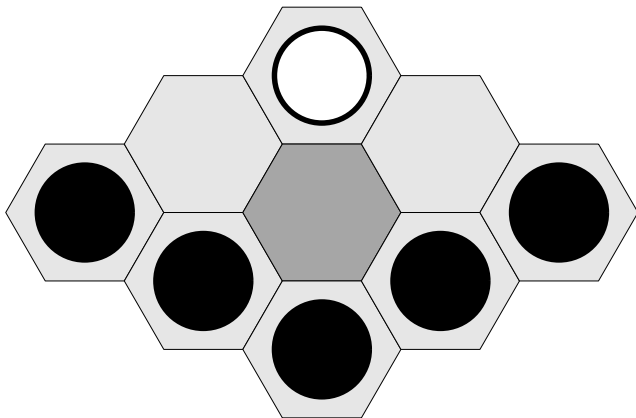
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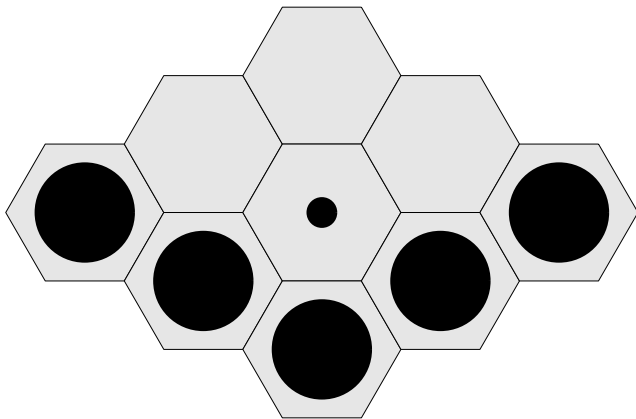
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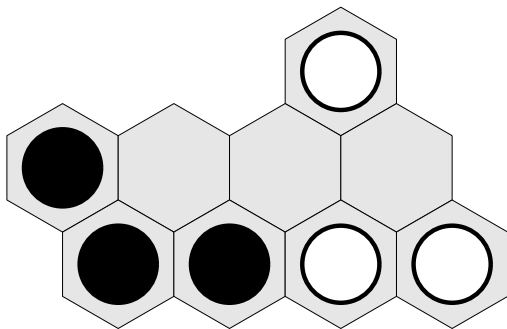
MOTIVATION

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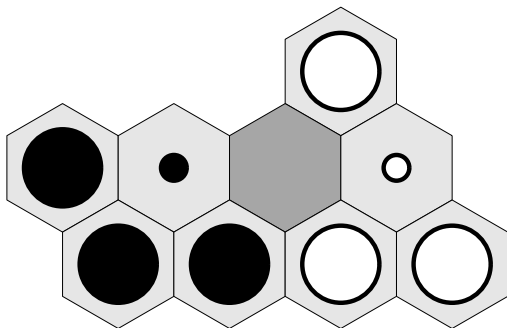
- fill and prune speeds up Hex solver
- capture-fill: breakthrough to solve 7x7 Hex
- are there new fill/prune theorems?
- can they speed up 8x8 Hex solver?
- (spoiler yes, no)

NEW: NEAR DEAD

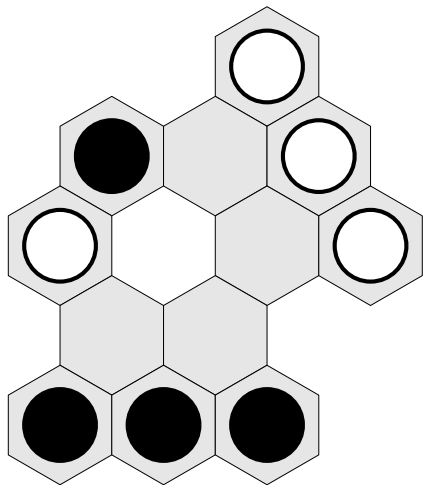
NEW: NEAR DEAD



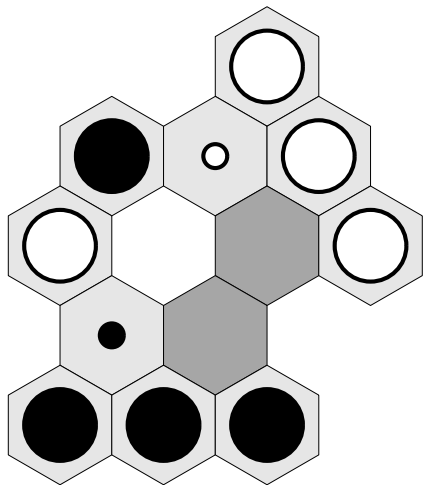
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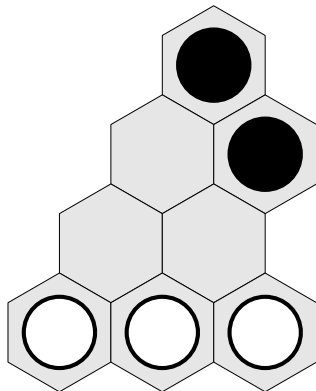


NEW: NEAR DEAD

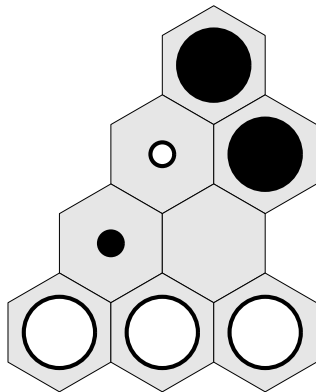


NEW: MUTUAL FILL

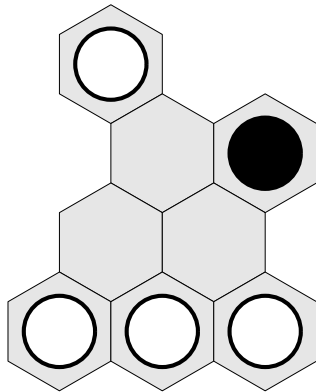
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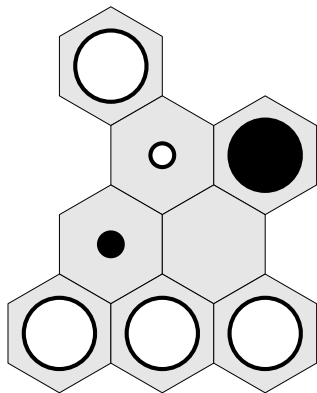
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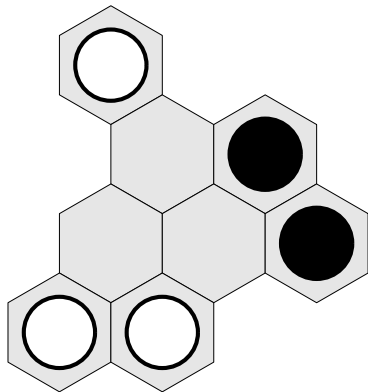
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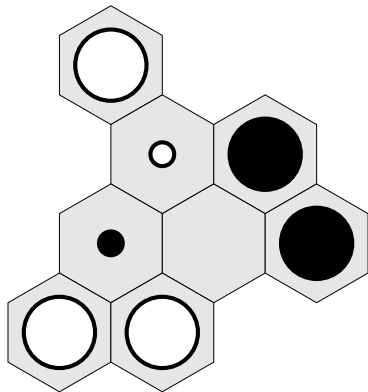
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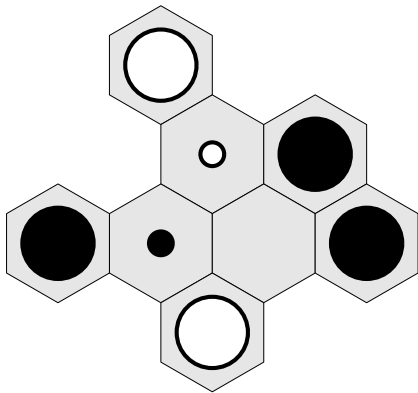
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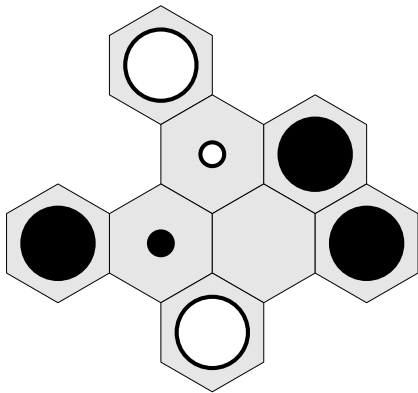
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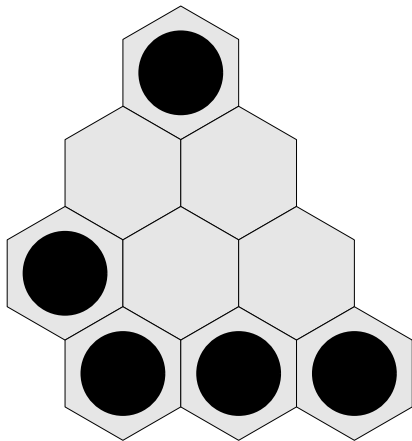


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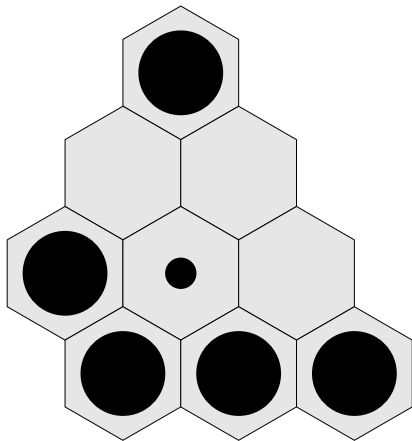


NEW: FILL MORE PERMANENTLY INFERIOR

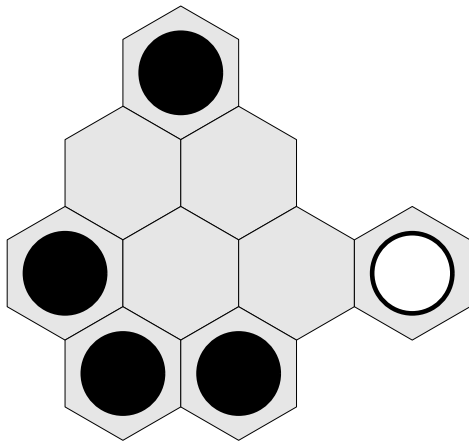
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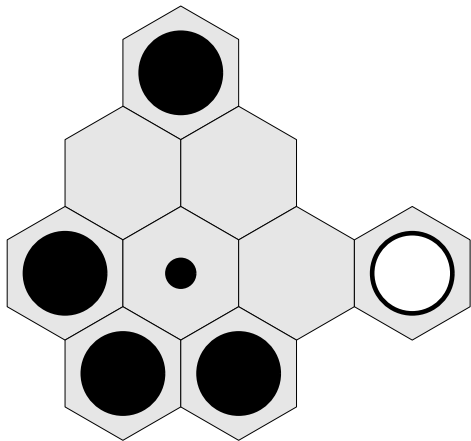
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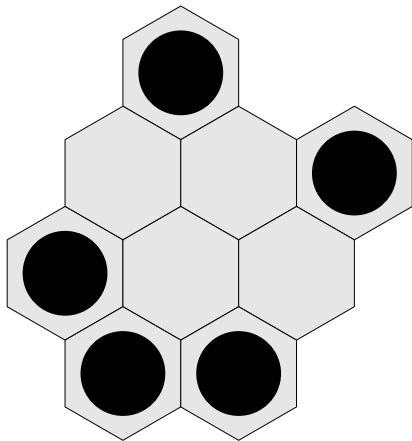
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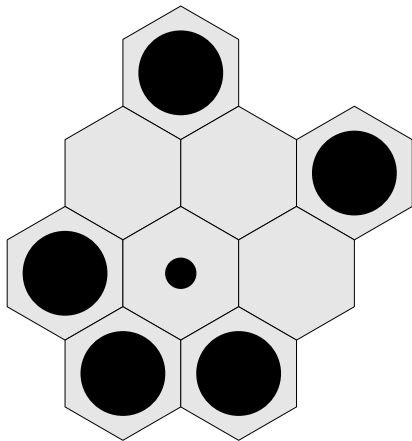
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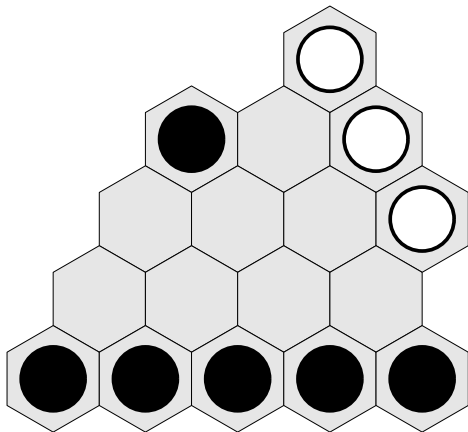
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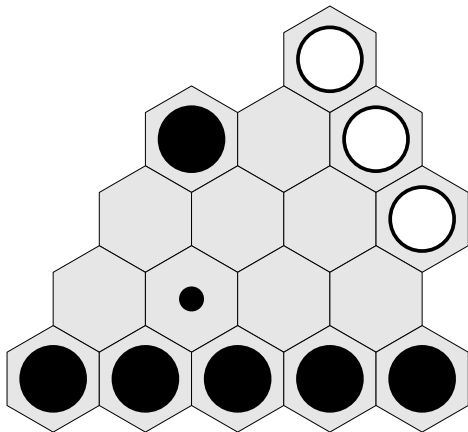
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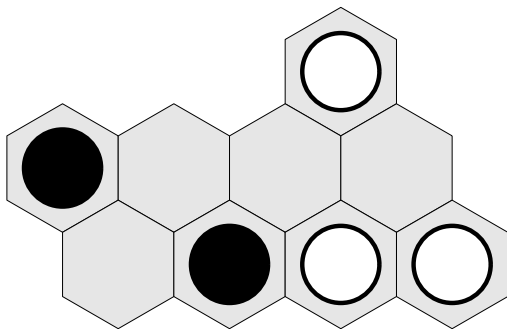


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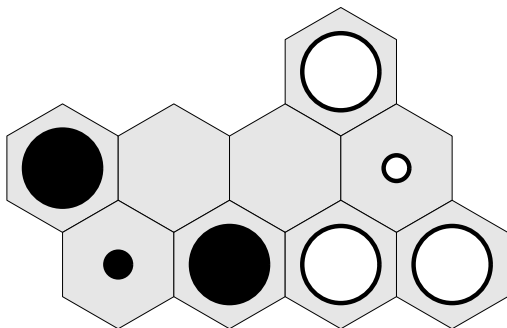


NEW: PRUNE MORE STRONGLY REVERSIBLE MOVES

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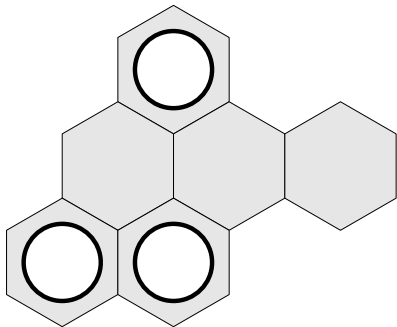


NEW: PRUNE MORE STRONGLY REVERSIBLE MOVES

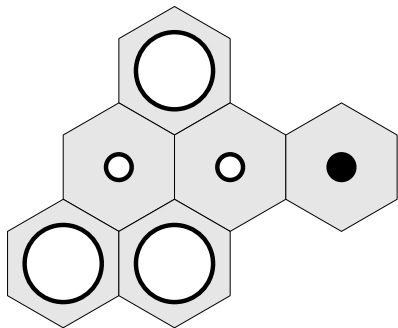


white dot strong-reversed by black dot

NEW: PRUNE MORE STRONGLY REVERSIBLE MOVES



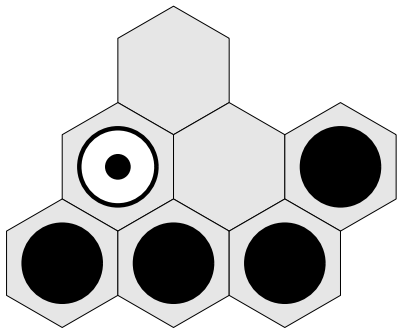
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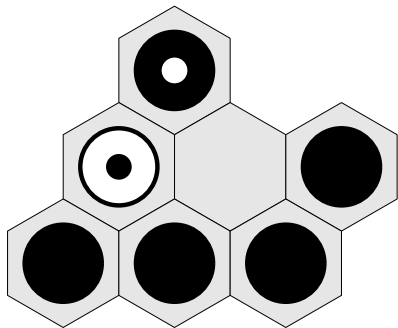
each white dot strong-reversed by black dot

NEW: BYPASS REVERSIBLE MOVE

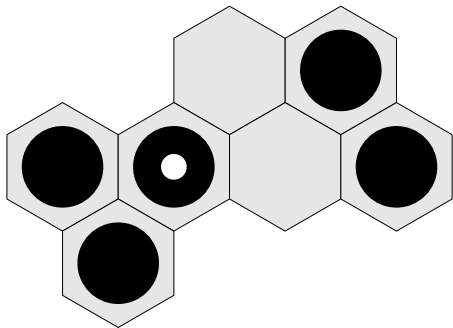
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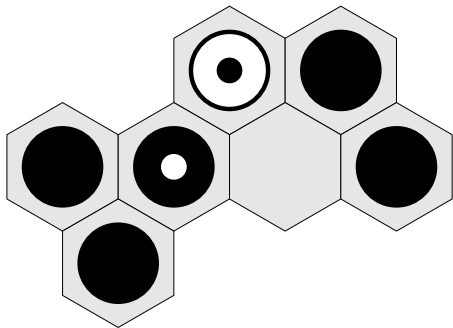
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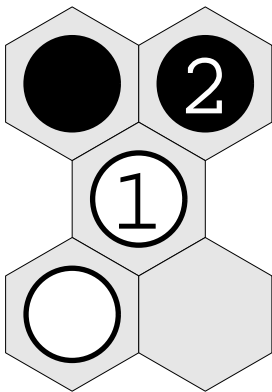


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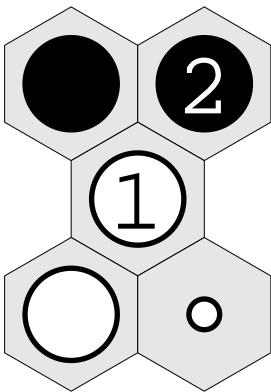


NEW SELF-REVERSE: AFTER 1,2, AVOID DOT

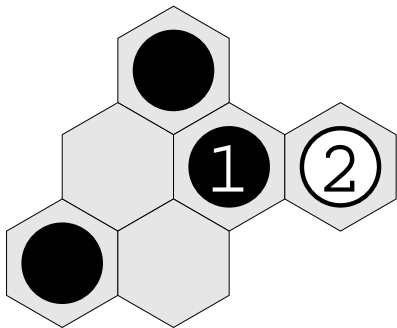
NEW SELF-REVERSE: AFTER 1,2, AVOID DOT



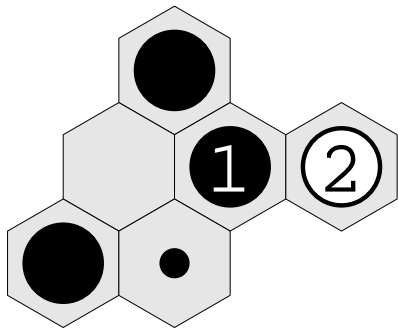
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NEW SELF-REVERSE: AFTER 1,2, AVOID DOT



8X8 SOLVER: NODES BY FEATURE

ND near death PI perm.inf. F ND+PI

S strong reverse R reverse R' conditional rev.

	none	nodes (x1000)	PI	F	F+S	F+S+R	F+S+R'	F+R'
a1	96	95	96	95	95	95	89	89
b2	371	335	335	320	328	385	318	318
c3	186	191	191	196	196	231	206	206
Σ	653	621	623	611	618	710	613	613

CONCLUSION

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- many new prune/fill theorems
- unfortunately did not speed up 8x8 solver:
decrease in node count but increase in
processing/time node

THANK YOU

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