

# Life and Death in Explorer

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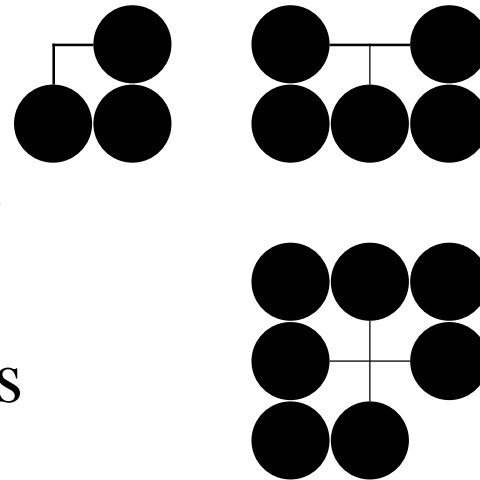
- What is Life and Death?
- ExLife: Simple Search for 2 Eyes
- Benson's algorithm
- Finding 1-vital and 2-vital regions

# What is Life and Death?

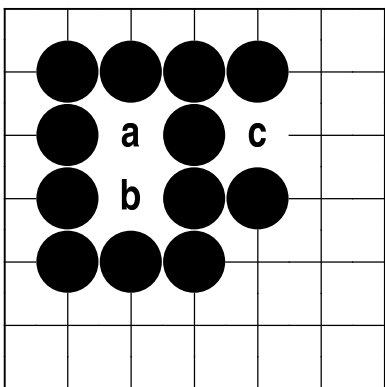
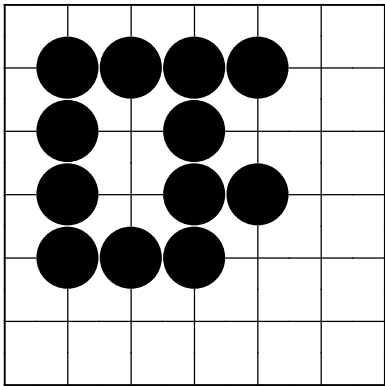
- Alive group: safe from capture
- Usual way to live:  
2 eyes
- Other ways possible:  
double ko, seki,  
snapback

# ExLife: Simple Search for 2 Eyes

- Written by Anders Kierulf
- Used in Explorer for more than 10 years
- Recognizes only one-point-eyes
- Fast brute force search
- Heuristic move evaluation for move ordering
- Exact lower bound for distance to life

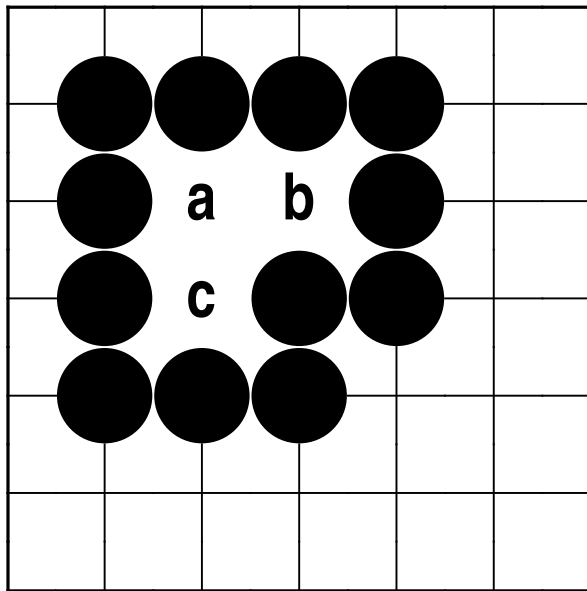


# Distance to Life Example 1



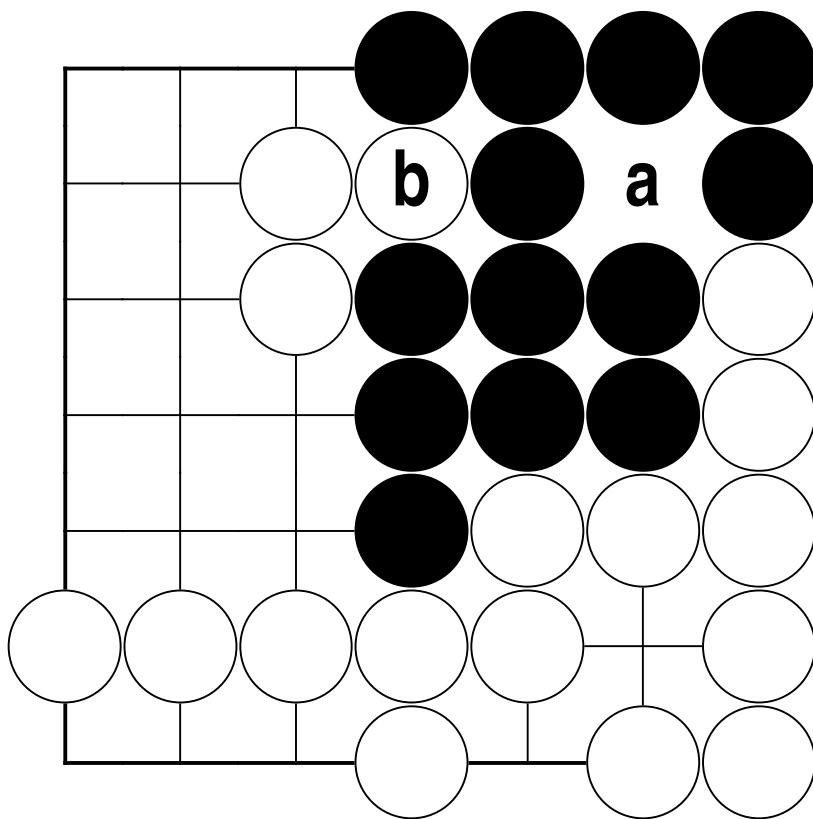
- Find distance to eye for each point
  - $d(a) = 1$
  - $d(b) = 1$
  - $d(c) = 2$
- Find non-adjacent pair with min. number of moves
  - $d(a,c) = d(b,c) = 3$

# Distance to Life Example 2



- Find distance to eye for each point
  - $d(a) = 2$
  - $d(b) = 1$
  - $d(c) = 1$
  - $d(b) + d(c) = 2$
- But:
  - $d(b,c) = 1$

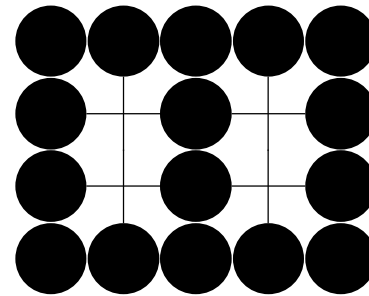
# Distance to Life Example 3



- Find distance to eye for each point
  - $d(a) = 0$
  - $d(b) = 5$  (!)
- Find non-adjacent pair with min. number of moves
  - $d(a,c) = d(b,c) = 3$

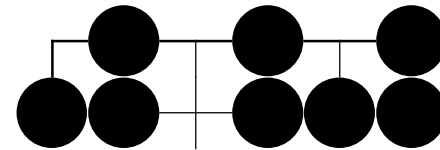
# Problems

- Only one point eyes



d=2 :-)

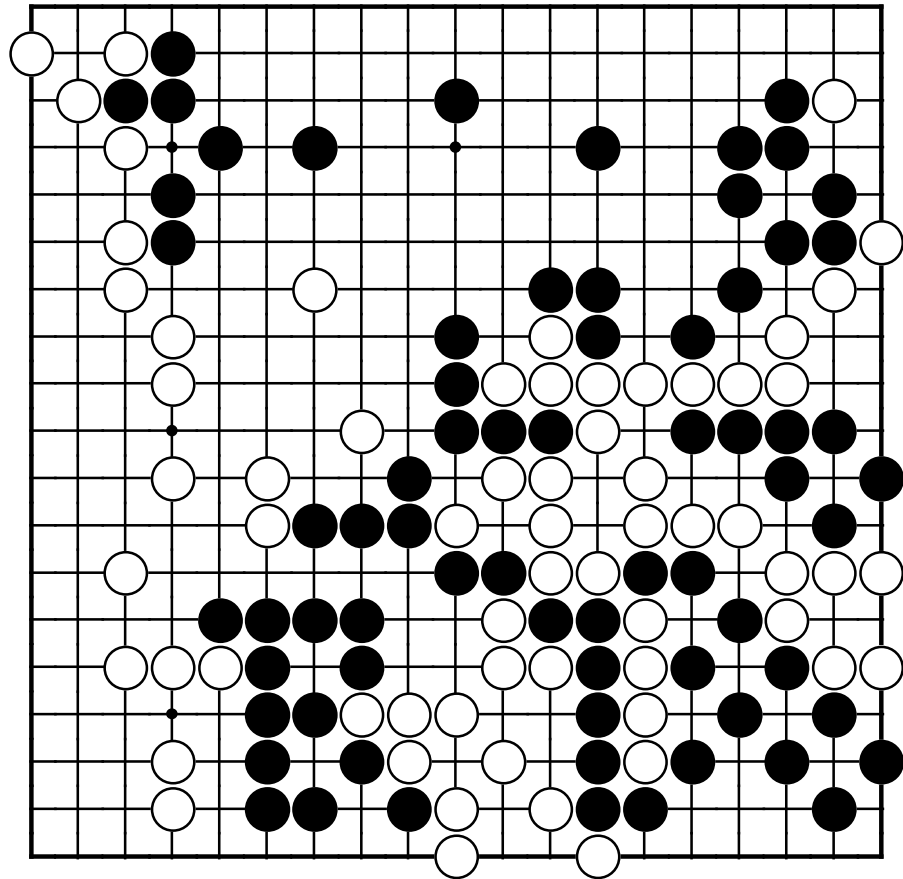
- Connectivity of stones



- Real game, big group:  
search space too large

# A Real-Life Example

- An example from a real game
- Problem: Explorer could not determine that big white group on right side is alive.
- Wasted a move defending





# Example continued

