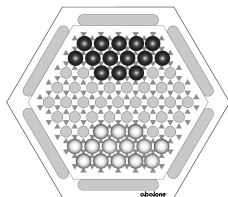


# Exploration of Abalone game-playing agents

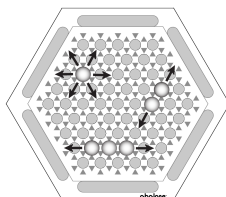
Ture Claussen

2021-06-14

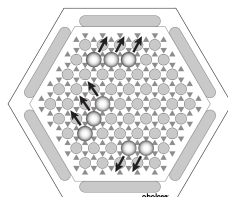
# Rules



(a) Starting position



(b) "In-line" moves



(c) "Side-step" moves

# Agent design: PEAS

**Performance measure** Win/loss, number of moves, time to deliberate

**Environment** Digital playing board

**Actuators** Move marbles, display text to CLI

**Sensors** Position of marbles

# Agent design: Environment

- ▶ fully observable
- ▶ two-agent
- ▶ competitive
- ▶ sequential
- ▶ static and discrete

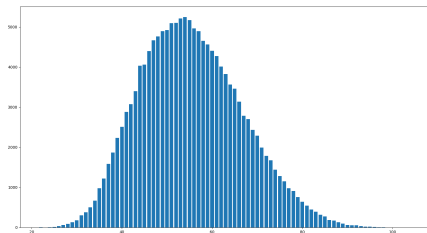
## State space complexity

$$\sum_{k=8}^{14} \sum_{m=9}^{14} \frac{61!}{k!(61-k)!} \times \frac{(61-k)!}{m!((61-k)-m)!}$$

# Game tree complexity

- ▶ Average branching factor  $b$  of 60
- ▶ Average length of game  $d$  of 87 [?]

$$b^d = 60^{87}$$



**Figure:** Counts of moves available for random for random player in 5 games

# Complexity Comparison

Game	state-space complexity (log)	game-tree complexity (log)
Tic-tac-toe	3	5
Reversi	28	58
Chess	46	123
Abalone	24	154
Go	172	360