**CSE318 AI**

**offline-3**

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**Heuristics :**

1. **Orb Count Difference :**

**Formula** : orb\_diff = total\_orbs\_AI - total\_orbs\_opponent

**Rationale** : the more orbs you have, the more explosive power you hold. By maximizing orb count, the AI aims to dominate the game early and build pressure on the opponent. It’s an aggressive and straightforward strategy.

**Category :** Offensive

1. **Controlled Cell Count Difference :**

**Formula** : cell\_diff = cell\_count\_AI - cell\_count\_opponent

**Rationale** : This heuristic focuses more on controlling cells than building power. The AI spreads out, aiming to hold more space, which can offer long-term strategic benefits like flexibility and map control. It's a more cautious, balanced approach.

**Category : Balanced**

1. **Number of Critical Own Cells :**

**Formula** : critical\_cells = near\_critical\_AI - near\_critical\_opponent

**Rationale** : These near-critical cells can trigger chain reactions and dominate nearby enemy cells. The AI uses this to build up explosive opportunities and strike when the moment is right. It’s aggressive and rewards precise timing.

**Category :** Offensive

1. **Total Adjacent Cells :**

**Defn :** Counts the total number of adjacent cells around the AI’s cells.

**Rationale** : The more connections a cell has, the more options it provides for expansion, attack, or defense. This helps the AI stay active in well-connected areas of the board, maximizing its strategic choices.

**Category :** Balanced

1. **Own Support :**

**Defn** : Counts the total number of orbs in neighboring AI-owned cells.

**Rationale** : Cells that are backed up by friendly neighbors are harder to eliminate and can quickly retaliate. This heuristic helps the AI form clusters and defend its position effectively. It promotes resilience and cooperation among the AI’s cells.

**Category :** Defensive

1. **Opponent Support:**

**Defn**: Counts the total number of opponent orbs in cells adjacent to AI’s cells.

**Rationale** : It helps the AI stay alert to high-risk zones. If enemy orbs are heavily concentrated around a cell, it’s likely to be targeted next. This heuristic guides the AI to play more cautiously and avoid dangerous areas.

**Category :** Defensive

**Result :**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Heuristic | vs | Depth | winning rate | avg time to win | tradeoffs |
| Orb Count | Human | 2 | 90% | 65.8 s | \*Best\* |
| 3 | 85% | 75 s | (guessable pattern-> plays defensively) |
| Cell Count | Human | 2 | 80% | 70s | tries to fill the cells first |
| 3 | 85% | 77s | “ |
| Critical Cell Count | Human | 3 | 50% | 40s | (donot explode, just increase cc) |
| Adjacent Cell count | Human | 3 | 40% | 55s | (try to minimize adj cell, rarely explode) |
| Own Support | Human | 3 | 30% | 35s | (donot explode where needed ) |
| Opponent Support | Human | 2 | 40% | 40s | - |
| Human | 3 | 75% | 100s | plays defensively to delay loosing |

Random move vs AI :

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Heuristic | vs | Depth | winning rate | avg time to win |
| Orb Count | Random | 2 | 100% | 4 min |
| 3 | 100% | 6 min |
| Cell Count | Random | 2 | 95% | 8 min |
| 3 | 95% | 9 min |
| Critical Cell Count | Random | 3 | 85% | 10 min |
| Adjacent Cell count | Random | 3 | 60% | 8 min |
| Own Support | Random | 3 | 50% | 10 min |
| Opponent Support | Random | 2 | 70% | 9 min |
| Random | 3 | 85% | 7 min |