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Lab 2 Report

*Note: in the code (agentbucket.py), changes have the section title as a comment*

# CHANGE 1

If Bucket Hat Agent has no other actions, it discards the "oldest" card in its hand. Cards either remain in the hand because they are not immediately playable or are not beneficial to the board.

# CHANGE 2

Bucket Hat Agent plays a card if it is more than 50% sure that the card is playable and there are less than 2 mistakes.

# CHANGE 3 (unused)

Bucket Hat Agent gives a hint on a card with the lowest rank. Lowest ranked cards would have the highest priority because it would eliminate lower ranked cards.

This did not work and was commented out, but took a lot of time to implement so it stays.

# CHANGE 4

Bucket Hat Agent applies the "Chop Principle," where the oldest unhinted card is discarded. Bucket Hat Agent determines if a card is unhinted by checking the diagonal of each card's knowledge matrix for zeros. If all cards in its hand have a hint, it falls back on # CHANGE 1.

Interestingly, discarding card j instead of i yielded a higher mean in the set seed (j gives 14.18; i gives 14.11), but i yielded a *slightly* better result in 1000 matches (j gives 14.23 vs i's 14.24), so i was kept.

Running `python main.py buckethat buckethat`

| Change Number | Mean | Improved mean by… |
|---|---|---|
| 0 | 13.21 | |
| 1 | 13.6 | 0.39 |
| 2 | 14.06 | 0.46 |
| 3 | -- | It didn't |

| 4 | 14.11 | 0.05 |

Note:
- improvements are cumulative (i.e. new changes are added to previously changed code)

Bucket Hat Agent's strategy is built off of the Osawa outer agent's code and strategy. However, as noted in the changes above, Bucket Hat Agent exhibits several different behaviors from the Osawa agent, resulting in better performance and higher scores. For example, Bucket Hat Agent plays a card if it is more than 50% sure it is playable (# CHANGE 2), as opposed to the Osawa outer agent, who will only play a card when 100% certain it is playable. Additionally, it no longer discards a random card when faced with no other courses of action, and instead discards the oldest unhinted card ("the chop") in its hand (# CHANGE 4). If all cards have a hint, it discards its oldest card (# CHANGE 1).

In mirrored play (100 games), Bucket Hat Agent does better (mean 14.11) in comparison to the mirrored play of the Osawa inner (mean 9.95) and outer (mean 13.21) agents given in the framework. Our agent gets a mean of 14.11 against itself in two player mirror matches and 14.06 against two versions of itself in three player mirror matches.

Bucket Hat Agent performed better the more games it played, getting a mean of 14.24 in a two-player 1000-game mirror match, and a mean of 14.32 in a two-player 2000-game mirror match.