COM2001: Advanced Programming Topics

Assignment 3

Test Results

Players

Note: All the tests below are performed over 1000 games.

1. simplePlayer

- **Test Case**

    1. **hsdPlayer**   vs   **simplePlayer**
    2. **skillPlayer**   vs   **simplePlayer**
    3. **simplePlayer** vs   **hsdPlayer**
    4. **simplePlayer** vs   **skillPlayer**

Test Case	Seed	Result	Status
1	97	(955,45)	-
	283	(958,42)	-
	431	(961,39)	-
	591	(973,27)	-
2	97	(987,13)	Better
	283	(986,14)	Better
	431	(991,9)	Better
	591	(987,13)	Better
3	97	(30,970)	-
	283	(46,954)	-
	431	(29,971)	-
	591	(35,965)	-
4	97	(7,993)	Better
	283	(9,991)	Better
	431	(7,993)	Better
	591	(11,989)	Better

Table 1. Comparison between hsdPlayer and skillPlayer against simplePlayer

2. hsdPlayer

- **Test Case**

  1. **hsdPlayer**   vs   **skillPlayer, no tactics**
  2. **hsdPlayer**   vs   **skillPlayer, all tactics**
  3. **skillPlayer, no tactics**   vs   **hsdPlayer**
  4. **skillPlayer, all tactics**   vs   **hsdPlayer**

Test Case	Seed	Result	Status
1	97	(527,473)	-
	283	(523,477)	-
	431	(528,472)	-
	591	(502,498)	-
2	97	(389,611)	Better
	283	(392,608)	Better
	431	(388,612)	Better
	591	(373,627)	Better
3	97	(527,473)	-
	283	(523,477)	-
	431	(528,472)	-
	591	(502,498)	-
4	97	(667,333)	Better
	283	(675,325)	Better
	431	(689,311)	Better
	591	(671,329)	Better

Table 2. Comparison between hsdPlayer and skillPlayer, with or without tactics

Adding Tactics   *Note: These tests are run against hsdPlayer

These tests are to show that as more knowledge is added to skillPlayer, the performance of skillPlayer improves.

1. tactics = []

Seed	Result	Status
97	(527,473)	-
283	(523,477)	-
431	(528,472)	-
591	(502,498)	-

Table 3. Results of skillPlayer with no tactics

2. tactics = [firstDropTactic]

Seed	Result	% increase compared to previous	Status
97	(578,422)	9.70%	Better
283	(579,421)	10.71%	Better
431	(595,405)	12.69%	Better
591	(580,420)	15.53%	Better

Table 4. Results of skillPlayer with 1 tactic

3. tactics = [firstDropTactic, aggressiveTactic]

Seed	Result	% increase compared to previous	Status
97	(644,356)	11.41%	Better
283	(661,339)	14.68%	Better
431	(669,331)	12.43%	Better
591	(652,348)	12.41%	Better

Table 5. Results of skillPlayer with 2 tactics

4. tactics = [firstDropTactic, aggressiveTactic, comboToWinTactic]

Seed	Result	% increase compared to previous	Status
97	(644,356)	0%	-
283	(661,339)	0%	-
431	(669,331)	0%	-
591	(652,348)	0%	-

Table 6. Results of skillPlayer with 3 tactics

5. tactics = [firstDropTactic, aggressiveTactic, comboToWinTactic, matchPointTactic]

Seed	Result	% increase compared to previous	Status
97	(658,342)	2.17%	Better
283	(675,325)	2.11%	Better
431	(679,321)	1.49%	Better
591	(669,331)	2.60%	Better

Table 7. Results of skillPlayer with 4 tactics

6. tactics = [firstDropTactic, aggressiveTactic, comboToWinTactic, matchPointTactic, luckyWinTactic]

Seed	Result	% increase compared to previous	Status
97	(668,332)	1.51%	Better
283	(675,325)	0%	-
431	(689,311)	1.47%	Better
591	(671,329)	0.30%	Better

Table 8. Results of skillPlayer with 5 tactics

7. tactics = [firstDropTactic, aggressiveTactic, comboToWinTactic, matchPointTactic, luckyWinTactic, blockWinTactic]

Seed	Result	% increase compared to previous	Status
97	(668,332)	0%	-
283	(675,325)	0%	-
431	(689,311)	0%	-
591	(671,329)	0%	-

Table 9. Resutls of skillPlayer with 7 tactics

8. tactics = [firstDropTactic, aggressiveTactic, comboToWinTactic, matchPointTactic, luckyWinTactic, blockWinTactic, drawGameTactic]

Seed	Result	% increase compared to previous	Status
97	(668,332)	0%	-
283	(675,325)	0%	-
431	(689,311)	0%	-
591	(671,329)	0%	-

Table 10. Results of skillPlayer with all tactics

$$Total\ approximated\ \%\ increase = \frac{\sum \% \ increase}{\sum total\ seed}$$

$$= \frac{111.21}{4}$$

$$= 27.8\%$$
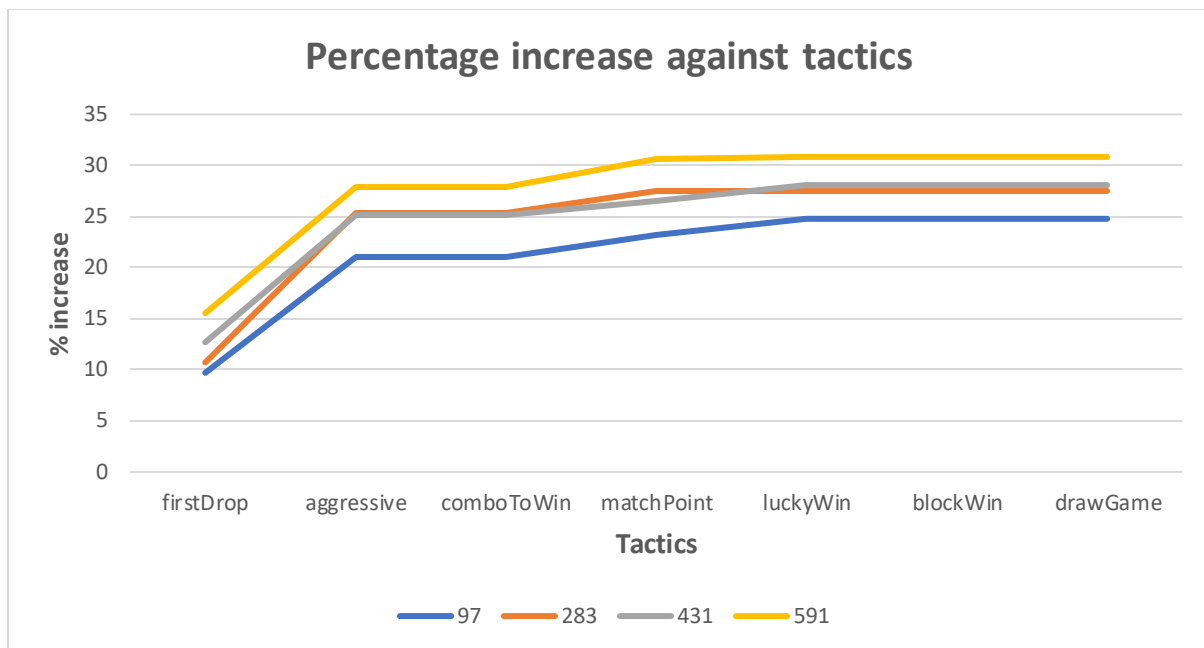
Percentage increase against tactics

Figure 1. Percentage increase chart of 4 seeds against tactics

According to **Figure 1**, the largest performance increase is from aggressiveTactic, and then matchPointTactic at a later stage. **Figure 1** also showed that the performance of skillPlayer improves when more tactics are added to it.

The reason that the performance increase of aggressiveTactic is huge is because it predicts the opponent hand quite accurately, and it plays the highest scoring domino which does not result in a bust. In order to predict the opponent hand accurately, the skillPlayer must try to knock the opponent as much as possible during the mid-game to figure out what is the weak tiles of the opponent.

Late-game is probably the most important part. According to **Figure 1**, there does not seem to be much performance increase in late game tactic. The reason might be the skillPlayer has no dominoes left which can knock or block the opponent.

Individual Tactics   *Note: These tests are run against hsdPlayer

These tests are to show that some tactics give huge performance boost, and some just give very little performance increase or even decrease it.

1. tactics = firstDropTactic

Seed	Results	% increase compared to no tactics	Status
97	(578,422)	9.70%	Better
283	(579,421)	10.71%	Better
431	(595,405)	12.69%	Better
591	(580,420)	15.53%	Better

2. tactics = aggresiveTactic

Seed	Results	% increase compared to no tactics	Status
97	(609,391)	15.56%	Better
283	(623,377)	19.12%	Better
431	(626,374)	18.56%	Better
591	(601,399)	19.72%	Better

3. tactics = comboToWinTactic

Seed	Results	% increase compared to no tactics	Status
97	(527,473)	0.00%	-
283	(524,476)	0.19%	Better
431	(529,471)	0.19%	Better
591	(502,498)	0.00%	-

4. tactics = matchPointTactic

Seed	Results	% increase compared to no tactics	Status
97	(583,417)	10.63%	Better
283	(602,398)	15.11%	Better
431	(607,393)	14.96%	Better
591	(584,416)	16.33%	Better

5. tactics = luckyWinTactic

Seed	Results	% increase compared to no tactics	Status
97	(565,435)	7.21%	Better
283	(580,420)	10.90%	Better
431	(605,395)	14.58%	Better
591	(598,402)	19.12%	Better

6. tactics = blockWinTactic

Seed	Results	% increase compared to no tactics	Status
97	(527,473)	0.00%	-
283	(522,478)	-0.19%	Worse
431	(528,472)	0.00%	-
591	(502,498)	0.00%	-

7. tactics = drawGameTactic

Seed	Results	% increase compared to no tactics	Status
97	(527,473)	0.00%	-
283	(523,478)	0.00%	-
431	(528,472)	0.00%	-
591	(502,498)	0.00%	-

<u>Conclusion</u>

1. **blockWinTactic** and **drawGameTactic** do not to improve performance of skillPlayer.

2. Tactics like **aggressiveTactic** and **matchPointTactic** which look deeply into the game state and make their move based on the current situation give best performance increase.

3. The **percentage increase** is affected by the provided seed, since different seeds will give different hand to the skillPlayer.

4. According to **Table 10**, the skillPlayer is actually pretty good. It can maintain a win rate above **66%** against the hsdPlayer.

5. There is still room of improvement for the skillPlayer. If the skillPlayer can predict the opponent hand more accurate, then it can look ahead and work out what dominoes to play in the next few turn to win the game.

Test Execution Logs

```
*Dominoes> domsMatch hsdPlayer simplePlayer 1000 97
(955,45)

*Dominoes> domsMatch hsdPlayer simplePlayer 1000 283
(958,42)

*Dominoes> domsMatch hsdPlayer simplePlayer 1000 431
(961,39)

*Dominoes> domsMatch hsdPlayer simplePlayer 1000 591
(973,27)

*Dominoes> domsMatch (skillPlayer tactics) simplePlayer 1000 97
(987,13)

*Dominoes> domsMatch (skillPlayer tactics) simplePlayer 1000 283
(986,14)

*Dominoes> domsMatch (skillPlayer tactics) simplePlayer 1000 431
(991,9)

*Dominoes> domsMatch (skillPlayer tactics) simplePlayer 1000 591
(987,13)

*Dominoes> domsMatch simplePlayer hsdPlayer 1000 97
(30,970)

*Dominoes> domsMatch simplePlayer hsdPlayer 1000 283
(46,954)

*Dominoes> domsMatch simplePlayer hsdPlayer 1000 431
```

```
(29,971)

*Dominoes> domsMatch simplePlayer hsdPlayer 1000 591
(35,965)

*Dominoes> domsMatch simplePlayer (skillPlayer tactics) 1000 97
(7,993)

*Dominoes> domsMatch simplePlayer (skillPlayer tactics) 1000 283
(9,991)

*Dominoes> domsMatch simplePlayer (skillPlayer tactics) 1000 431
(7,993)

*Dominoes> domsMatch simplePlayer (skillPlayer tactics) 1000 591
(11,989)
```

```
*Dominoes> domsMatch hsdPlayer (skillPlayer []) 1000 97
(527,473)

*Dominoes> domsMatch hsdPlayer (skillPlayer []) 1000 283
(523,477)

*Dominoes> domsMatch hsdPlayer (skillPlayer []) 1000 431
(528,472)

*Dominoes> domsMatch hsdPlayer (skillPlayer []) 1000 591
(502,498)

*Dominoes> domsMatch hsdPlayer (skillPlayer tactics) 1000 97
(389,611)

*Dominoes> domsMatch hsdPlayer (skillPlayer tactics) 1000 283
(392,608)
```

```
*Dominoes> domsMatch hsdPlayer (skillPlayer tactics) 1000 431
(388,612)

*Dominoes> domsMatch hsdPlayer (skillPlayer tactics) 1000 591
(373,627)

*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 97
(527,473)

*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 283
(523,477)

*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 431
(528,472)

*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 591
(502,498)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 97
(667,333)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 283
(675,325)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 431
(689,311)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 591
(671,329)
```

```
*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 97
(527,473)

*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 283
(523,477)
```

```
*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 431
(528,472)

*Dominoes> domsMatch (skillPlayer []) hsdPlayer 1000 591
(502,498)

*Dominoes> domsMatch (skillPlayer [firstDropTactic]) hsdPlayer 1000 97
(578,422)

*Dominoes> domsMatch (skillPlayer [firstDropTactic]) hsdPlayer 1000 283
(579,421)

*Dominoes> domsMatch (skillPlayer [firstDropTactic]) hsdPlayer 1000 431
(595,405)

*Dominoes> domsMatch (skillPlayer [firstDropTactic]) hsdPlayer 1000 591
(580,420)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic]) hsdPlayer 1000 97
(644,356)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic]) hsdPlayer 1000 283
(661,339)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic]) hsdPlayer 1000 431
(669,331)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic]) hsdPlayer 1000 591
(652,348)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic]) hsdPlayer 1000 97
(644,356)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic]) hsdPlayer 1000 283
```

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(661,339)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic]) hsdPlayer 1000 431
(669,331)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic]) hsdPlayer 1000 591
(652,348)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic]) hsdPlayer
1000 97
(658,342)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic]) hsdPlayer
1000 283
(675,325)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic]) hsdPlayer
1000 431
(679,321)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic]) hsdPlayer
1000 591
(669,331)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic]) hsdPlayer 1000 97
(668,332)
*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic]) hsdPlayer 1000 283
(675,325)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic]) hsdPlayer 1000 431
(689,311)

```
*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic]) hsdPlayer 1000 591
(671,329)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic,blockWinTactic]) hsdPlayer 1000 97
(668,332)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic,blockWinTactic]) hsdPlayer 1000 283
(675,325)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic,blockWinTactic]) hsdPlayer 1000 431
(689,311)

*Dominoes> domsMatch (skillPlayer [firstDropTactic,aggressiveTactic, comboToWinTactic, matchPointTactic,
luckyWinTactic,blockWinTactic]) hsdPlayer 1000 591
(671,329)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 97
(668,333)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 283
(675,325)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 431
(689,311)

*Dominoes> domsMatch (skillPlayer tactics) hsdPlayer 1000 591
(671,329)
```