Supplementary Material for AAAI Submission titled *Monte Carlo Tree Search with Heuristic Evaluations using Implicit Minimax Backups*

1 Appendix A

This appendix includes details of the results of played games to determine the best baseline players.

1.1 Parameter Values for Breakthrough and Kalah

Technique	Parameter set
pd$x$	$\{0, 1, \ldots, 5, 8, 10, 12, 16, 20, 30, 50, 100, 1000\}$
det$x$	$\{.1, .2, .3, , .4, .5, .55, .6, .65, .7, .75, .8, .85, .9\}$
egeϵ	$\{0, .05, .1, .15, .2, .3, .4, .5, .6, .7, .8, .9, 1\}$
imα	$\{0, .05, .1, .15, \ldots, .55, .6, .75, 1\}$

Table 1: Parameter value sets.

1.2 Breakthrough Playout Enhancement Optimization

1.2.1 Fixed Early Terminations Tournament

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round 1

winner mcts_h_pd1000 (115) vs. loser mcts_h_pd0 (85)
winner mcts_h_pd100 (117) vs. loser mcts_h_pd1 (83)
winner mcts_h_pd50 (108) vs. loser mcts_h_pd2 (92)
winner mcts_h_pd30 (138) vs. loser mcts_h_pd3 (62)
winner mcts_h_pd20 (129) vs. loser mcts_h_pd4 (71)
winner mcts_h_pd10 (129) vs. loser mcts_h_pd5 (71)
mcts_h_pd8 gets a by

round 2

winner mcts_h_pd8 (108) vs. loser mcts_h_pd1000 (92)
winner mcts_h_pd10 (112) vs. loser mcts_h_pd100 (88)
winner mcts_h_pd20 (128) vs. loser mcts_h_pd50 (72)
mcts_h_pd30 gets a by

round 3

winner mcts_h_pd30 (113) vs. loser mcts_h_pd8 (87)
winner mcts_h_pd20 (104) vs. loser mcts_h_pd10 (96)

round 4
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winner mcts_h_pd20 (104) vs. loser mcts_h_pd30 (96)

Winner: mcts_h_pd20
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1.2.2 Epsilon-greedy Playout Tournament

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round 1

winner mcts_h_ege0.0 (156) vs. loser mcts_h_ege1.0 (44)
winner mcts_h_ege0.05 (155) vs. loser mcts_h_ege0.9 (45)
winner mcts_h_ege0.1 (156) vs. loser mcts_h_ege0.8 (44)
winner mcts_h_ege0.15 (153) vs. loser mcts_h_ege0.7 (47)
winner mcts_h_ege0.2 (151) vs. loser mcts_h_ege0.6 (49)
winner mcts_h_ege0.3 (119) vs. loser mcts_h_ege0.5 (81)
mcts_h_ege0.4 gets a by

round 2

winner mcts_h_ege0.0 (115) vs. loser mcts_h_ege0.4 (85)
winner mcts_h_ege0.05 (119) vs. loser mcts_h_ege0.3 (81)
winner mcts_h_ege0.1 (125) vs. loser mcts_h_ege0.2 (75)
mcts_h_ege0.15 gets a by

round 3

winner mcts_h_ege0.15 (103) vs. loser mcts_h_ege0.0 (97)
winner mcts_h_ege0.1 (110) vs. loser mcts_h_ege0.05 (90)

round 4

winner mcts_h_ege0.1 (108) vs. loser mcts_h_ege0.15 (92)

Winner: mcts_h_ege0.1
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1.2.3 Tournament Winner Comparisons

Each players used the basic evaluation function.

Player A	Player B	A Wins (%)	B Wins (%)	Ties
MCTS(ege0.1,det0.5)	MCTS(ege0.1)	738 (78.2)	262 (26.2)	0
MCTS(ege0.1,det0.5)	MCTS(pd20,det0.5)	633 (63.3)	367 (36.7)	0
MCTS(ege0.1)	MCTS(pd20)	557 (55.7)	443 (44.3)	0
MCTS(ege0.1)	MCTS(pd4)	768 (76.8)	232 (23.2)	0

Table 2: Breakthrough playout comparisons.

1.3 Kalah Playout Optimization

1.3.1 Fixed Early Termination Tournament

```
round 1

winner mcts_h_pd0 (368) vs. loser mcts_h_pd1000 (61)
winner mcts_h_pd1 (408) vs. loser mcts_h_pd100 (61)
winner mcts_h_pd2 (458) vs. loser mcts_h_pd50 (61)
winner mcts_h_pd3 (460) vs. loser mcts_h_pd30 (37)
winner mcts_h_pd4 (429) vs. loser mcts_h_pd20 (44)
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winner mcts_h_pd5 (223) vs. loser mcts_h_pd10 (83)
mcts_h_pd8 gets a by

round 2

winner mcts_h_pd0 (181) vs. loser mcts_h_pd8 (169)
winner mcts_h_pd5 (189) vs. loser mcts_h_pd1 (116)
winner mcts_h_pd4 (166) vs. loser mcts_h_pd2 (115)
mcts_h_pd3 gets a by

round 3

winner mcts_h_pd3 (161) vs. loser mcts_h_pd0 (124)
winner mcts_h_pd4 (132) vs. loser mcts_h_pd5 (122)

round 4

winner mcts_h_pd4 (139) vs. loser mcts_h_pd3 (110)

Winner: mcts_h_pd4
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