

# Supplementary Material for CIG2014 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
fet $x$	$\{0, 1, \dots, 5, 8, 10, 12, 16, 20, 30, 50, 100, 1000\}$
det $x$	$\{.1, .2, .3, .4, .5, .55, .6, .65, .7, .75, .8, .85, .9\}$
ege $\epsilon$	$\{0, .05, .1, .15, .2, .3, .4, .5, .6, .7, .8, .9, 1\}$
im $\alpha$	$\{0, .05, .1, .15, \dots, .55, .6, .75, 1\}$

Table 1: Parameter value sets.

### 1.2 Kalah Playout Optimization

#### 1.2.1 Fixed Early Termination Tournament

round 1

winner mcts\_h\_fet0 (368) vs. loser mcts\_h\_fet1000 (61)  
winner mcts\_h\_fet1 (408) vs. loser mcts\_h\_fet100 (61)  
winner mcts\_h\_fet2 (458) vs. loser mcts\_h\_fet50 (61)  
winner mcts\_h\_fet3 (460) vs. loser mcts\_h\_fet30 (37)  
winner mcts\_h\_fet4 (429) vs. loser mcts\_h\_fet20 (44)  
winner mcts\_h\_fet5 (223) vs. loser mcts\_h\_fet10 (83)  
mcts\_h\_fet8 gets a by

round 2

winner mcts\_h\_fet0 (181) vs. loser mcts\_h\_fet8 (169)  
winner mcts\_h\_fet5 (189) vs. loser mcts\_h\_fet1 (116)  
winner mcts\_h\_fet4 (166) vs. loser mcts\_h\_fet2 (115)  
mcts\_h\_fet3 gets a by

round 3

winner mcts\_h\_fet3 (161) vs. loser mcts\_h\_fet0 (124)  
winner mcts\_h\_fet4 (132) vs. loser mcts\_h\_fet5 (122)

round 4

winner mcts\_h\_fet4 (139) vs. loser mcts\_h\_fet3 (110)

Winner: mcts\_h\_fet4

### 1.3 Breakthrough Playout Enhancement Optimization

#### 1.3.1 Fixed Early Terminations Tournament

round 1

winner mcts\_h\_fet1000 (115) vs. loser mcts\_h\_fet0 (85)  
winner mcts\_h\_fet100 (117) vs. loser mcts\_h\_fet1 (83)  
winner mcts\_h\_fet50 (108) vs. loser mcts\_h\_fet2 (92)  
winner mcts\_h\_fet30 (138) vs. loser mcts\_h\_fet3 (62)  
winner mcts\_h\_fet20 (129) vs. loser mcts\_h\_fet4 (71)  
winner mcts\_h\_fet10 (129) vs. loser mcts\_h\_fet5 (71)  
mcts\_h\_fet8 gets a by

round 2

winner mcts\_h\_fet8 (108) vs. loser mcts\_h\_fet1000 (92)  
winner mcts\_h\_fet10 (112) vs. loser mcts\_h\_fet100 (88)  
winner mcts\_h\_fet20 (128) vs. loser mcts\_h\_fet50 (72)  
mcts\_h\_fet30 gets a by

round 3

winner mcts\_h\_fet30 (113) vs. loser mcts\_h\_fet8 (87)  
winner mcts\_h\_fet20 (104) vs. loser mcts\_h\_fet10 (96)

round 4

winner mcts\_h\_fet20 (104) vs. loser mcts\_h\_fet30 (96)

Winner: mcts\_h\_fet20

#### 1.3.2 Epsilon-greedy Playout Tournament

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

### 1.3.3 Tournament Winner Comparisons

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(fet20,det0.5)	633 (63.3)	367 (36.7)	0
MCTS(ege0.1)	MCTS(fet20)	557 (55.7)	443 (44.3)	0
MCTS(ege0.1)	MCTS(fet4)	768 (76.8)	232 (23.2)	0

Table 2: Breakthrough playout comparisons.