Takeshi Murakami vs. Logistello

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Abstract

This report summarizes the first decent match between an Othello World–Champion and a strong program held at the NEC Research Institute in Princeton (NJ) on August 4–7, 1997.

1 Don Quixote vs. Windmill?

When you study the history of computer Othello you are told that programs already played at World–Champion–level in the early 80's [Rosenbloom 1982] and Bill, the first learning Othello program, managed to surpass human strength in the late 80's [Lee & Mahajan 1990].

So, you might ask, what the point is of organizing a match between the current Othello World–Champion and one of today's strongest programs in 1997. After all, it is not a secret that Othello programs have become much stronger over the last decade due to faster hardware, smarter evaluation functions, selective search, and better opening books. Unfortunately, all claims regarding the "great" playing strength of the early Othello programs were either based on indirect comparisons or single game outcomes against only relatively strong human players. In fact, not a single multi–game match between strong Japanese players and a good program took place after 1980 in order to justify the claims.

During the weeks before the match Bill played a series of games against different versions of Logistello.[1] Sanjoy Mahajan, a co–author of Bill, came to the conclusion that his program playing 10 minute games running on a PentiumPro/200 PC (where it is able to search 9–10 ply) is weaker than 3–ply Logistello, that — on the other hand — can only be called mediocre by today's human standards.

Two explanations for this discrepancy come into mind: human players have improved their playing skills considerably and/or the playing strength of programs in the

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[1] Descriptions of the inner workings of this program can be found at http://www.neci.nj.nec.com/homepages/mic/

80's was largely overestimated. I guess the truth lies somewhere in between.

2 Are you ready?

In 1993 Hans Berliner (CMU) published an item suggesting that no human player could win from a computer. Takeshi Murakami, a strong Othello player living in Tokyo, read this and wanted to get in touch with Berliner and issue a challenge. A match against Logistello was agreed and we "only" had to find a sponsor for this event. The match was scheduled for December 1993 but cancelled by Mr. Berliner for personal reasons and the lack of sponsorship. In retrospect Logistello was not ready to face a strong human player in a decent match at this time. Its opening book was a hack which became quite clear in the Waterloo tournament in late 1993.

The breakthrough came in 1994 while finishing my Ph.D. thesis at the University of Paderborn. As always, the best ideas were born under pressure. This time it was time pressure. The deadline for my thesis was September and by January the only successful novel approaches I had to report were the application of logistic regression for feature weight estimation and a new technique for computing pattern values — not quite enough for a Ph.D. thesis. At this time I commuted from Aachen to Paderborn once a week by train. What do you do when you don't have access to a computer (I had no laptop) for three hours? Exactly: "Carpe horam!" Instead of wasting your time in front of a computer by surfing the internet or playing the optimization game with your program in order to make it faster and — of course — to introduce bugs, better lean back and THINK. So far, several attempts had failed regarding selective search and opening book learning but the basic ideas still seemed promising. It took me six train rides to come up with improvements that finally led to ProbCut and the new book–learning scheme.

The second time I was experiencing pressure was in late 1996 after a new strong Othello program called

"Hannibal", created by Martin Piotte and Louis Geffroy, entered the scene. With regard to Logistello I had been lazy for over one year. It wouldn't take long before other programmers come up with good and even better programs after the ideas behind Logistello were published. Here he was — Hannibal — ready to defeat the Roman Empire. So it was again time for a "deep thought" which resulted in an enhanced selective search algorithm and a much better evaluation function. Competition can be quite stimulating.

3   The Match

By late 1996 Mr. Murakami still was interested in playing a match against Logistello. Meanwhile, the NEC Research Institute kindly agreed to sponsor the event providing me with a sufficient budget that allowed us to invite Mr. & Mrs. Murakami to stay in Princeton for one week and to organize the event adequately. In last November Mr. Murakami became World–Champion which enhanced the match status even further. He requested to play long–timed games (2h/player/game) and agreed to a six–game match starting on August 4, 1997.

Match Diary

Thursday, July 31

I returned to Princeton from the AAAI–97 conference in Providence that day. Here Logistello played two games against Tetsuya Nakajima who recently had become the Othello Meijin. In the second game he reached a winning position 31 plies before the end of the game. Fortunately for Logistello, he missed the narrow win and lost the game. Hmm, isn't Mr. Murakami an even stronger player? If he has prepared well we can expect a tough fight.

Friday, August 1

Takeshi and Rieko Murakami arrived in Princeton. I did not want to disturb them on the first day, so I waited till Saturday to make an appointment for visiting the match site together with David Parsons — the tournament director. All day long I was busy preparing the match and spectator room: cable for the video projection had to be laid and tables and chairs had to be arranged. Furthermore, two computers had to be moved and connected to the network: one PentiumPro/233 (over–clocked) system for Logistello in the match room and another PC in the spectator room. Done. What was left? Ah — I still had to prepare slides for my workshop talk on Tuesday.

Saturday, August 2

This morning I spent two hours of my life installing X–Windows on the computer in the spectator room. We wanted to show Logistello's output during the games and to give David Parsons the opportunity to visualize his 10–ply ideas on a graphical user–interface in such a way that even Othello greenhorns can follow him. Mr. Parsons had kindly agreed to provide live commentary on the games.

In the afternoon I called Mr. Murakami. He was fine and wanted to see the site before the match began.

Sunday, August 3

After breakfast I found time to finish the slides while taking care of Logistello's final match preparation: it was finishing the analysis of ca. 800 available Murakami games. At 6:15 pm I picked up Mr. & Mrs. Murakami to go to the institute accompanied by a Japanese TV team and a reporter from the largest Japanese newspaper. Mr. Murakami was impressed by the setup. He felt quite comfortable in his chair and even liked to play a couple of warm–up games in front of a running camera. First he wiped me out handily (ouch — I guess I had been absent–minded), then he played two games against "viper" — the 4-ply version of Logistello which is connected to the Othello server. Mr. Parsons, one of the best US Othello players, was watching the games closely — he knew this nasty silicon adversary very well. Viper easily won the first game but missed a draw in the second. Result: 1–1. The games and interviews took longer than expected. So we were in a hurry to get to the Chinese restaurant in time. Fifteen people were enjoying the welcome dinner.

Monday, August 4

Chaos. The media interest in the match especially in Japan was overwhelming. People, TV cameras, microphones, and cable everywhere! The spectator room was crowded. The first match day began with a welcome address by NECI's president Bill Gear. Then Mr. Parsons explained the match rules and colors were determined for the first game. It followed a brief press conference in which reporters — among other things — wanted to know our expectations for the match. Mr. Murakami compared himself with Don Quixote fighting against a windmill as he did before in an interview in May. He expected to win one or two games. Wow. When I heard this remark for the first time I thought it would be some kind of diplomatic understatement. I expected tough fights in the opening/midgame, only minor endgame errors, and close game outcomes.

Before each game I set the program's clock to 90 min allowing 30 minutes recover time in case of technical problems. Game 1 started at 9:30 am with c4 e3 amid a series of flashlights. Which opening would Logistello choose? I didn't know and didn't check before the game started because I do not interfere with its choice anyway.

Later in the game a couple of errors led to a large winning margin for Logistello. After the game we went to the spectator room to give comments. Mr. Murakami reported that he had missed the crucial 4–ply variation d2? c7 d7 c6! (diagram) which keeps White clustered in the center and leaves Black without access to e7. I was surprised. How could a human player of such a calibre miss a 4–ply combination? I saw him even playing backwards over the board the other day! And what happened in the endgame? Actually there is not much hope to win a single game if one constantly gives away four or more discs in the endgame. Hmm, maybe I had overestimated him. The next game would show his real strength because he would play with the white discs ...

We didn't really have time for lunch between the games since many teams asked for personal interviews. Game 2 started at 3 pm.

It happened again: shortly after the opening Murakami's position gradually deteriorated and many late middlegame and endgame errors led to a large win for Logistello. Looking at the disastrous outcomes of the first two games, one would expect signs of anger or depression on Murakami's side. Not so in this case. I felt guilty: didn't my pet — a T.-Rex — just munch a man who only wanted to play with it? Oops. Later, during the game wrap–up, it occurred to me that Murakami might have estimated his chances in this match more accurately than I did. After analysing the critical positions in this game, he gave a surprising explanation for the high winning margin: Against imperfect human players

it pays off to complicate endgame positions. This strategy includes avoiding obvious losing moves. For instance, at one point after Murakami's move to g5 (diagram), g8 was optimal for him giving Black the h8 corner without any compensation. Therefore, he didn't play to g8. Of course, against an opponent that plays perfectly in the endgame, this strategy is asking for trouble.

After the dust of the first match day had settled, the "computer–game–gang" (Yngvi Björnsson, Mark Brockington, Igor Đurđanović, Sanjoy Mahajan, David Parsons, Warren Smith, and myself) decided to stay at the institute, to order pizza, and to play Bughouse till Igor and Mark had learned to make use of all their pieces instead of just collecting them. It did not happen. Shortly after David's remark "I don't like team games" we called it a successful day.

Mr. & Mrs. Murakami had been invited for dinner by Kazuko Anderson — the NEC PR–division spokeswoman — who helped organize the match.
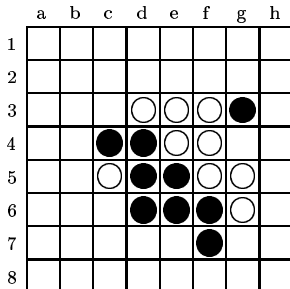
Tuesday, August 5

Workshop day. Mrs. Anderson informed me that Mr. Murakami did not sleep well last night and that he would prefer to stay at the hotel. Since we had scheduled him for playing a simultaneous tournament against workshop participants in the afternoon we had to find another good player. What about David Parsons? He is known to be an expert in virtually any popular game. He agreed and lost only two of the four Othello, three chess, and one
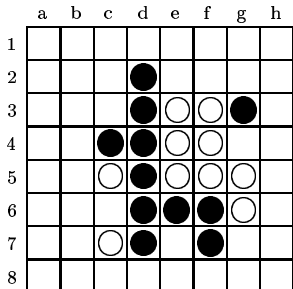

Game 1

August 4, 9:30 EDT

● Murakami (16)
○ Logistello (48)

perfect play result
at move 35: 21–43

	a	b	c	d	e	f	g	h
1	52	46	57	53	35	36	48	49
2	44	45	31	15	22	37	51	58
3	40	34	24	12	2	14	13	59
4	41	27	1	○	●	7	33	32
5	25	20	6	●	○	5	10	29
6	42	19	18	11	4	3	8	30
7	55	43	16	17	23	9	47	50
8	54	56	21	38	28	26	39	60

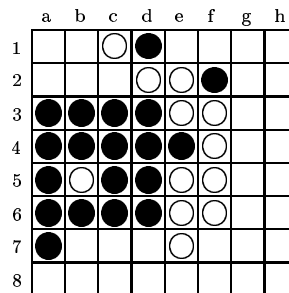BTM: g4 is better than d2. It creates only one new frontier disc.

WTM: (... d2? c7 d7) c6!

Game 2

August 4, 15:00 EDT

● Logistello (48)
○ Murakami (16)

perfect play result
at move 37: 35–29

	a	b	c	d	e	f	g	h
1	53	42	26	25	29	28	51	60
2	54	40	39	6	14	15	45	58
3	23	27	2	3	13	12	37	44
4	17	5	1	○	●	9	49	46
5	20	16	4	●	○	10	38	41
6	18	11	8	7	19	22	36	43
7	21	52	30	31	24	35	59	50
8	55	56	32	47	34	33	48	57

WTM: e1 is better than f1 which allows Black to create a good edge configuration with e1.
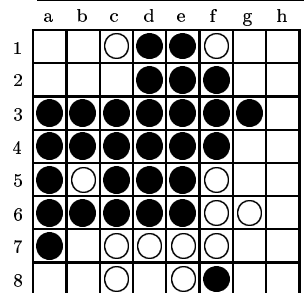
Murakami played g5 which loses by 18. The best move b2 loses by 6.

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Attax game he played simultaneously. What a performance!

Hans Berliner, the invited speaker, arrived on time coming from Boston. He gave an overview of computer chess history. Later, Yngvi Björnsson (Univ. of Alberta) talked about his ideas regarding selective depth–first search methods and Mark Brockington (also Univ. of Alberta) described the inner workings of his Othello program, Keyano. In my talk after lunch, I got lost in the details of Logistello's new evaluation function and overran the 30 minute time limit shamelessly. The workshop was concluded by Hitoshi Matsubara (ETL, Japan) who gave a talk on Monte–Carlo sampling.[2]

David Parsons was my guest in the evening.

Wednesday, August 6

For Mr. Murakami the first two games were more exhausting than we thought on Monday. Again, he had not slept very well last night but nevertheless, seemed to be in a good mood. I was concerned. With far less media attention than on the first day, game 3 started at 9 am.

I could sense Murakami's exhaustion during this game. He played a perfect endgame which costs a lot of energy. Computers excel in this game phase because they can follow each variation till the very end in order to find

[2]The workshop papers are available at http://www.neci.nj.nec.com/homepages/mic/workshop.html

perfect moves. In all games played so far, Logistello knew that it was winning by move 36.[3]

Murakami is a remarkable man. Even after the third loss in a row he was still enjoying the match as he told us in the game wrap–up.

Game 4 started at 3 pm. Just after Murakami moved to f8 he informed me that he was not feeling well. We stopped the clock, as we did several times before, when he left the room. What was wrong? The air–conditioning! Apparently the room was too cold for Murakami — he asked for a blanket. He told me that the same thing happened to him at the World–Championships last year in Tokyo. It must be a mixture of cool air and deep thoughts that causes him to freeze. The game resumed after a 30 minute break which Murakami spent laying in the grass in front of the NECI building to pep him up. In the meantime the ventilation slits in the match room had been closed.

At the end of the game Murakami got into time trouble which, in part, explains Logistello's high winning margin. Four wins in a row — the match was already decided. People congratulated me but I was not really happy about how Logistello won the games.

For dinner I invited Ryan Matreyek, an enthusiastic

[3]Log–files can be found at http://www.neci.nj.nec.com/homepages/mic/event.html

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Game 3

August 6, 9:00 EDT
● Murakami (26)
○ Logistello (38)

perfect play result at move 36: 28–36

	a	b	c	d	e	f	g	h
1	55	19	51	50	13	17	59	60
2	56	54	18	10	11	16	40	34
3	39	12	7	9	2	15	33	32
4	42	41	1	○	●	14	24	29
5	43	49	6	●	○	5	25	26
6	52	44	8	21	4	3	20	35
7	53	57	38	28	22	23	45	36
8	58	48	37	27	30	31	47	46

BTM: b4 is much better than f7. After f7 Logistello's heuristic search predicted a win by 4.

BTM: a3 ↝ −12, b2 ↝ −8.

Game 4

August 6, 15:00 EDT
● Logistello (55)
○ Murakami (9)

perfect play result at move 37: 46–18

	a	b	c	d	e	f	g	h
1	60	59	48	47	46	54	49	53
2	56	58	38	43	45	44	50	42
3	37	33	29	7	6	9	17	41
4	30	27	26	○	●	14	18	20
5	40	10	5	●	○	1	8	15
6	39	31	11	4	3	2	19	21
7	32	34	25	12	13	23	36	22
8	35	28	51	52	24	16	57	55

WTM: g4 is better than f8 which Logistello evaluated as leading to a 4–disc–loss.

White postponed breaking Black's wall (c3–g3) as long as possible which is usually a good strategy. At this point, however, f2 is better than a4.

Othello player, and the "computer–game–gang" to our house. Murakami needed to rest.

Thursday, August 7

On the last day we should see the two most interesting games of the match. Murakami stayed in Logistello's opening book for a long time in both games. Since the book consists of self–played games this means he played moves that Logistello once considered to be best. However, the program explores new opening variations by itself in order to find improvements. In game 5 Logistello followed a winning path until Murakami's move a6 finally threw it out of book. It then had time to solve the position for a narrow +6 win and thus didn't need its heuristic evaluation at all in this game.

In game 6 Murakami thought he would win until he finally discovered that Logistello had set up a nasty swindle which allowed it to move twice into the h8 corner region (diagram).

The match thus ended with two close games and the following end result

Takeshi Murakami	Logistello
0 points	6 points
(120 discs)	(264 discs)

At the awards ceremony, NECI's president Bill Gear presented the prizes to us: two identical heavy brass candle holders (in contrast to the ugly trophies people usually get) and a $1,000 check for Mr. Murakami. Logistello's prize money goes into my research budget. Furthermore, NECI had decided to donate the prize money difference of $2,000 to the Japanese Language School in Princeton in recognition of Mr. Murakami's contribution to international understanding: he is an English teacher.

Mr. Parsons left Princeton this evening. At this point I would like to thank him again for his commitment to this event. As the tournament director, game commentator, and simul player in one person he did a great job.

Mr. Murakami was exhausted and didn't feel like joining the "gang" for dinner. I would give him a call the next day.

Friday, August 8

Mr. & Mrs. Murakami visited the Princeton Art Museum. In the afternoon I gave them a call to invite them for their last dinner in Princeton. We spent the evening together enjoying the salmon and the lemon cream, talking about the match, Othello, and our plans for the future, and playing a couple of games on the Othello server.

On Saturday two new friends left Princeton for a vacation in Europe. Good bye! I am sure we will meet again.

4 Résumé

Although Mr. Murakami had not achieved his goal to win one or two games against Logistello he enjoyed the

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Game 5

August 7, 9:00 EDT

● Murakami (26)
○ Logistello (38)

perfect play result
at move 36: 30–34

	a	b	c	d	e	f	g	h
1	58	44	19	20	29	25	43	42
2	51	45	21	10	11	18	41	40
3	22	12	7	9	2	16	15	33
4	36	13	1	○	●	14	17	28
5	49	24	6	●	○	5	27	32
6	35	50	8	31	4	3	26	56
7	59	57	34	30	23	39	54	55
8	60	47	48	37	52	38	46	53

BTM: a6 finally threw Logistello out of book. b6 – the expected book move – also loses.

BTM: g2 ↝ −12, a5 ↝ −6.

Game 6

August 7, 15:00 EDT

● Logistello (37)
○ Murakami (27)

perfect play result
at move 35: 35–29

	a	b	c	d	e	f	g	h
1	54	37	17	30	22	24	31	56
2	47	53	9	14	23	32	58	39
3	48	8	5	4	15	19	26	33
4	49	12	3	○	●	6	28	34
5	59	13	7	●	○	1	29	35
6	16	18	11	2	10	20	42	45
7	60	50	27	38	25	21	46	57
8	51	52	36	41	40	43	44	55

WTM: d7 is slightly better than d1 which Logistello evaluated as losing by 4 discs.

WTM: a1 ↝ −10, a5 ↝ −8. After a1 Black has the nice swindle h8 h7 — whereas after a5 Black's a7 controls the a8–h1 diagonal allowing g2.

5

match very much. In his speech during the award ceremony he made a remarkable point: For him playing against Logistello was not just a match against a PC programmed with ideas of a single man. Rather, he felt like fighting against generations of engineers and mathematicians. He also thinks that Othello games between human players will remain interesting because it is not possible for human beings to discover all secrets of the game in a lifetime. Unlike chess or go, Othello is a young game and there is still much to learn about openings and strategies. The match result shows that Othello programs can be of great help for human studies of the game in the future.

References

K.F. Lee & S. Mahajan (1990), *"The Development of a World Class Othello Program"*, Artificial Intelligence 43, pp. 21–36

P.S. Rosenbloom (1982), *"A World–Championship–Level Othello Program"*, Artificial Intelligence 19, pp. 279–320