The 1st International Paderborn Computer–Othello Tournament

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Abstract

We present the results of an International Computer–Othello Tournament held at the University of Paderborn in October 1993. Furthermore, some participants describe their entries.

1 Organization, Participants and Results

The tournament was held at the University of Paderborn (Germany) from October 5th till 7th, 1993. It was thought to be a replacement for the Othello tournament of the Computer–Olympiad which was canceled this year because David Levy didn't find a sponsor. We called for participation on Internet in July and received many replies. In order to give authors which couldn't come to Paderborn the opportunity to enter their programs we provided PCs and SPARC–stations and found operators for the programs. The entries listed by their start positions were as follows:

1	LOGISTELLO	SPARC10	Michael Buro	Germany
2	OOT	PC486DX-50+Card	Markku Poysti	Finland
3	DESDEMONA	PC286+Card	Ola Liljedahl, Lars Johansson, Ingvar Lindgren	Sweden
4	MODOT	SPARC10	Joel F. Feinstein	England
5	MONYCA	PC486DX-50	Asuncion Gomez–Perez, Carlos Linares Lopez	Spain
6	ADAMS OTHELLO	SPARC10	Brian T. Gray	U.S.A.
7	REV	SPARC10	Igor Durdanovic	
8	OTHEL DU NORD	PC486DX-50	Jean–Claude Delbarre	France
9	VERS2	PC486DX2-66	Ben de Wolf	The Netherlands
10	THOR	PC486DX-50	Sylvain Quin	France
11	COUNTMAX	PC486DX-50	Edward L. Grau	U.S.A.
12	KEYANO	SPARC10	Mark Brockington	Canada

The hardware ranged from PCs over SPARC–stations (Model 10/M20 which has roughly the double integer power of a PC486DX2-66) to special purpose hardwares OOT and DESDEMONA. The latter was able to search more than 250,000 positions per second.

Because of the time constraints we couldn't play a complete tournament with two one–hour games per pair. So we decided to play one game against each other in the first part of the tournament. Thereafter, the eight best programs played their return games with reversed colours. The program with the most points from games against the best programs finally won the tournament. Here are the tournament results:

1st Part (11 rounds)

b\w	1	2	3	4	5	6	7	8	9	10	11	12	Points
1	-	47:17	-	42:22	-	64:0	-	44:20	-	42:22	-	32:32	10.5
2	-	-	22:42	-	47:17	-	15:49	-	23:41	-	35:29	-	4
3	16:48	-	-	0:64	-	1)	-	44:20	-	46:18	-	31:33	6.5
4	-	39:25	-	-	64:0	-	36:28	-	30:34	-	45:19	-	6
5	0:64	-	12:52	-	-	47:17	-	12:52	-	17:47	-	7:57	1
6	-	0:64	-	2:62	-	-	2:62	-	0:64	-	28:36	-	0
7	24:40	-	48:16	-	50:14	-	-	46:18	-	33:31	-	35:29	9
8	-	46:18	-	33:31	-	57:7	-	-	32:32	-	53:11	-	7
9	18:46	-	32:32	-	42:22	-	31:33	-	-	43:21	-	29:35	7
10	-	46:18	-	33:31	-	64:0	-	32:32	-	-	50:14	-	5.5
11	24:40	-	20:44	-	47:17	-	12:52	-	16:48	-	-	0:64	2
12	-	31:33	-	33:31	-	64:0	-	13:51	-	37:27	-	-	7.5

1) postponed due to network problems, then canceled — rated as a win for DESDEMONA (with no effects on the final ranking)

2nd Part (7 rounds)

	b\w	1	3	4	7	8	9	10	12	Points
1	LOGISTELLO	-	37:27	-	41:23	-	39:25	-	-	6
3	DESDEMONA	-	-	-	27:37	-	28:36	-	-	2.5
4	MODOT	20:44	37:27	-	-	27:37	-	34:30	30:34	3
7	REV	-	-	18:46	-	-	29:35	-	-	3
8	OTHEL DU NORD	33:31	29:35	-	28:36	-	-	49:15	31:33	3
9	VERS2	-	-	35:29	-	34:30	-	-	-	4.5
10	THOR	29:35	28:36	-	20:44	-	33:31	-	22:42	1
12	KEYANO	30:34	32:32	-	33:31	-	32:32	-	-	5

Final Ranking

	Program	Points against best eight programs	Prizes
1.	LOGISTELLO	12.5	A nice blue Cup + 300,– DM
2.	KEYANO	9.5	A smaller nice blue Cup + 200,– DM
3.	REV	8	An even smaller nice blue Cup + 100,– DM
4.	VERS2	7.5	
5.	OTHEL DU NORD	6	
6.	MODOT	5	
	DESDEMONA	5	
8.	THOR	2.5	
9.	OOT	1	
10.	COUNTMAX	0	
11.	MONYCA	0	
12.	ADAMS OTHELLO	0	

Everyone enjoyed the tournament — we saw exciting games and had much fun. It was "astonishing" that after instructive discussions at dinner "beim alten Fritz" DESDEMONA played stronger and stronger. Looking at the great resonance we think that it is likely that there will be the 2nd International Paderborn Computer–Othello Tournament in 1994.

2 Entry Descriptions

LOGISTELLO (Michael Buro – buro@uni–paderborn.de)

One of the strongest Othello program of the last decade – BILL [LeeMah88] – has inspired the work on LOGISTELLO. The idea was to build a fast evaluation function which bases entirely on pattern recognition and statistic approaches and needs no manual tuning at all.

To evaluate a position LOGISTELLO only performs a couple of fast table accesses using all colums, rows and diagonals of the board as indices: One set of tables approximates the number of legal and potential moves and another set estimates the final disc differential which was computed using 18,000 example games between the predecessors of LOGISTELLO and Igor Durdanovic's REV. Finally, all features are combined linear. The parameters are also estimated from the game database using a statistical method called Logistic Regression which makes no assumptions on the feature distribution and is in this sense more robust than Discriminant Analysis which was used to estimate BILL's parameters.

LOGISTELLO's searching techniques like zero–window alpha–beta search, use of killer tables and a large hashtable, performing shallow searches for move ordering and using opponent's time are standard. Up to now the tree is searched iteratively until timeout without search extensions. In a one hour tournament game LOGISTELLO completes depth 11–13 searches in midgame and starts win–draw–loss search at 22–24 empty squares (running on a SPARC10, compiled with gcc).

MODOT (Joel F. Feinstein – jff@maths.nott.ac.uk)

MODOT's evaluation function has been through various phases. The current version has fewer features than previous versions: in particular legal moves for both sides are no longer counted, and there is no edge table. Apart from a very small bias in favour of the four center squares, MODOT simply counts for each side the number of empty squares next to the opponent's pieces (just one form of potential mobility) and balances this against the evaluation of the corner regions (four squares round each corner only). Here MODOT uses the somewhat unstable method of assuming that squares next to corners (which are bad before corners are taken) become worth a large fraction of a corner each when the corner is full. To try to reduce the instability, MODOT has a variable depth search, and searches deeper if either player has played a move in or next to a corner near the end of the line searched. However, these lines are not allowed to exceed 7/5 of the depth originally intended.

The bias against squares diagonally next to corners is large near the beginning of the game, but becomes smaller as the game progresses. I have always felt that computers do not sacrifice enough corners. I juggled the parameters in MODOT until I was impressed with its corner sacrifices: they were not always correct, but usually interesting, and sometimes devastating.

The alpha–beta search is a little primitive. There is no transposition table, and only a crude imitation of the killer heuristic. There is no windowing, unless the win–loss–draw endgame calculation counts. There is, however, move ordering. At the lowest levels, a "fixed sensible order is used". At higher levels, a search of depth four less than the intended depth is used to order the moves. The exception is in the endgame, since it is not sensible to order a 20–ply win–loss–draw calculation using a 16 ply mid–game calculation.

I have been looking at some of the tournament games. Many of them are of very high quality, and very exciting. I have not yet decided exactly where MODOT is going wrong. I do not think I can blame MODOT's tiny opening book, as some of the top programs were able to beat MODOT from openings which I believe to be inferior.

KEYANO (Mark Brockington – brock@cs.ualberta.ca)

KEYANO is based on the Carnegie–Mellon program, BILL. The search strategy used in KEYANO is extremely similar. However, the evaluation function takes much more time to compute. The function computes exact mobility as well as a count of non–interior discs. Corner and edge configurations are also stored in tables and examined at every node. The four components are combined into a linear regression. KEYANO can normally achieve a depth of 10 or 11 on a SPARCstation in tournament speed, and solve positions completely at 18 empty squares. The opening book is based on the book generation ideas of Jean Delteil (author of SPOCK) and from the games in the THOR database. This is the "standard" database of top–level Othello games.

OOT (Markku Poysti – mpoysti@vipunen.hut.fi)

My ideas concern using gate array logic chips to do low–level parallel processing in evaluation function and move generation. Currently I'm improving my PC card using 8 Intel's iFLEX chips. I do evaluation row–by–row, compared to previous signal processor version's square–by–square sequential style. My evaluation function consists of two simple logic functions that take square's colour as input and do pattern recognition for rows, and a "value" function that converts the result of recognition to a number, that is then summed for all squares to get the result. The original idea has not been changed much during last five years, I look for stable disks, possible moveplaces and possible stable places. Current version can do about 1500 evaluations / sec, which is slow compared to PC's capability to do search algorithm (currently pvs), so I concentrate on improving evaluation hardware.

REV (Igor Durdanovic – igor@uni–paderborn.de)

Overall idea:

- to think on opponent's time
- to be able to learn dynamically

Learning:

- statistical learning of 8–disc & 9–disc patterns and parameters for mobilities (number of moves & number of moves per discs) from mini–maxed tree of 18,000 games made by investigating "all" openings of depth 7, played against LOGISTELLO over a year
- each pattern weighted by probability of being created in each stage of game

Performance:

- complicated evaluation function with lot of float operations ... resulting in about 10,000 (mid) and 15,000 (end) game evaluations per sec on a Sparc 10
- In spite of that capable of win/loss solving 21-23 empty squares dependent on mobility

THOR (Sylvain Quin, Bruno de la Boisserie – cx7@email.teaser.com)

BIRTH OF A PASSION (by THOR)

Once upon a time, there was a French computer magazine, called "L'ordinateur Individuel". In its first issue, an Othello program written in Basic was published. Then, this magazine started (in 1979) to organize tournaments. Sylvain Quin (author of THOR) was first an interested reader, then an enthusiast spectator. In 1981, my grand–father "THOR version 1" was born. It was written in Z80 assembly (an 8 bits processor) on a dino–computer: The Tandy TRS–80 model 1. It finished 4th in the September 1981 tournament, and 2nd in the September 1982 one. In the beginning of 1983, the night falls on the whole world (may be I exagerate a little). In 1988, a meeting with a human Othello player restarts interest for the game. Sylvain acts as a referee in the 1988 World Championship, and met Francois Aguillon (author of Comp'Oth, probably the best program of this time). At the end of the year, THOR version 2 runs on a PC compatible computer. In March 1989, it played its first tournament, and was rated first equal (Let me be honest: it was due to an endgame mistake of Paul Ralle, human world Champion 1984, who blundered in a winning endgame). Finally, the version 3 arrived, with many new intersting features that I'm going to explain. First of all, I want to clearly state that the aim of THOR is to be a useful program for human players, and NOT the very best player in the world. I'm fully written in C language, and my source code is approximately 7000 lines long. I'm able to run on PC compatible machines, Atari ST, Apple Macintosh and Sun workstations. I'm able to use text, Hercules, CGA, EGA and VGA graphics cards (when running on PC). I have several strength levels, from 2 seconds to 99 hours, plus a special level which manages itself the time given for a whole game. I use standard minimax with alpha–beta cutoffs algorithm, with a little improvement: At each level of the tree, once the first move has been computed, I use its value as the beta bound for the other moves (including all the tree which is under this node.)

Sylvain add many features rarely found in programs only designed for playing in tournaments: for example, the coefficients of the differents parts of the evaluation function (mobility, number of discs, and positional values of several squares (edges, C and X squares)) may be modified by the user: the weight of each parameter may be change from half the standard tuning to twice). It allows to change the style of play of the program, and train the user to win against different kind of players. This partly solves a frequent criticism, which is that playing against programs only trains humans to win against programs, and not against other players.

Another interesting function is "evaluate position". Other programs usually provides only the evaluation of the best move. But you are interested by knowing the value of the move you ought to play. With other programs, you then need to play this move, to see what the program answers. With the function available in THOR, you'll have not only the value of the best move, but also the value of the 2 less good ones. If you examine the relative values, you'll see if the first move is really far ahead, or at the opposite, if the others are very close (including the one you ought to play, I suppose ?)

The last function, which was longer to program than all the others, is the database function. I will finish this paper by this one.

The evaluation function is the heart of an Othello program. But it is probably the part of THOR which is the less performing. To describe it quickly, I will say that it minimize the discs, it maximize the mobility and it avoid to play C and X squares. Sylvain do not agree with the edge evaluation method used by "Comp'Oth", but is not really satisfied by any other one. Then, it only follows some rules like:

- only play C squares if the corner is occupied (if it's by me, it's very good, if it's by the opponent, it tries to inserted discs.
- or if the other C square on the same edge is occupied and there are already several discs on the edge: 6 discs balanced edges, or both unbalanced edges where it is important to gain tempo.
- same first rule for X squares, all the other situations strongly avoided.
- take the corners especially if it gives many stable discs.

The discs are minimized until move 40, with a little change when corners are taken: if THOR give corners early in the game, it's rarely without an equivalent gift, and it is usually good to take stable discs earlier.

Let me now talk about the most interesting feature, in the opinion of the author: the database of tournament games. It currently contains more than 19600 tournament games (mostly from French and World Championships, International tournaments, Japanese games...). All these games have been checked after move 44 to know who was the winner if both players played perfectly until the end. This allow, when looking at the statistics of win/loss in "theoretical" mode, to avoid wrong results due to loss on time, or endgame blunders.

The rest is quite simple. The database can contain 400 tournaments, 2000 players, and 30000 games. Here is the way it is organized, to allow other software programmers to extract informations from it:

1) Header: 68 bytes 2 bytes for the quantity of games in the database 2 bytes for the quantity of players 64 bytes not yet used.

2) Tournaments: 400 records of 32 bytes 30 bytes for the name of the tournament, the last one must be binary 0 (end of a string in C) 2 bytes for the quantity of games in this tournament

3) Players: 2000 records of 20 bytes 20 bytes for the name of the player, the last one must be binary 0

4) Games: N record of 68 bytes 2 bytes for the order number of the tournament (0 to 399) 1 byte for the total quantity of BLACK discs at the end 1 byte for the theoretical winner after move 44 : N for Black, B for White, E for Draw. 2 bytes for the order number of the BLACK player (0 to 1999) 2 bytes for the order number of the WHITE player (0 to

1999) 60 bytes for the moves of the games. All games start with F5, each byte has a value corresponding to a given square, following these rules: Squares A1 to H1 are numbered 11 to 18, A2 to H2 21 to 28 ... squares A8 to H8 are numbered from 81 to 88. The D4 (44), E4 (45), D5 (54) and E5 (55) squares are never used because they are already played at the beginning.

THOR is available freely for PC compatibles computers, Atari St, Apple Macintosh and Unix (currently Sun Sparc) workstations. This program is currently translated in 9 languages. The doc files are available in French or English. The database is regularly updated, and other programs (like Cassio for the Apple Macintosh) are able to use it. The source code is available on request for those who want to produce versions for others computers. For all informations, you may write to:

Sylvain Quin 132, rue de Bagnolet 75020 Paris (France)

or mail to Bruno de la Boisserie, author of the Atari St version, who will transmit your request to Sylvain.

VERS2 (Ben de Wolf – b.t.h.m.de-wolf@mailbox.rug.nl)

The first serious version of VERS2 dates back to February '89, when it took part in the Dutch Open in Utrecht and reached a parted third and fourth place. The Paderborn version, written entirely in C and running on a 486 66MHz PC under OS/2, was recently ported from the latest Acorn Archimedes version in C and ARM assembler. With the translation of assembler to C, a few bugs were introduced that effected the speed but not the correctness of the endgame search.

The program uses iterative deepening and zero–window alpha–beta search. The evaluation function is essentially a modification of the one described in [Ros82], i.e. a linear combination of a measure of mobility (move counting for both sides), two different measures of "potential mobility" and edge evaluation. The edge table consists of entries for all configurations of 8 edge squares and the 2 adjacent 'X' squares, with the value for black and for white, with white to move and with black to move. These values are calculated more or less as in [LeeMah90], but with less weight for stability and more for mobility. Also there is an algorithm to adjust for disturbing interactions between edges. The coefficients for the evaluation function change fluently every half move as the game progresses. The endgame coefficients are based on a set of games, played by humans and programs, of which the game theoretical value is calculated. So even shallow search usually leads to correct moves in the endgame. But this also speeds up the endgame win/loss/draw search in tournament play. Because much effort is spent to optimize the endgame search, VERS2 is at its best in the endgame.

The opening is played from a small opening book that once was calculated by VERS2 itself, but that is adjusted in a semi-automated way after most lost games. This leaves the midgame as the weakest spot of VERS2 as its author does not have enough game specific knowledge to trim the evaluation coefficients by hand.

Acknowledgements

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Appendix A

Games of the first Part

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

LOGISTELLO 47
OOT 17

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

REV 35
KEYANO 29

38		45		34			
36	37	2	1	16	21	12	20
40	33	3	○	●	6	11	19
41	35	4	●	○	7	13	14
30	29	10	5	9	8	15	18
43	39	31	25	17	26		
42	32	24	23	22	27	28	

VERS2 42
MONYCA 22

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

THOR 33
MODOT 31

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

OTHEL DU NORD 57
ADAMS OTHELLO 7

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

COUNTMAX 20
DESDEMONA 44

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

DESDEMONA 16
LOGISTELLO 48

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

KEYANO 31
OOT 33

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

ADAMS OTHELLO 0
VERS2 64

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

MODOT 45
COUNTMAX 19

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

MONYCA 17
THOR 47

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

REV 46
OTHEL DU NORD 18

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

LOGISTELLO 42
MODOT 22

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

KEYANO 13
OTHEL DU NORD 51

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

THOR 64
ADAMS OTHELLO 0

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

OOT 22
DESDEMONA 42

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

COUNTMAX 47
MONYCA 17

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

VERS2 31
REV 33

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

MONYCA 0
LOGISTELLO 64

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

DESDEMONA 31
KEYANO 33

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

ADAMS OTHELLO 28
COUNTMAX 36

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

MODOT 39
OOT 25

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

OTHEL DU NORD 32
VERS2 32

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

REV 33
THOR 31

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

LOGISTELLO 64
ADAMS OTHELLO 0

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

VERS2 29
KEYANO 35

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

OOT 47
MONYCA 17

				23			
		40	33	10	17		39
19	13	8	9	2	6	28	
20	15	1	○	●	3	31	32
16	11	4	●	○	22	34	36
14	12	18	5	7	26	35	37
21		27	29	25	24		38
				30			

DESDEMONA 0
MODOT 64

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

THOR 32
OTHEL DU NORD 32

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

COUNTMAX 12
REV 52

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

REV 24
LOGISTELLO 40

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

KEYANO 33
MODOT 31

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

MONYCA 12
DESDEMONA 52

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

VERS2 43
THOR 21

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

OTHEL DU NORD 53
COUNTMAX 11

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

ADAMS OTHELLO 0
OOT 64

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

LOGISTELLO 44
OTHEL DU NORD 20

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

KEYANO 37
THOR 27

				6			
	20		○	●	9		
		17	●	○	1		
		14	4	3	2	8	
		11	7	13	5	18	
		10	19	12	15	16	21

MODOT 64
MONYCA 0

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

COUNTMAX 16
VERS2 48

			○	●			
			●	○			

DESDEMONA 64
ADAMS OTHELLO 0

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

OOT 15
REV 49

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

VERS2 18
LOGISTELLO 46

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

MONYCA 7
KEYANO 57

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

OTHEL DU NORD 46
OOT 18

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

ADAMS OTHELLO 2
MODOT 62

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

THOR 50
COUNTMAX 14

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

REV 48
DESDEMONA 16

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

LOGISTELLO 42
THOR 22

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

COUNTMAX 0
KEYANO 64

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

DESDEMONA 44
OTHEL DU NORD 20

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

OOT 23
VERS2 41

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

MONYCA 47
ADAMS OTHELLO 17

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

MODOT 35
REV 28

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

COUNTMAX 24
LOGISTELLO 40

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

KEYANO 64
ADAMS OTHELLO 0

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

OTHEL DU NORD 33
MODOT 31

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

VERS2 32
DESDEMONA 32

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

THOR 46
OOT 18

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

REV 50
MONYCA 14

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

LOGISTELLO 32
KEYANO 32

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

MODOT 30
VERS2 34

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

MONYCA 12
OTHEL DU NORD 52

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

DESDEMONA 46
THOR 18

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

OOT 35
COUNTMAX 29

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

ADAMS OTHELLO 2
REV 62

Games of the second Part

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

LOGISTELLO 41
REV 23

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

THOR 29
LOGISTELLO 35

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

DESDEMONA 28
VERS2 36

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

MODOT 27
OTHEL DU NORD 37

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

OTHEL DU NORD 28
REV 36

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

LOGISTELLO 39
VERS2 25

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

THOR 22
KEYANO 42

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

OTHEL DU NORD 29
DESDEMONA 35

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

REV 18
MODOT 46

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

OTHEL DU NORD 31
KEYANO 33

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

MODOT 34
THOR 30

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

REV 29
VERS2 35

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

KEYANO 32
DESDEMONA 32

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

LOGISTELLO 37
DESDEMONA 27

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

MODOT 30
KEYANO 34

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

VERS2 34
OTHEL DU NORD 30

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

THOR 20
REV 44

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

KEYANO 30
LOGISTELLO 34

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

VERS2 35
MODOT 29

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

THOR 28
DESDEMONA 36

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

OTHEL DU NORD 49
THOR 15

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

OTHEL DU NORD 33
LOGISTELLO 31

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

KEYANO 32
VERS2 32

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

DESDEMONA 27
REV 37

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

MODOT 20
LOGISTELLO 44

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

KEYANO 33
REV 31

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

THOR 33
VERS2 31

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

MODOT 37
DESDEMONA 27

Appendix B

Tournament Impressions

The pictures are available via ftp:

ftp ftp.uni-paderborn.de (login:anonymous, password:guest)
cd unix/othello
...