Minesweeper – a personal survey by Stephan Bechtel

1.   Preface

Probably nearly anybody knows Minesweeper, the old Windows game that could already be run on Win 3.1. It has been one of my favourite computer games (mostly because of the possibility of a short playing session and the small system requirements) for many years. After having played Minesweeper for several years only occasionally, but in my opinion quite successfully (personal bests 3-25-96), I redeveloped some ambition to improve these times in September 2001, when I found other players' best scores on the web (particularly Damien's site[1]). This ambition has been rewarded, as I could improve my personal bests down to a nice total of 66 (2-12-52). With these scores, I've been within the Top20 of the world for several years.

2.   My Personal Records

My best times have always been achieved non-flagging. Due to technical problems (my mouse didn't work perfect any more), I retired from active playing on October 6, 2004. Below you can see my personal bests.
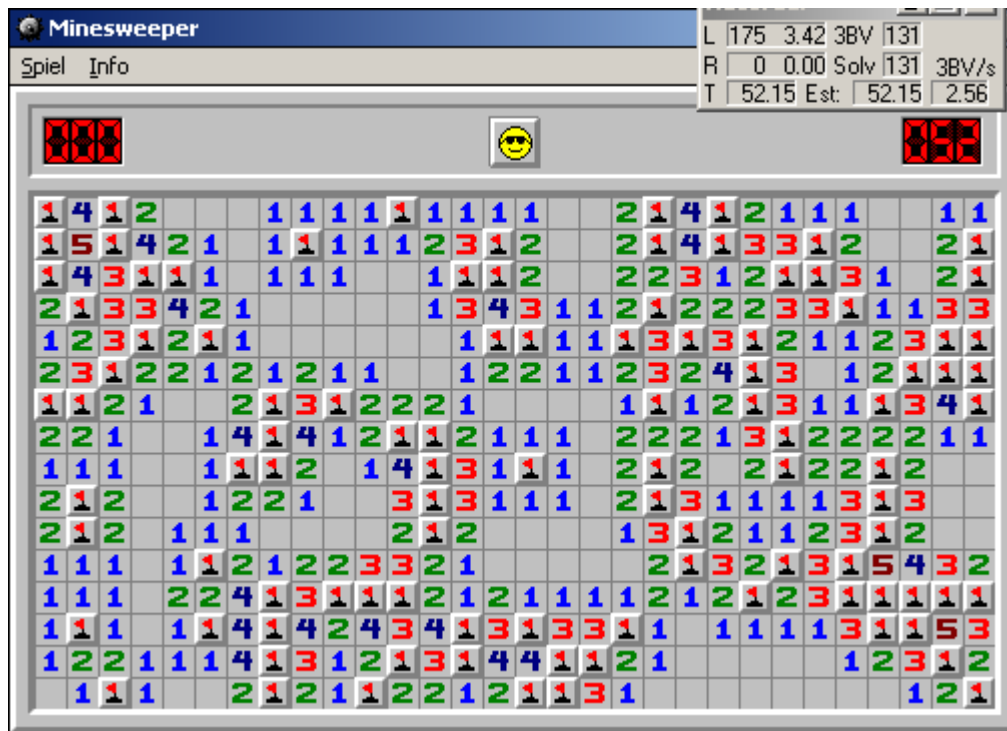
2.1 Overall records

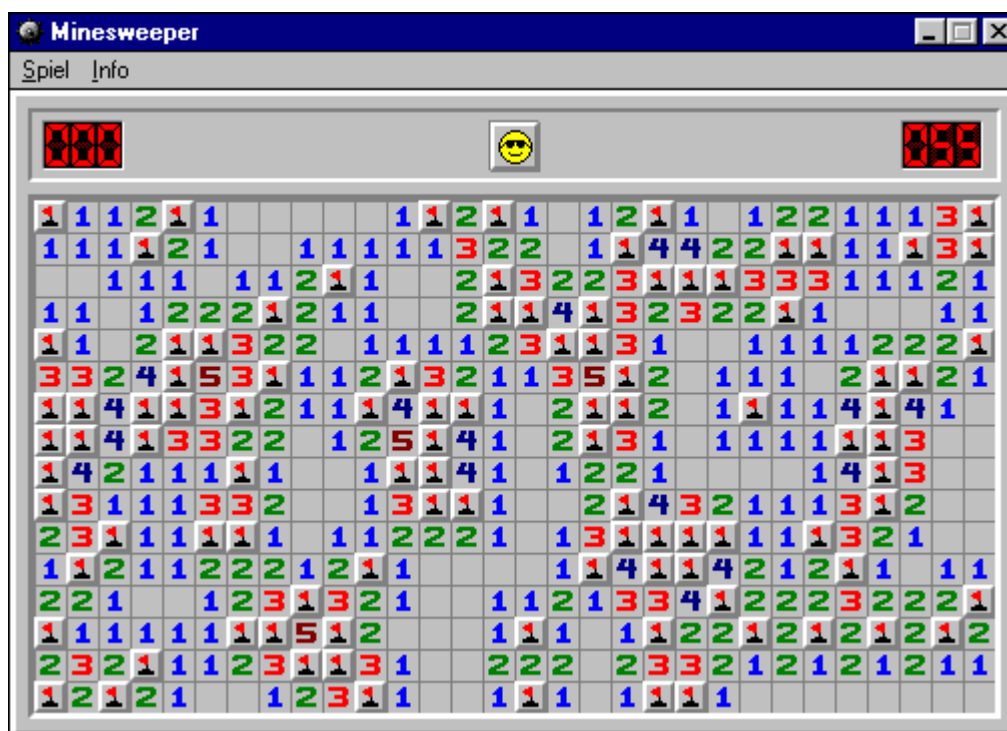| Version	Best Time Beginner	Best Time Intermediate	Best Time Expert	Total
Original MS version (Win 3.1 with 8x8 beginner)	2	12	52	66
Original MS version (Win XP with 9x9 beginner)	1	15	56	72
Rodrigo's clone	2.49	13.37	56.49	72.35

2.2 Scores in detail - Expert

I achieved 17x sub-60, 205x sub-70, 591x sub-80, 800x sub-90, and 911x sub-100.

Time	Totals	3BV Maximum	3BV Minimum	3BV Average	3BV/sec Maximum	3BV/sec Average
52	1	131	131	131	2,52	2,52
55	1	119	119	119	2,16	2,16
56	4	152	127	139	2,71	2,48
57	3	144	120	130	2,53	2,27
58	3	151	139	145	2,60	2,50
59	6	150	133	142	2,54	2,40
60	1	150	150	150	2,50	2,50
61	9	154	126	143	2,52	2,34
62	9	177	136	154	2,85	2,49
63	14	158	104	144	2,51	2,29
64	13	169	133	152	2,64	2,38
65	26	173	111	154	2,66	2,36
66	31	179	120	154	2,71	2,33
67	20	191	126	158	2,85	2,36
68	26	180	132	159	2,65	2,34
69	38	180	126	157	2,61	2,28
70	46	190	128	167	2,71	2,39
71	38	192	141	165	2,70	2,33
72	52	202	112	163	2,81	2,27
73	43	210	123	167	2,88	2,29
74	33	201	135	173	2,72	2,33
75	40	207	145	174	2,76	2,32
76	41	213	135	169	2,80	2,23
77	34	209	140	173	2,71	2,24
78	30	215	139	175	2,76	2,24
79	27	220	147	174	2,78	2,21

This is the screenshot of my expert record :-).

For a long time, this 55 seemed to be the limit of my path of improvement.

In Expert mode, the non-flagging technique I always played with needs a very easy board to be as fast as the normal playing style (flagging occassionally and opening surrounded squares by pressing left and right mouse button at the same time).

There is a probably high positive correlation between the "easiness" of a board and the 3BV, a special indicator which was developed in order to provide a single number to indicate whether a board is easily solvable by a low number of left clicks (see section 4).

2.3 Scores in detail - Intermediate

Intermediate has always been my favourite level. On easy boards, the non-flagging style might be as fast as the "normal" style. So, I got 17x sub-15, 987x sub-20, 4027x sub-25.

Time	Totals	3BV Maximum	3BV Minimum	3BV Average	3BV/sec Maximum	3BV/sec Average
(11)	1	30	30	30,0	2,73	2,73
12	3	42	31	36,7	3,50	3,06
13	3	30	29	29,3	2,31	2,26
14	10	46	28	36,3	3,29	2,59
15	30	49	30	40,2	3,27	2,68
16	84	57	27	42,1	3,56	2,63
17	160	62	30	44,6	3,65	2,62
18	298	62	33	46,9	3,44	2,61
19	389	70	32	49,9	3,68	2,63
20	539	72	32	53,2	3,60	2,66
21	685	81	31	55,6	3,86	2,65
22	695	81	38	58,1	3,68	2,64
23	591	87	39	60,2	3,78	2,62
24	539	88	37	62,2	3,67	2,59

On the left side, you can see a screenshot of the 12 with the highest 3BV. The other 12s were a 12.46 (3BV of 37), and a 12.51 (31). My personal best of 11 seconds (on the right side) was achieved on the so-called dreamboard which isn't counted any more for world record rankings.

2.4 Scores in detail - Beginner

Grid	Time	Totals	3BV Maximum	3BV Minimum	3BV Average	3BV/sec Maximum	3BV/sec Average
8x8	2	40	8	2	4,6	4,00	2,29
8x8	3	384	13	3	7,3	4,33	2,45
8x8	4	1340	-	-	-	-	-
9x9	1	1	2	2	2,0	2,00	2,00
9x9	2	53	9	2	5,2	4,50	2,61
9x9	3	243	12	4	8,4	4,00	2,79

Due to the known bug of the original MS version that sometimes, the timer jumps from 1 to 2 immediately (instead of after one second), I couldn't finish the few very easy beginner boards I got in 1 second.

On the other hand, I managed to finish 2 boards that required a theoretical amount of 8 left clicks in 2 seconds as well. You can see the screenshots there. The one on the right is a screenshot from Rodrigo's clone.

3.   Active Ranking (AR)

The Active Ranking (AR) was started in 2002. It provided me with a lot of competition so that I played regularly in order to get good positions in the ranking. So, I was listed continuously 73 periods until I retired from sweeping.

2004 Period	2004 Rank	2004 Scores	2003 Period	2003 Rank	2003 Scores	2002 Period	2002 Rank	2002 Scores
26	-	-	26	6	76 (3-15-58)	26	11	81 (2-14-65)
25	-	-	25	6	75 (2-16-57)	25	15	85 (3-17-65)
24	-	-	24	8	79 [+5]	24	13	82 (2-15-65)
23	-	-	23	7	74 (2-14-58)	23	10	77 [+5]
22	-	-	22	7	77 (2-14-61)	22	6	72 (2-14-56)
21	22	82 [+10]	21	5	73 (2-15-56)	21	13	86 (3-17-66)
20	17	77 [+5]	20	4	76 (2-15-59)	20	15	86 (2-16-68)
19	8	72 (15-57)	19	7	80 (2-16-62)	19	13	84 (3-15-66)
18	17	80 [+5]	18	6	79 (3-15-61)	18	11	86 (3-16-67)
17	10	75 (16-59)	17	6	78 (2-12-64)	17	11	83 (2-16-65)
16	11	76 [+5]	16	12	85 [+10]	16	11	80 (2-15-63)
15	5	71 (15-56)	15	7	80 [+5]	15	8	79 (2-13-64)
14	20	79 [+5]	14	5	75 (2-16-57)	14	12	83 (2-15-66)
13	10	74 (15-59)	13	7	78 (2-15-61)	13	7	78 [+5]
12	14	79 [+5]	12	7	78 (2-14-62)	12	4	73 (2-16-55)
11	11	74 (13-61)	11	9	82 (2-15-65)	11	12	83 (2-15-66)
10	8	74 (15-59)	10	9	80 (2-14-64)	10	17	88 (2-17-69)
9	10	75 (15-60)	9	7	77 (2-12-63)	9	14	87 (2-16-69)
8	12	80 [+5]	8	8	79 (2-15-62)	8	12	88 (2-17-69)
7	8	75 (14-61)	7	16	85 (3-16-66)	7	22	95 [+10]
6	8	74 (12-62)	6	12	79 [+10]	6	17	90 [+5]
5	12	77 [+5]	5	8	74 [+5]	5	11	85 (3-17-65)
4	7	72 (14-58)	4	5	69 (2-11-56)	4	27	106 (4-24-78)
3	7	72 (13-59)	3	14	83 (3-15-65)	3	24	108 (4-21-83)
2	3	66 (14-52)	2	12	82 (3-16-62)	2	21	96 (3-20-73)
1	12	77 (16-61)	1	15	86 (3-17-66)	1	20	98 (4-18-76)

During a long time, I was not only participating at the AR, but also contributed to the success of the project by hosting the files on my webspace and by calculating some statistics.
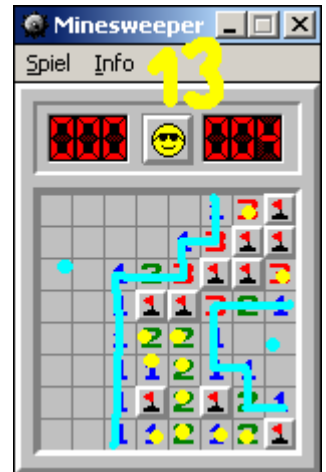
4.   3BV

3BV is a shortcut for "Bechtel's Board Benchmark Value". The name was invented by Benny Benjamin. It is just the method that I used to check out fast boards.

3BV shows the optimal number of clicks for non-flagging style. But it should be even an acceptable indicator for other playing styles. You have to count like the following: 1 click for each possible opening and 1 click for each number square that is not border of any opening.

On the right, you can see an example with a 3BV of 13 (for beginner, but the method is valid for all levels, of course).
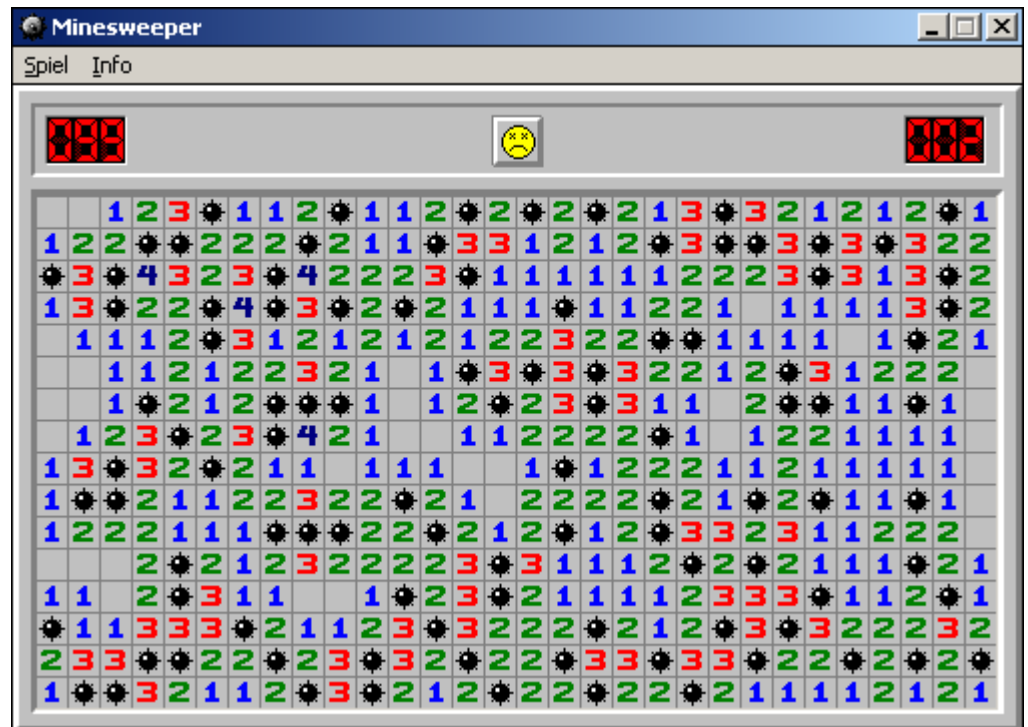
It should be noted that a low 3BV only indicates a possible fast board. My own empirical analysis shows that obviously, there is a possible correlation between low 3BV boards and fast boards. Indeed, there are both boards with low 3BVs, but complexe mine arrangements that make fast times impossible, and boards with high 3BVs but an arrangement of mines that is easy to clear.

As an example, I'll show two boards I finished in 20 seconds, one (on the left) with a 3BV of 38, the other one (on the right) with a 3BV of 72.
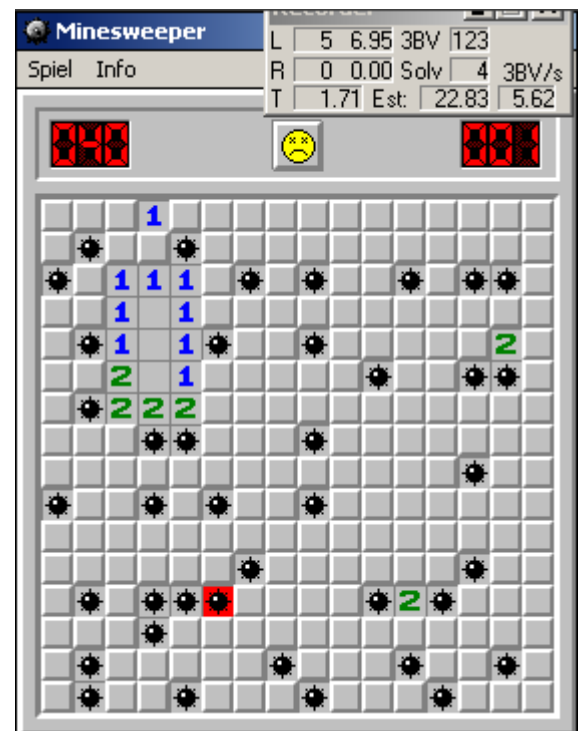
Benny Benjamin and Yoni Roll wrote a "Minesweeper Board Reader" program that analyzes screenshot files and, besides additional information, gives 3BV for the board as a result. It can be downloaded at our yahoo group[2]. Sorin Manea developed a recorder that record games, and, on a special GUI, provides information on the number of clicks made and as well on the 3BV.

5. Horrible Boards - boards with the highest 3BV I encountered

During my career, I encountered several boards which have been horrible in terms of 3BV. You can see screenshots of an Expert Board with a 3BV of 260, an Intermediate Board with a 3BV of 123, and a Beginner Board with a 3BV of 36.

6. The end

In October 2004, the noiselessly clicking left button of my minesweeper mouse (a Mitsumi Classic Mouse) stopped to work *every* time. And a mouse that doesn't work 100%, is probably the worst thing to get still fast times. As I can't play that fast with another mouse and as this special can't be bought anywhere, I decided to retire from active sweeping! To quote Lance's popular statement, let's say "Happy Sweeping" to everyone!

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1   http://www.metanoodle.com/minesweeper/
2   http://groups.yahoo.com/group/minesweeper-addicts/