JOSTLE 2007

Klaus P. Jantke

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> *If A is success in life, then A equals x plus y plus z.*
> *Work is x; y is play; and z is keeping your mouth shut.*
>
> Albert Einstein, Observer, January 15, 1950

Preface

In the present paper, I can't follow Albert Einstein's advice, because the rules of the game Jostle 2007 have to be published; thus I'll try it with $(x \wedge y \wedge \neg z)^1$.

Jostle is a family of games I developed on demand more than 20 years ago. In preparation of some private party, I have been told to develop a game for being played the next day. The game was then named SDI abbreviating the German term 'Super Drängel-Idee' – an allusion to a US American military program named the 'Strategic Defense Initiative (SDI)' which was en vogue these days. We have been playing the game successfully for many years.

For the purpose of scientific studies, SDI was stripped down to its essentials in 2006 published and discussed in [Jan 2006a] and [Jan 2006b], among others.

SDI and the other games of the Jostle family are board games – track games, more precisely – which are of some interest for patterns in game play and for these patterns' relationship to fun.

The most recent version of the game is named Jostle 2007 derived from its predecessor Jostle core by a subtle modification of the rules. Jostle 2007 is discussed in public for the first time within my invited keynote speach at the 4th International Symposium on Ubiquitous Knowledge Network Environment, Sapporo, Japan, March 5-7, 2007.

Klaus P. Jantke

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[1] I am used to the notations of the Berlin school of mathematical logics due to Karl Schröter who was the teacher of my teacher Helmut Thiele.

Contents

Abstract

Understanding digital games is a highly interdisciplinary endeavor. Patterns in games and game play seem to be essential for affecting the human brain. Games do need to some extent regularity for being playable. Hence, variants of pattern concepts are central to the digital games science. Jostle 2007 is an intentionally simple track game revealing quite obvious patterns of game play–the jostling of the players' pieces on the game track. Jostle 2007 may be seen as a testbed for investigations of different type. How does the occurrence of patterns–the jostling–correlate to winning or loosing the game? How does jostling relate to fun in playing the game? Interfering these questions, how closely is fun related to winning the game? How important is jostling when some computerized players are designed? Does so-called game intelligence depend on the artificial players' ability to jostle intensively? Jostle 2007 is setting the stage for related studies.

1   The Key Ideas of Jostling

The games of the JOSTLE game family have been designed purposefully to provoke especially intensive interaction between human players.

There is no principle limit to the number of players. When the number of players becomes larger, enlarged versions of the JOSTLE game track have to be used. Throughout the present introduction, JOSTLE 2007 is explained for the case of three players. Some of them may be computerized.

Basically, the JOSTLE game board is a linear track of 32 cells. There is an order assumed. At the one end, there is the first cell. At the other end, there is the target area formed by the last 5 cells.

The basic activity of playing is moving the players' pieces along the track from the first cell to the target area. Every player has the same number of pieces. This number must be at least 2. For a pleasant game play, three or more pieces are useful. In the case of JOSTLE 2007, we assume that every player has 3 pieces.

The game playing proceeds in rounds. When it is a player's turn, a dice is rolled. The player freely chooses one of her pieces and moves the piece as many cells forward as the dice shows. In case the dice shows a 6, the player has another free dice roll. But in this case, she has to move the same piece as before.

Every cell of the track may host at most one piece. Therefore, it is necessary to determine what happens when a piece moved forward hits a cell where another piece is sitting. In such a case, the piece which has been sitting before on the cell reached by the currently moving piece is displaced backward to the closest cell which is not occupied. If all the cells on the track before are occupied, the piece is pushed off the track.

The goal of the game is to reach the target area for scoring as many points as possible. The last five cells of the track which form the target area give scores of 1, 2, 3, 4, and 5 points, respectively. The closer a cell is to the end, the higher is the score.

There holds the peculiar rule that no piece in the target area is allowed to move again. The only exception is that a piece may be displaced backward by a newly arriving piece. In case it is pushed off the target area, it may move again.

Therefore, to win the game it is desirable neither to be too early nor to be too late at the target area. This leads to some interesting tactics.

To make the game even more interesting, two special event cells have been introduced. There is one type of cells with the effect that a piece stepping on such a cell has to move three cells backward. There is another type of cells of which always two cells are paired. When a piece steps on one of those cells, it is directly moved to the cell's mate.

Event cells have the effect that after rolling a dice and moving a piece forward, further moves of this piece are caused. As the piece may hit other pieces on its way, those are also moved and a kind of chain reaction is triggered.

2 The Rules of JOSTLE 2007

The present chapter aims at a complete description of the game JOSTLE 2007.

2.1 The Track of the Game

The game JOSTLE 2007, like its predecessor, is played on the track displayed in Figure 1.
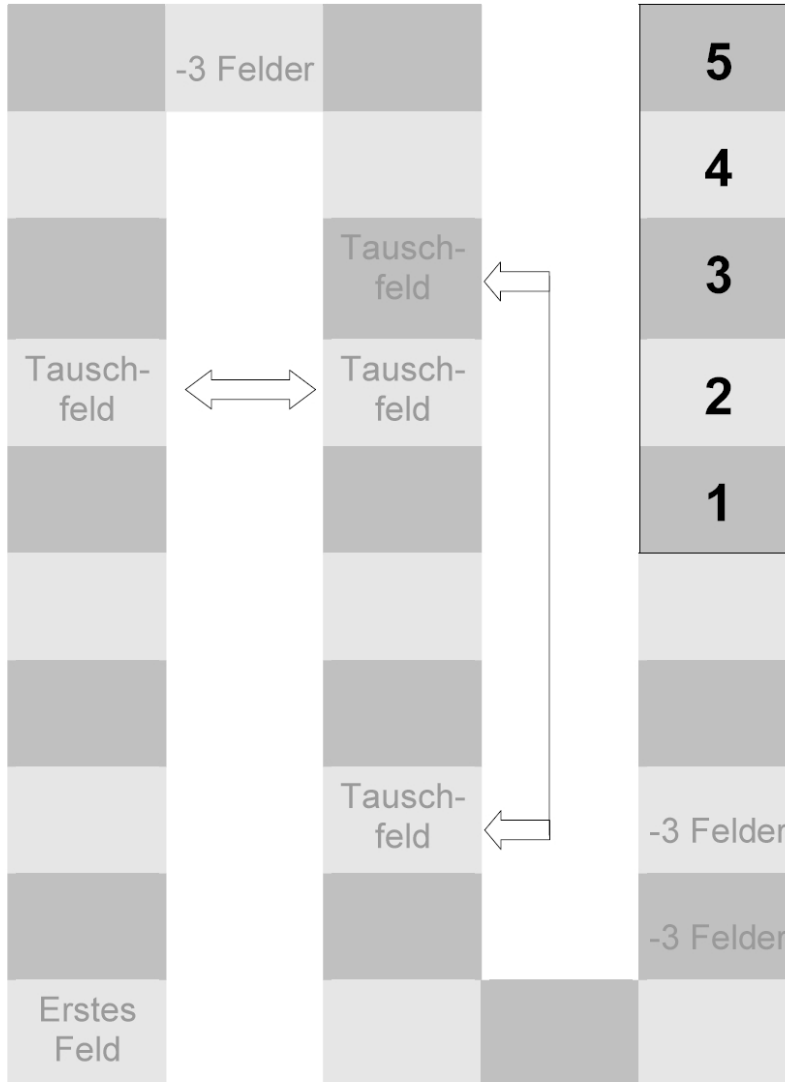
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Figure 1: The Standard JOSTLE Track with German Annotations

The track's target area is at the right upper end showing the scores in its cells. 'Erstes Feld' simply indicates the first cell. The special event cells are annotated by 'Tauschfeld' (cell of exchange) and '-3 Felder' (minus 3 cells; 3 cells backward).

2.2   The Rules of the Game

The Board: For a precise notation, we assume that the cells are numbered from 1 to 32. The cells in the target area have the numbers from 28 to 32. The two types of event cells are denoted by '-3' and 'ex'. The cells numbered 11, 24, and 25 are cells of type -3. There are two pairs of cells of type ex with the numbers (7,15) and (14,19). The cells in a pair are mutually called its mate.

Preparation: The game is played in turns. Players agree about an order which is not changed during game play. Every player has three pieces. A dice is needed. Initially, all pieces are off the board; they may be seen on an imaginary field no. 0.

Moves: The first player begins, rolls a dice and moves one of her pieces exactly the number of cells forward which the dice shows. If the player has thrown a 6 and moved a piece, she rolls the dice again. This time, the same piece as before has to be moved. Repeated rolls of 6 are treated in the same way. When a player's turn is completed, the next player moves.

Locking: Pieces on one of the cells from 28 to 32 may not be moved forward. If a piece moves into the target area after a 6 was rolled, no second dice roll is allowed. If there is a piece on cell 27 which is the player's only piece outside the target area or which has been moved there after a 6 was rolled, and if for this piece a 6 is now rolled, the move is not executed. The dice must be rolled again.

Jostling: If a piece is moved to a cell where another piece is sitting, this piece is displaced backward to the closest cell which is not occupied. If all the cells on the track before are occupied, the piece is pushed off the track.

Events: If a piece arrives at one of the event cells 7, 11, 14, 15, 19, 24, or 25, either by being moved forward or by being displaced backward due to jostling, an event is triggered. From cell 11, 24, or 25, the piece is moved backward 3 cells to cell 8, 21, or 22, respectively. From cell 7, 14, 15, or 19, the piece is moved to the cell's mate, respectively. In case an event causes a piece to hit a cell where another piece is sitting, this is jostled backward as described above.

Blocking: To avoid conflicts and potential cycles, the following applies within one player's turn. When a piece moves to one of the cells 7, 14, 15, or 19, this cell is seen occupied in case jostling happens.

The End: If the last cell in the target area has been filled by one player's move, the game is–almost–over. Every player has one more turn to roll the dice and to move a piece (up to a player who has all his three pieces in the target area where no more move is allowed).

Scoring: Every player who has pieces in the target area sums up the scores associated with cells on which her pieces are sitting. The maximal score wins.

2.3   Illustrating JOSTLE

To get an impression of how the game rules unfold into game play, let us consider a few cases.

The first case is possible, but rather unlikely. The case has been constructed to demonstrate (a) the phenomenon of jostling, (b) the effect of the -3 type event cells, and (c) the effect of the ex type event cells at once with a minimal setting of pieces and turns.

Assume that there are three players named Red, Green and Yellow playing pieces of the corresponding colors[2]. Let us the particularly rare case in which (i) Red rolls a 6 followed by a 5, (ii) the green rolls a 6 also followed by a 5, and by change (iii) Yellow's dice rolls return the same numbers.
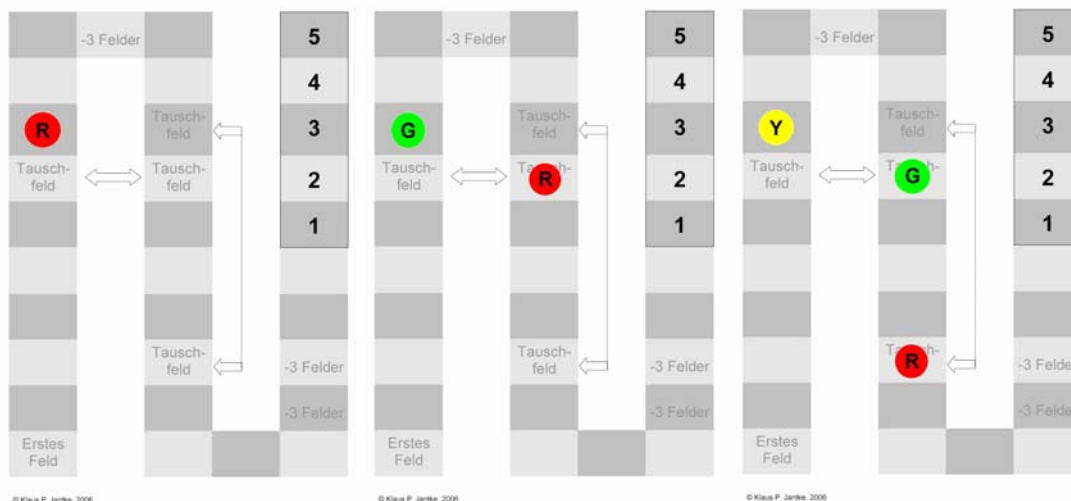

Figure 2: The JOSTLE game states after three subsequent turns of example 1

Let us summarized what happened in each turn.

- In the first turn, Red rolls a 6 and moves one piece to the cell number 6. The following dice roll returns a 5. Red has to move the same piece. It arrives on cell 11 which is of type -3. The piece is sent back to cell 8.

- Green rolls, by chance, the same subsequent numbers and the green piece arrives at cell 8. The piece of Red sitting there is displaced backward to the closest free cell. This is cell 7 which is of type ex. Therefore, the arriving piece of Red is sent to the cell's mate number 15.

- Similarly, Yellow rolls the dice twice, by chance, returning 6 and 5 subsequently as well. The piece of Yellow arrives at cell 8 and the piece of Green arrives at cell 15. There, it hits the piece of Red sitting on cell 15. The piece of Red is displaced to cell 14. Because cell 14 is of type ex, the piece of Red is sent to the mating cell 19 where it rests.

This completes the discussion of our first illustrating example case.

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[2]To allow for a black and white printing, the pieces carry the corresponding initial letters.

The leftmost game state on display in Figure 3 shows the starting point for another interesting case study. Assume it's Yellow's turn who rolled a dice which returned a 2. Yellow's pieces are on the cells 5, 6, and 13. It is, obviously, not advantageous to move the top piece on cell 13. When hitting the event cell 15, it would be thrown back to cell 7. So, let's consider the remaining two alternatives.
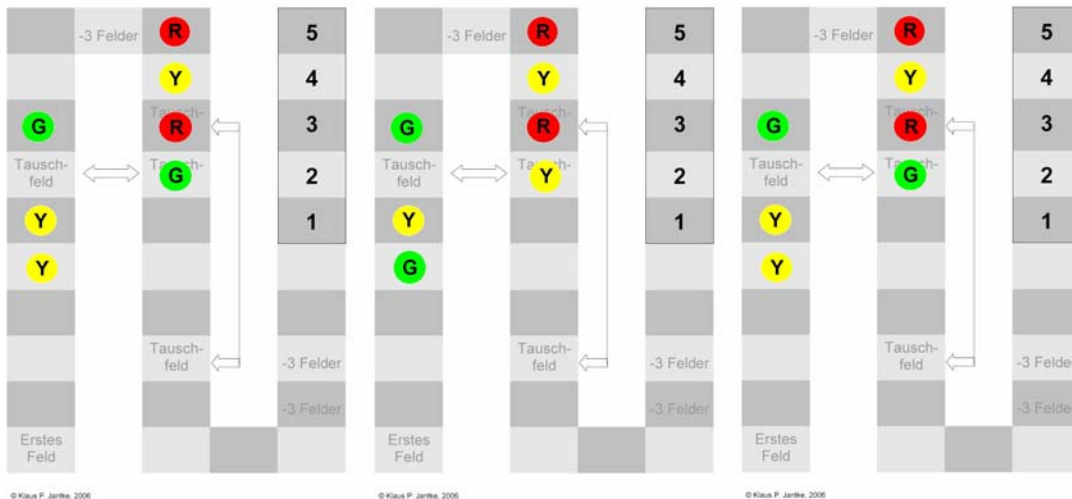

Figure 3: Comparison of two out of three alternatives for Yellow after rolling a 2

The leftmost track of Figure 3 shows the game state in which Yellow moves either the piece on cell 5 or the piece on cell 6 two steps forward.

- Moving the piece on cell 5 brings this piece to the event cell 7 from where it is elevated to cell 15. According to the 'blocking' rule, cell 7 is considered occupied throughout Yellow's current turn. According to the 'jostling' rule, Yellow's piece displaces Green's piece from cell 15 backward to the closest free cell which is 11. This is an event cell of type -3. Thus, the green piece is moved to cell 8 where it hits another green piece. Once more the 'jostling' rule does apply. Because cell 7 is blocked, the green pice arrives at cell 5. This resulting game state is displayed in the middle of Figure 3.

- Moving the piece on cell 6 hits a green piece sitting on cell 8. Yellow's piece remains for a moment, whereas Green's piece is jostled backward to cell 7. According to the 'blocking' rule, cell 7 is considered occupied throughout Yellow's current turn. Green's piece is transferred to cell 15 where it hits another green piece. Exactly as in the case, this moves through cell 11 to cell 8. On cell 8, it hits the yellow piece which returns to its origin. The resulting state on display in the right part of Figure 3 appears unchanged from the original state. In fact, two pieces of Green have exchanged their positions.

This completes the second case study. For the purpose of the present paper intended to present and explain the rules of JOSTLE 2007, this shall do.

> *Art is the imposing of a pattern on experience,*
> *and our aesthetic enjoyment is recognition of*
> *the pattern.*
> Alfred North Whitehead, August 30, 1941
> (see [Pri 1954])

3   The Cluster Concept

Play is the imposing of a pattern on activity ..., and it is several practitioners' strong belief that fun in game playing is recognition of the pattern(s) [Kos 2005].

This perspective at game playing has motivated systematizations [BH 2004] of and experimentation [Jan 2006b] with patterns in game design. JOSTLE 2007 has been designed with studies of patterns in mind.

The present report does only present the rules, not the forthcoming studies based on them. Nevertheless, this chapter shall allow for a glimpse at what the rules are for.

It seems that the rules of JOSTLE 2007 drive human players toward jostling. A number of related questions are still open, among them to what extent jostling is a criterion for game intelligence and, hence, has to be considered as a game design principle.

Observations show that in a majority of games played, pieces frequently group on the track. If a new piece hits a group of pieces loitering on the board, it is likely that the group grows. Those groups of pieces, their development and changes when playing the game, the correlation between engagement in group formation and winning or loosing the game, etc. are subject to investigation. This requires clear concepts. Variants of different strength may be of interest. For the present introduction, a very simple conceptualization shall do.

Semi-formally expressed, a cluster is a subsequent and uninterrupted chain of cells which are all occupied by pieces.

Formally speaking, the JOSTLE game track is the set of cells $B = \{1, 2, \ldots, 32\}$. Intervals $[m, n] = \{m, \ldots, n\}$ are subsets of B without gaps. A game state[3] is a mapping σ from B into $P = \{G, R, Y, *\}$, where the letters represent the players or, more precisely, their pieces on the track. The asterisk means an empty cell. There is the admissibility condition $|\sigma^{-1}(X)| \leq 3$ for X being G, R, or Y.

A cluster is an interval $[m, n]$ with $1 \leq m$ and $n \leq 27$ meeting these conditions:

- $\sigma([m, n]) = \bigcup_{m \leq x \leq n} \{\sigma(x)\} \subseteq \{G, R, Y\}$
- $\sigma[m-1] = *$ or $m = 1$
- $\sigma[n+1] = *$ or $n = 27$

It is the author's strong belief based on playing experience that humans have as much fun in clustering as in winning the game–an interesting hint to designers.

Occurrences of clusters when playing JOSTLE 2007 will be studied in detail.

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[3]The terminology is not completely satisfying, but sufficient for the present purpose.

4 Outlook

The coming Summer term 2007 will bring with it several implementations of Jostle 2007 to study and compare variants of programmed game intelligence. This presentation of the game's rules is a necessary prerequisite to the work and to the fun to come.

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