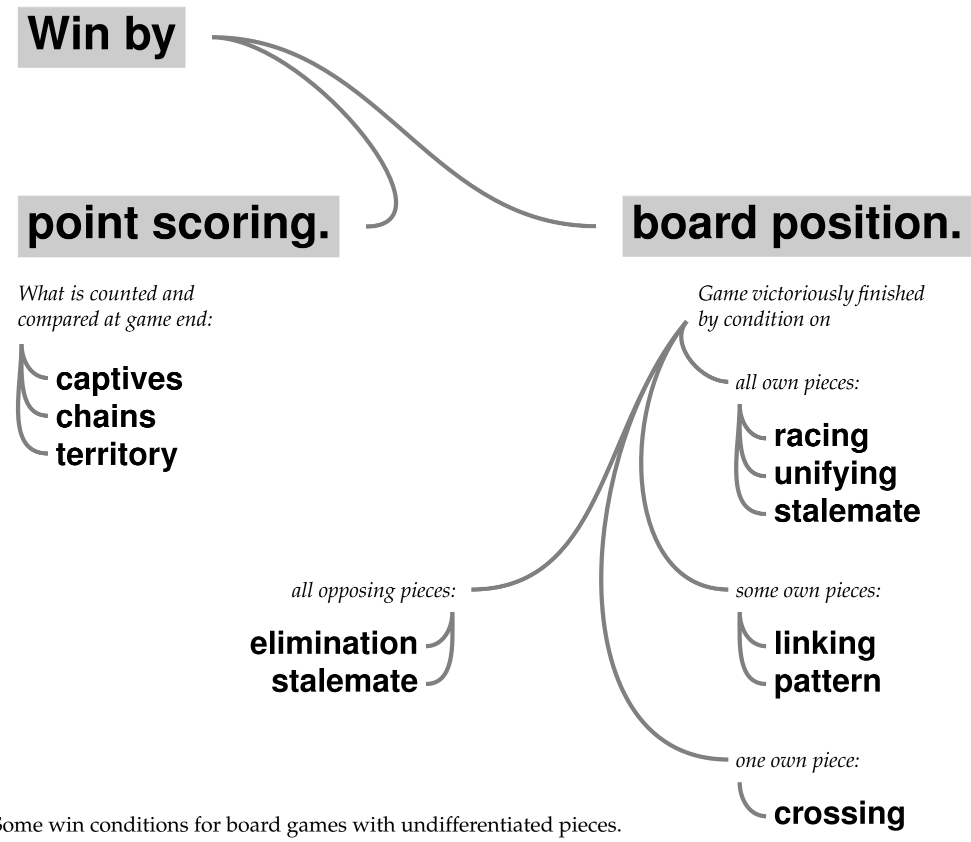
Goals

All games share a marvellous property: their simplicity. Daily life can become annoyingly complicated, yet games restrict our attention to a compact area and precise rules. One instance of this are win conditions: every game comes with its own definition of winner and loser (and sometimes draw).

There is no ultimate taxonomy of win conditions in board games, and there couldn't be: in contrast to evolutionary trees, someone can (and will!) devise games which intentionally avoid established typing. Nonetheless, we want to suggest a system which covers the majority of games, and uses very straightforward concepts. Our approach is most concisely summarised in the following flowchart. We will proceed to carefully explain all the notions.



Some win conditions for board games with undifferentiated pieces.

Our approach incorporates several major simplifications: First, game end and goals are conflated. In principle, one should have a similar flowchart, starting with *Game ended by ...*. This is not needed for our purposes, especially since there aren't too many really interesting game end conditions. However, note that there are games with a score tracker which are simultaneously ended and won by a condition such as 'first to achieve 12 points'.

Second, the goals in our scheme are restricted to games with undifferentiated pieces, thus excluding the checkmate. It is easy to extend the system to more complicated games, but because this book features no such games, we will merely mention some more elaborate win conditions at the end of the section.

Third, many games combine different win conditions. In such cases, it is a subjective matter how to classify such a game. And then there are games where the two sides have genuinely different goals. We start our discussion with a quick survey of the symmetry properties of win conditions.

Finally, 'board position' should really encompass additional information such as the entire move history (needed for conditions on repeated positions, e.g. in CHESS), out-of-board information (e.g. captured pieces in SHOGI) and current score (e.g. in BOOM AND ZOOM).

Symmetric goals. The classical board games DRAUGHTS, CHESS, NINE MEN'S MORRIS are all *symmetric*. This means that if a winning position for one side is achieved, then swapping the colours of all pieces, ● ↔ ○, produces a winning position for the other side. Most board games are of this type. GO is included if it is played without additional points accorded to White (komi).

Opposite goals. Some games, mostly of the connection type, have a different property: swapping colours at game end will not necessarily change the winner. Instead, draws are impossible, and the winning conditions for Black and White are mutually exclusive.One could call this quality 'anti-symmetric'. Here, the two players pursue *opposite goals*.

The most famous example is likely HEX. It has opposite goals because Black strives to link two opposing borders (usually top-bottom) whereas White aims to link the other border (left-right). Many other connection games inherited this concept from HEX.

Asymmetric goals. Finally, there are a few games where the players pursue genuinely different goals. A famous historical example is TABLUT, but it is by far not the only one. Many cultures had their own brand of hunt or siege games with asymmetric goals. Kungser etc. Note that adding a starting turn equalizer (such as the swap rule or komi) makes a game asymmetric. From this point of view, it is better to discuss symmetry disregarding these extra regulations.

These *asymmetric* games tend to be particularly hard to balance. UNLUR (2002), by Jorge Gómez Arausi, solves this issue neatly by handing it directly to the players.

Types of goals

The most important distinction among win conditions is this: Is a game finished at once after reaching a particular board position? Or are scores counted after finishing play? This disparity is seen clearly when comparing GONNECT and GO: these games have almost identical rules regarding placement and capture, but GONNECT ends with a winner as soon as a single-coloured chain linking two opposing boundaries is established; by contrast, a match of GO ends by agreement between the players, and then proceeds to a score counting phase which finally settles the winner.

All board position winning conditions known to us only incorporate pieces of *one* colour. Therefore, we distinguish whose pieces are considered (own or opponent), and how many pieces are involved (all, some, one). For each of these classes there are several well-established win conditions.

Win conditions involving scores naturally take pieces of both colours into account, although not necessarily all of them. We distinguish such conditions into three types.

Asymmetric games can employ win conditions of different types for the two sides. This happens in the classical specimen TABLUT which has a crossing goal for White, and a checkmate goal for Black. Other asymmetric games have the same type of goals for both sides: connection in UNLUR and capture in GUERILLA CHECKERS.

Point scoring games

We start with those games that establish scores for each side after a game has ended. Let us emphasise that the rules of point scoring games need to contain an *end condition*.

All point scoring games allow to equalise the starting advantage or a difference in skill by awarding one player a certain number of points in advance (this is *komi* in GO). This can be used in actual games: if two players carry out a number of games at once, they can agree to adapt *komi* whenever one side wins three games in a row.

It is generally a bad idea to use the margin of difference as a measure for anything. As an example, suppose that in two matches, the results were $44 : 20$ and $48 : 50$ (Black : White). One should not say that altogether Black has played better. Promoting players to eke out maximal scores (rather than winning) has a tendency to incur degenerate play.

We consider three types of scoring, in increasing order of complexity. Let us mention right away that there are further types of scoring games for which we just name examples: OLIX (pattern scoring), TINTAS (complex majority scoring). In particular, these are games where the final scores are not determined by the final board position!

Captives comparison: *After game end, compare the number of pieces captured/collected.*

All games featuring capture allow this kind of scoring. A natural end condition is that no pieces can be captured anymore. Note that here captured pieces feature as a natural and in-build scoring track.

The classical examples for this kind of scoring are sowing games such as AWALE, KALAHA, TOGUS KUMALAK. Another one is ALQUERQUE: it rarely happens that one side captures all opposing pieces. In many cases, comparing captives allows to establish a winner nonetheless.

A modern sowing-type game is BUKU. It has a very clever end condition, which players need to advance or delay purposefully.

Harvest Brian Wittman 2012 https://boardgamegeek.com/boardgame/129950/harvest

Chain comparison: *The score of a player is determined by the list of sizes of chains of that player's colour.*

By a *chain*, we mean a maximal set of connected pieces of one colour. Hence, tiles adjacent to a chain are either empty or occupied by opposing pieces.

Almost all chain games have as end condition that the board be full. This tends to create rule sets with desirable formal properties (games always end; no draws) but on the other hand, such games can take very long. Also, there is often a lot of counting involved, which can be cumbersome when not playing on or with a computer; this is especially true when there tend to be many chains, all of which are including in the scoring. In particular, chain scoring games tend to scale rather badly.

The chain games of the simplest type incorporate only a single chain for each player, for example their largest chain each. It can also happen that the number of chains is invoked.

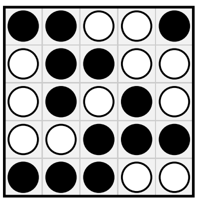
A chain game has a more local character if rather few chains are involved in scoring, and if those chains are typically small. Contrariwise, chain scoring has a more global character, if more (or even all) chains are involved; this is also leads to a more elaborate end game protocol.

A special case are games where the final score is simply the number of pieces of the appropriate colour. Since this is at the same the sum of all sizes of chains of the relevant colour, such games fall under the above definition.

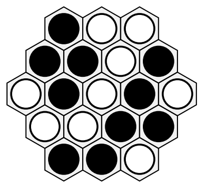
Chain games (except for the counting-all-pieces type) are a recent phenomenon, but there has been a burst of inventions. We mention some of those, sorted by local to global scoring. The sizes of chains of one colour at game end is denoted by $l_1 \geq l_2 \geq \cdots \geq l_n$.

formula	comparison	games	scoring
l_n	min	Minimize	smallest chain wins
l_1	max	Catchup, Ecalper	largest chain wins
$l_1 l_2$	max	Produto	product of largest two chains
$l_1 + \cdots + l_k$	max	Taiji	sum of k largest chains
n	min	Xodd, Yodd	smaller number of chains
n	min	Libra	compare number of chains to bid
$l_1 \cdots l_n$	max	Omega	product of all chain sizes
$l_1 + \cdots + l_n$	max	Flume, Othello, Ataxx	number of pieces
$l_1 + \ldots + l_n - nP$	max	Symple	number of pieces minus P points for each chain

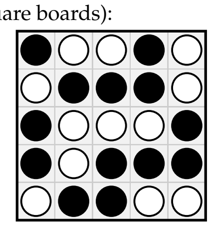
Some examples of the list of chain sizes on full boards (with 4-adjacency on the square boards):



White: 5, 4, 2, 1
Black: 7, 5, 1



White: 7, 1, 1
Black: 6, 4



White: 4, 2, 2, 1, 1, 1
Black: 6, 4, 2, 1

Draws can be resolved in various ways. One possibility is recursion, comparing the next largest (or smallest) chains. This is done in Minimize and Catchup. In Ecalper, equality of largest chains is solved by the smaller number of chains.

Some games employ chain based scoring, but with additional conditions on which chains are included in the score. One might call these *conditional chain games*. A representative is Star (1983): a star is a chain (of one colour) connecting three border tiles, and a star scores as many points as it contains pieces, minus 2. Another example is Polar, where a chain of size l is allowed to score only if is adjacent to a smaller, opposing chain; in this case, it scores $l(l+1)/2$ points.

Another extension of the concept deals with stacks: if a rule set creates scores from the total heights of all stacks, one could call this a *vertical chain game*. A conditional version of that is Abande, where only those stacks contribute to the score which are adjacent to an opposing stack.

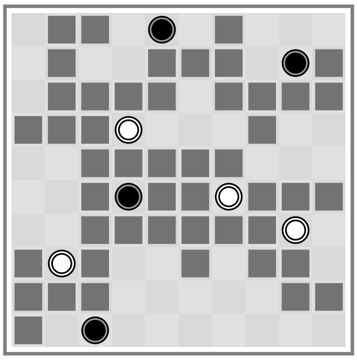
Territory scoring: *At game end, surrounded territories are compared.*

This notion is not at all precise but a succinct definition is unfortunately not called for, because this class of games is really small. However, it does contain the showpieces Go and Amazons. In distinction to chain scoring games, territory counting cannot be reduced to just chains of both colours. The prototype of all territory games is Go (in this context, ideally with Chinese scoring). Creation of territories GO and AMAZONS differs highly, and there is no reason why there shouldn't be other, equally good, games of this type.

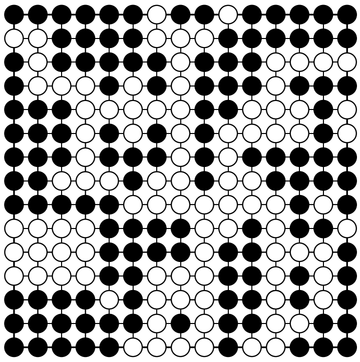
GO: points occupied and surrounded by the player.
AMAZONS: number of moves left.
STORISENDE to check but I think it fits
SYGO
PONTE DEL DIAVOLO suggested by Ralf, need to check too
ANCHOR https://boardgamegeek.com/boardgame/23235/anchor
MOBILITY https://boardgamegeek.com/boardgame/129947/mobility
LOOPS https://boardgamegeek.com/boardgame/144390/loops KULAMI

Perhaps there should be a category *area majority scoring*?

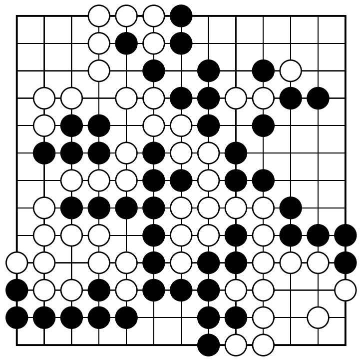
The following three diagrams show final positions of three point scoring games. Positions may feel more or less clear, depending on the taste and the experience of a reader.



AMAZONS



SYMPLE, $P = 10$



GO

To us, pure territorial scoring games have particularly high clarity, for two reasons: first, the number of territories tends to be small; secondly, boards don't have to be filled completely. For chain scoring games, both properties are different. They also have a potential for many layers of strategies, and particularly more than chain (typical, i.e. current) scoring games. The reason is that territories are only *potential* for the longest time, and therefore can change shape in many ways and also swapped. By contrast, point accumulation in chain scoring games seems to be more direct and predictable. This includes OTHELLO which is extremely swingy in the beginning, with stability (=permanence) only visibly setting in once the four corners are occupied. The statement holds even more strongly for pure placement chain scoring games.

Positional winning conditions

Most games make players aim for certain game-specific board positions. Time-honoured examples are capturing the king in CHESS, capturing all pieces (DRAUGHTS) or getting all pieces into the opposite starting area (HALMA). There is a lot of variety among conceivable win conditions conceivable, and this is part of the appeal of designing board games.

The common characteristic of all these games is that one — possibly long — stare at the board suffices to conclude whether the game is finished (and who then has won) or not yet decided. Traditionally, these conditions are only phrased in terms of pieces of a single colour. (Purely logically speaking, this is not necessary.) We present our classification in somewhat historical order, starting with capturing games.

Some win conditions require different types of pieces. One example is CHESS or games about forming tall stacks. We turn to such conditions at the very end of this section, because almost all games in this book just need black and white counters.

Elimination: [5] *All opposing pieces are captured.*

[5]Often called *war games* but we prefer the less bellicistic term. We prefer elimination over *capture games* so as to avoid confusion with games where prisoners/captures stones are scored.

The board game version of an overwhelming victory in battle: nothing's left of the enemy! Many traditional games use this win condition, among those DRAUGHTS/CHECKERS and NINE MEN'S MORRIS (the latter stops at two remaining opposing pieces). An ancient capturing game from Madagascar is FANORONA, which additionally features a unique capturing rule.

However, it is by no means easy to devise a good capturing game. The reason is that often very strong material superiority is needed to finish the job. Many capturing games, such as DRAUGHTS, suffer from a high draw margin: the player with fewer pieces can still successfully go for a draw. Even worse, a player might turtle, intentionally and from the outset, and thus ruin any meaningful match. Sadly, in tournaments such a strategy might be entirely rational, so we cannot get rid of the problem by shrugging it off as character deficits of certain players.

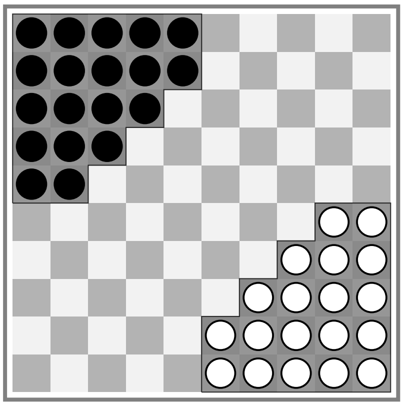
On page **??**, we explain this problem and a solution for the classical game of DRAUGHTS. Interestingly, the aggressive capturing mode of FANORONA evades these deficits.

In this book, we cover these capturing games: DAMEO, EMERGO, FANORONA, FOCUS. Of these, DAMEO is a variant of (International) DRAUGHTS, which avoids the large susceptibility towards draws, makes games faster and sharper while keeping the splendid, beloved combinations.

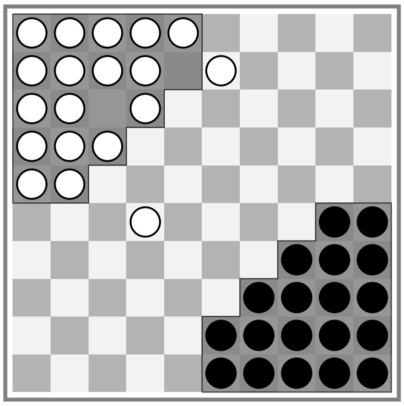
Often, stalemate is treated as another loss condition.

Race: *All own pieces have to reach designated destinations.*[6]

The prototype is HALMA (1883).[7] The concept of placing all pieces in one's own 'house' is ancient; it appears in dice games like the Indian PACHISI (approximately 6th century) and also in predecessors of BACKGAMMON like the Persian NARD (more than thousand years ago).



Halma: initial position



Game end: Black wins

AGON migth have been the first game to apply this concept to an abstract board game. HALMA took that up, and became extremely successful. A HALMA variation that was very popular back in its day, but is unfortunately not worthy of further mention, is SALTA by Konrad Büttgenbach (1899), which is plagued by extremly viscious game progression.

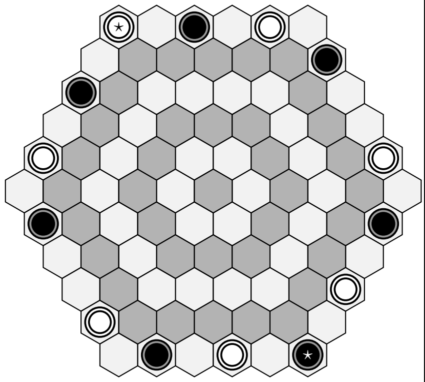
The overall lack of positional games is remarkable, especially considering their early invention and world wide popularity of CHINESE CHECKERS (to this day) but strikingly more as a toy than a game of skill. One reason for this lack might be absence of direct interaction: positional games cannot have permanent captures (AGON has accordingly has capture-and-replace). AGON also stands out because it has one destination zone for both players causing a lot more tension (and forcing a method to get opposing pieces out of the way). Sid Sackson did create his own positional game SNIGGLE (1975). See page 81.

[6] The word *race game* (by the way, does *racing game* sound nicer to the native ear?) is not as precise as it could be: it does not convey that *all* pieces have to reach the goal zones. A crossing game could easily be seen as a race game, too.

[7] The game AGON (1780) is much older and has the same win condition. However, HALMA/CHINESE CHECKERS turned into a folk game whereas AGON is unfortunately barely known.

Agon We follow the rules of [20] who in turn follows Cassell (1896). The earliest references are from the 1780s.

Each player has seven pieces: six stones and one queen. White starts. A piece is *trapped* if it is squeezed between two pieces of the other colour. An empty tile is *covered* if it between two pieces of the same colour.
During a turn, if the player's queen is trapped, he must place it to any empty tile not covered by the opponent. Else, if a stone of the player is trapped, he must place one of them on an empty boundary tile not covered by the opponent. Replacement of one piece ends the turn.
If no pieces of the player are trapped, then the player must move one piece, by a single step either on its ring or to the inner ring; the destinated tile may not be covered by opposing pieces. Only queens may enter the centre.
A player wins by having his queen at the centre and his six stones on the most inner ring. A player loses by having his six stones on the most inner ring with the queen not being in the central tile.



Pattern: *Some own pieces form a specified pattern.*

A famous example is TIC-TAC-TOE, even though is might be disputed whether a trivially solvable set of rules constitutes a game. The win condition of TIC-TAC-TOE, to form a row of three, allows an immediate extension to larger boards and longer rows.

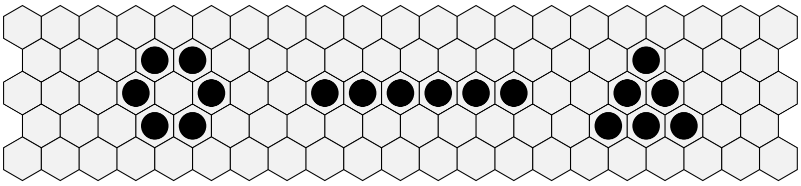
One such straightforward modification is GOMOKU (Japanese for 'five stones', probably an old game), which features particularly simple rules: players take turns putting stones of their colour on empty points and win by forming a straight, continuous line of five stones of their colour. This game is much more interesting than TIC-TAC-TOE and triggered a huge number of variants, among them PENTE and RENJU.

One of these variants disallows forming open rows of four, improving game play noticeably. This idea has been re-invented, for example in YAVALATH (2007) by Ludi (Cameron Browne's rule set generating program).

The old game CAPTAIN'S MISTRESS (before 1900) combines the win condition of four in a row with an abstraction of gravity. This same game has been successfully marketed as CONNECT4 (1974, Ned Strongin, Howard Wexler).

The position of the pattern on the board is inessential, so that translations, rotations and reflections are allowed. Patterns are small, compared to the board size. The winning shape is either unique, such as in the row games, or it is part of a reasonably short list.

One of the games to use patterns other than lines is HEXADE (Christian Freeling, 1992). It has three win patterns: a line, a ring, a triangle of six pieces in one colour. Another one is MANALATH (Dieter Stein, 2012), employing the 22 hex pentominos.



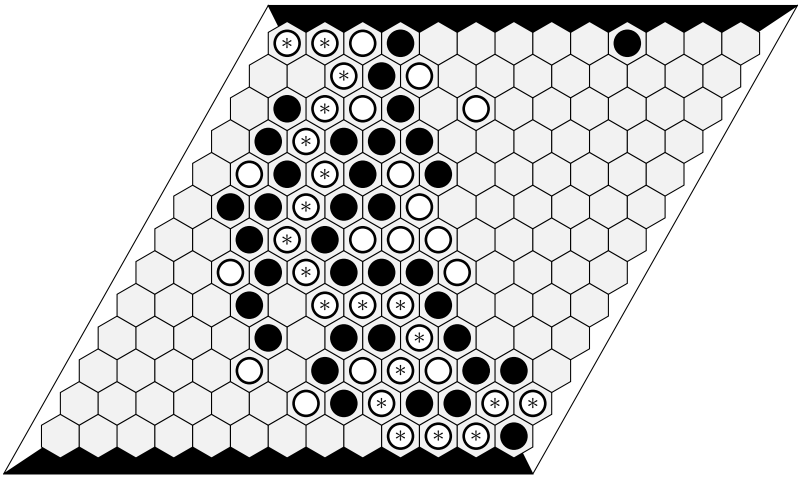
HEXADE *winning patterns: line, ring, triangle*

We would like to finish this condition with a critical remark: simple and very short rule sets can produce tactically and aesthetically pleasing pattern games. However, most of those games are more tactically inclined rather than strategically. The underlying reason is the locality of the win condition, which leads to remote positions interacting rather weakly. Christian Freeling developed the pattern game HEXADE expressly as a tactical pendant to his strategical masterpiece HAVANNAH.

Of course, it is possible to formulate rule sets of pattern games with strategical potential. An example is MANALATH.

Linking: *A chain touches all specified zones.*

This win condition is often called *connection*; we will use both notions. While the linking goal may seem obvious, it was only introduced 1942 by Piet Hein's HEX. Since then, very many linking games have been invented because this robust motive tends to make good rule sets. Cameron Brown authored a book dedicated to connection games [5]. In the next diagram, White wins with the marked connection:



HEX

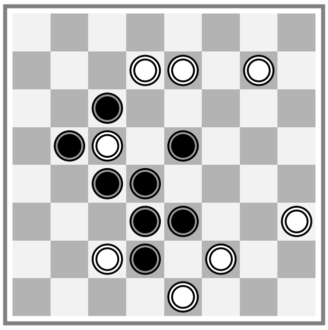
In this book, we present the connection games HEX, GONNECT, HAVANNAH, NETWORK, SLITHER and UNLUR. Among these, Sid Sackson's NETWORK stands out because it defines connections by line of sight rather than by chains. It is easy to expand the definition of 'connection' so as to include NETWORK but we don't think this is worth the effort.

All connection games feature distinguished zones which determine what to connect. In many cases, these zones are disjoint for Black and White (most often, opposite borders for each colour) but there are also symmetric connection games. Moreover, the size of the connection (i.e. the length of the connecting chain) is not pre-determined. This is why connection is a winning condition on *some* pieces. In contrast with the few winning shapes in pattern games, the number of different winning connections is huge.

Unification: *All pieces of the player form a single chain.*[8]

The definitive origin of this category is LINES OF ACTION, invented by Claude Soucie around 1962. We remark that connectivity — like position, but unlike patterns or connection — is a condition on *all* pieces of a player. There are no distinguished zones.

We hope to convince the reader that the distinction between *connection* and *connectivity* is meaningful and useful.



LINES OF ACTION

Even though connectivity games are won by having a single chain, they are not chain games in the above precise meaning: the win is achieved by a board position, not by a score.

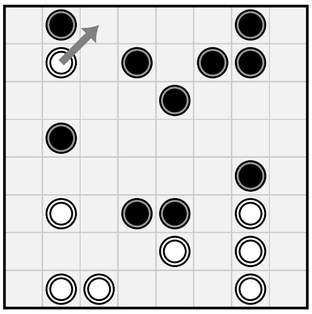
Since LINES OF ACTION, game developers have experimented with connectivity as a win condition, although this adoption was slower than with pattern or connection games. Strikingly, connectivity has been also used as a *turn condition*, i.e. that all pieces of a player have to form a single chain after any move[9]. By contrast, we are not aware of any game which uses connection as a turn condition (mos likely, the reason is that a game with connection as a turn condition assumes an initial position and moving pieces, whereas since HEX all connection games are placement games).

AYU, INERTIA, VOLO. Misere: ENTROPY (2) Luis points out that AYU really is a stalemate game.

[8]Other terms instead of 'unification could have been 'connectivity' or 'contiguity', as in 'the 50 contiguous American states'.

[9]HIVE, DVONN, ORDO (X)

Crossing: *One own piece reaches the designated goal zone.*
This kind of games is probably old, and one could file the asymmetrical HNEFATAFL games here: the white king has to reach the border or a corner, depending on the variant. Another classical crossing game is CHIVALRY (George S. Parker, 1887; better known is his variant CAMELOT from 1930) with the peculiarity that the goal zone consists of two squares both of which have to be filled.
Quite possibly, players of CHECKERS or DRAUGHTS toyed with the faster win condition of reaching the opponent's back row. A modern classic in this category is EPAMINONDAS by Robert Abott (1975). Here is a winning move in BREAKTHROUGH (Dan Troyka, 2000):



BREAKTHROUGH

Often, the goal zone is the opposite back row. Some games use a single square (often a corner square). In TABLUT, the zone for White is the entiry boundary. It would certainly be possible to have a *common* goal zone for both sides, leading to a race game.
The win condition of crossing generally leads to excellent rule sets. The implicit directionality and the fact that stalling is hard (or outright impossible) produces positive and often close games.
Short rules for BREAKTHROUGH and ARCHIMEDES.

Stalemate *The player (or the opponent) has no move.*
Win or loss by stalemate is a way to produce very short rules which guarantee that games end, and end without draws. On the other hand, this win condition is prone to long games in which both sides may play lateral moves.
In principle, all capturing games fit here because a player cannot move without pieces left. However, it is better to employ the most precise win condition. Another instance of this is AMAZONS where stalemating the opponent is the official win condition. As we explain later on, this is just an elegant way to phrase the rules; in reality, AMAZONS is a territorial game.
JOSTLE, BUG, AYU

Other win conditions

Games with several types of pieces allow more specific win conditions. In this book, that applies mostly to games where counters can be stacked, taking into account the heights or shapes of stacks.

Type: *Certain own pieces have a particular type.*
These conditions can be formulated in various ways. One option is to demand that all own pieces have a certain type (e.g. stacks of height > 2). Something like this could also be demanded for some, or just one, piece. There are games doing this, but not enough to create new categories.

All own pieces: UISGE.
Some own pieces: ATTANGLE (three stacks of height 3).
One own piece: PYLYX (all own pieces combinated to a single stack).

Mate: *Capture one particular opponent piece.*
The example par excellence is CHESS which also coined the notion *mate*. In this book we mention the asymmetric mate game TABLUT, where Black has to capture the white king.

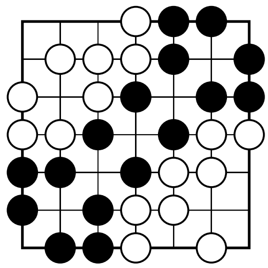
Game designers often combine various win conditions. An interesting case is HAVANNAH which combines two connection and one pattern goal, either of which wins. Particularly often, a main win condition is combined with declaring the opponent's stalemate as a win. This helps avoid draws and can prevent degenerate play.

We want to re-emphasise that our classification scheme is neither exclusive nor exhaustive. It can happen that a win condition may be rephrased to fit into another category. We give two positive examples for such reformulations, and a negative one.

AMAZONS: territory scoring ↔ stalemate. One could declare an AMAZONS game to be over as soon as no queens of opposing colour share a territory. From this point onwards, there is no interaction between the two sides. It is a matter of taste whether the players keep moving until one side has no turns anymore or whether territories are counted.
Regarding the definition of territories, one could naively add empty squares. This would yield something close to, but not quite the same as, the original rule set. However, the number of moves within each territory can be easily counted, too. In any case, AMAZONS is a territorial game. The formal win condition (loss by stalemate) is an elegant method to phrase the end protocol concisely.

ALQUERQUE: capture ↔ captured pieces. A typical win condition is to capture all opposing pieces. Sometimes, there is an addition, to count captured pieces at game end (when no pieces can't be captured anymore). Equivalently, the player with more pieces on the board wins. This change does affect tactics because offering moves become more risky. I would guess that both versions play similarly.

GO is no connection game. (It is mentioned as such in [5].)



The chains have almost nothing to do with territory. Connections and their counterpart, cuts, are very important in GO, both tactically and strategically. But this is just one aspect of many. In my opinion, GO has no 'connective play' in the sense of Browne.
In the purely hypothetical example diagram, White has 4 chains and Black 8. In Japanese scoring, White has 10 points, Black 7 (no captures). In Chinese scoring, White has 26 points, Black 23.

> [5, §2.4 Connection Quality]: "Some games are decided by the metric properties of connection games or some byproduct of connection. For instance, the winner of a game of Go is determined by the amount of territory enclosed by connected sets of pieces. Target connections in such territorial games do not have any specific size or shape, but their results are based on a measurable by-product of the connection shape. The goals of these games are therefore not strictly connection-based."

As the above example shows, territory is entirely unrelated from chains ("connected sets of pieces"). In my opinion, GO is not only "not strictly connection-based", but no connection game at all.