

Epilogue on Ing Ko Rules

by Robert Jasiek

Preface

Ing Chang-ki is said to have spent 10 years of his life on ko rules. The result is called the Ing Ko Rules and found in the Ing rulesets of 1986, 1991, and 1996. Emphasizing his effort is often used in a sense of implying a high level of quality. However, this is like claiming that every Go player reaches 9 dan simply by studying and playing the game for a decade. As we all know, this is not true. How else can we then judge about the actual level of quality of the Ing Ko Rules? As another person that has studied ko rules for over 10 years, the author is in a position to comment. Of course, the reader should not trust the spent total time nor the 1,100 hours particularly spent for creating a model of the Ing Ko Rules but consider how convincing his arguments are.

Better than Superko?

The Ing Rules of 1974 used a Superko Rule. At some time, Ing Chang-ki received a letter that suggested doubts about doing so. Regardless of whether one likes or dislikes Superko because of its features "the simplest ko ruleset" and "great strategic variation", let us ask whether he succeeded in improving on it.

Greatest Variation?

Ing Rules were advertised as providing the greatest variation while still allowing a game to end. Allowing suicide is just a simple consequence of that general, advertised aim, but how about ko rules? To allow a game to end, immediate recapture in a Basic-ko shape has to be prohibited by some rule. The more difficult shapes are those with long cycles. Do Ing Ko Rules allow the greatest variation in them? First we have to answer: What is "variation"? It is useless to advertise great variation if nobody knows what that variation is all about.

Superko, which in its standard wording prohibits a board-play to recreate any earlier position, is famous for leading to great *strategic* variation, i.e. Superko makes strategic decisions difficult in some long cycle ko fights. Because Ing Chang-ki disliked Superko, we can safely conclude that he did not mean "strategic variation" when he said "variation". Since it is not strategic variation, he must have meant *tactical* variation. Also from rules like "A move must provide variation.", we can conclude that tactical variation is meant: A player makes either this or that next move. It is about tactics. "Tactical variation" is the variation that allows a variety of different moves.

Are Ing Ko Rules such ko rules that provide the greatest possible tactical variation? The answer is: No. Why is this the answer? Because it is possible to provide a greater tactical variation than Ing Ko Rules provide: E.g., the combination of a Basic-ko-rule and of the Fixed-ko-rule creates greater tactical variation. Some readers might not know the latter, so here is its text: "A board-play is prohibited if the positions just before and just after it are the same and in the same order as the positions just before and just after an earlier board-play of

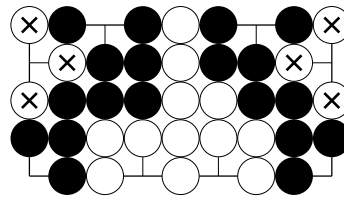
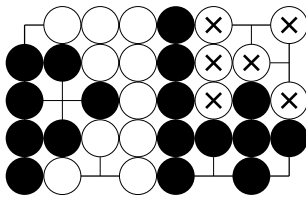
the game." In case of, what Ing Ko Rules want to call, Disturbing Lives, Ing Ko Rules and the Fixed-ko-rule are equally prohibitive. In case of Disturbing Deaths, Ing Ko Rules are more prohibitive than the Fixed-ko-rule: Under Ing Ko Rules one of the players is assigned the role of being the Disturber, i.e. he may make fewer attacks in a Disturbing Death than his opponent, while under the Fixed-ko-rule neither player is restricted by such an extra criterion. In case of Fighting Kos, Ing Ko Rules are more prohibitive than the Fixed-ko-rule: Ing Ko Rules create Hot Stones and prohibit their immediate capture while the Fixed-ko-rule does not create such an extra criterion and allows the immediate capture of some other Hot Stones.

Hence the answer to this section's initial question is: Ing Ko Rules do **not** provide the greatest variation while still allowing a game to end. They do not fulfil their own advertised aim.

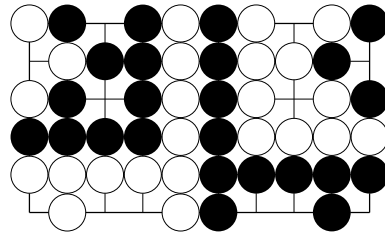
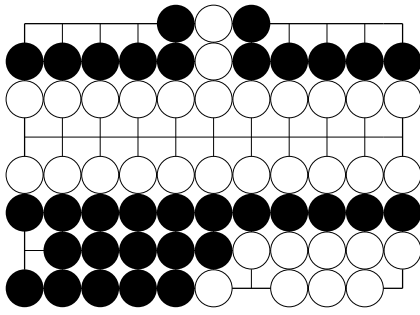
Now some readers might object that the concepts of Disturber and Hot Stones are useful in shortening long cycles in practice. They are. However, then the Ing Ko Rules should not be advertised as "allowing the greatest variation" but as "providing the shortest move-sequences in long cycle shapes". Even that would not be true because one would rather achieve that, e.g., by prohibiting any board-plays in any long cycle shapes, if we assume for the moment that those could be defined.

Local Shapes

Ing Chang-ki had the preference that it should be possible to capture everything of that its shape looks capturable. In the following diagrams, his perception is marked by crosses.



Other players would have a preference different from or contrary to his. Let us not discuss personal preference here but consider the second example by more objective means. Obviously Black can remove either the left stones or the right stones by one board-play. For both, he needs at least two board-plays. Because the players alternate moves and even White might start, we do not know immediately whether Black can capture all marked stones. In fact, it depends on the used ko rules. E.g., under a typical Superko Rule with White to start Black cannot force capture of all; under Ing Ko Rules Black can capture all. Which is better? To know this, we first have to set some aims under that we can then judge. A possible aim is: "Rules should be independent from shapes!" Unfortunately, with this aim one cannot conclude that in the second example Ing Ko Rules would be better than Superko. Another possible aim is: "Every two same local shapes should have the same outcome!" With this aim one can conclude that in the second example Ing Ko Rules would be better than Superko. Is the second aim also good for the general case of an arbitrary example position? The answer is No, because it fails in, e.g., the following position:



Although the upper left and the upper right in the third example have exactly the same shape, only one of them will survive. For the same reason, an aim like "One eye beats no eye!" would not make sense; we would only be discovering that two eyes can sometimes be insufficient to survive. Let us try yet another possible aim: "Every two same local shapes that contain at least two Basic-kos should have the same outcome!" Where does this get? It is trying to formulate very specialized conditions as a general, first order aim. How could that ever be superior to a fundamental aim like "Rules should be simple!?" Impossible. We would have to define "local" in fewer words. Another problem is: One cannot justify why always a particular shape should be captured. E.g., in the fourth example, it is absolutely superfluous to capture anything. The shortest perfect move-sequence consists of successive passes.

Conclusion

Even if we take Ing Chang-ki's own standards as a basis, we have to conclude that Ing Ko Rules are **not** better than Superko. We may say though: Their behaviours differ.

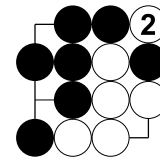
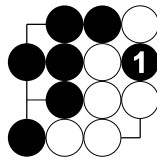
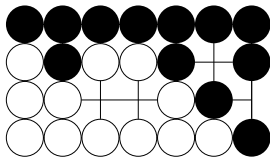
Better than Japanese Rules?

A key motivation for designing Ing rules was to create rules better than Japanese rules. Has this been achieved also for ko rules?

Exceptions

While Japanese Rules are criticised for their many exceptions, Ing rules are advertised as having no special rules. However, with regards to ko rules, this is an outrageous lie, as is shown below.

Already the basic structure of Ing Ko Rules introduces exceptions in the form of ko types: The major distinction is made between Fighting Kos and Disturbing Kos. For Disturbing Kos, further exceptions are introduced as subtypes: Disturbing Life and Disturbing Death. Careful shape study quickly leads to subtypes of subtypes, e.g., a Disturbing Ko has stable and instable states. Every type and subtype gets its own exceptional rules. E.g., in a stable Disturbing Life either player can become the disturber by making the next move while in an instable Disturbing Life neither player can become the disturber by making the next move. E.g., in a Disturbing Death only one player can become the disturber.



Yet further exceptions are necessary. E.g., even the major classification between Fighting Kos and Disturbing Kos is not good enough because a Molasses-ko (see the left diagram) with its single pass-plays deserves another major ko type: Semi-stable Kos.

The early Japanese rulesets tried to classify shapes and had to introduce precedents for unusual shapes. The Ing Ko Rules make the same mistake. Instead of speaking of nothing but "empty intersections", they introduce exceptions by trying to classify them by shape. They speak of "permanent breaths for independent life, balancing breaths for coexistence, unreal breaths for non-life, fighting breaths for ko life, and interchangeable breaths for disturbances that do not alter life and death". There are some $0.01 * 3^{361}$ possible shapes on the Go board. How could one ever hope to classify them all already in the ruleset, unless one wants to list them all?

In a Disturbing Ko it is allowed to recreate the position before the Disturbing-ko-rules issue restrictions. Then the Ing Ko Rules prohibit "invariation", which is undefined. From that term alone, one cannot know whether board-play 2 is allowed in the Double-ko-seki diagram. It is a Disturbing Ko, so the Fighting-ko-rule cannot apply. Every Go player would expect board-play 2 to be prohibited. How is it prohibited by the Ing Ko Rules? It is not prohibited at all. If one claims, that the mere word "invariation" prohibited it, then one would have to conclude this term to mean the same as the Positional-superko-rule. However, since Ing Ko Rules were introduced to overcome Superko and since positional recreation is allowed in Disturbing Kos, this cannot be the meaning. It turns out that for filling a gap in the rules, Ing Ko Rules need yet another special ko rule: a Basic-ko-rule. In fact, before one can distinguish any Fighting Kos from Disturbing Kos, one has to presume that a Basic-ko-rule already restricts possible move-sequences.

Dependency of the Rules on Game Tree and Life and Death

The central problem of all Japanese rulesets is the dependency of the scoring definition on the complete game tree and on life and death. Are Ing Ko Rules any better?

Already the terminology Disturbing Life and Disturbing Death reveals the dependency on life and death. One of the Ing rules says: "Stones live or die according to whether they can be removed." Quite like Japanese Rules, Ing Rules try to hide the analysis of the game tree's variations behind a word of grammar, namely "can" in the phrase "can be removed".

This dependency of the rules on the complete game tree and on a distinction of life and death has consequences for the Ing Ko Rules: To distinguish Fighting Kos from Disturbing Kos, a careful analysis of the game tree might be necessary.

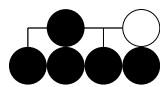
Unclear Terms

In the 1996 English version of the rules, the following 80 terms closely related to ko rules are undefined or ambiguous:

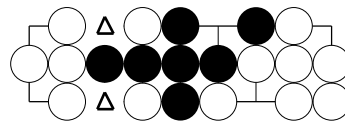
- group [of stones]
- life, death, can be removed, cannot be removed, life-or-death situation, live group, independent life, coexistence, settled, no outcome
- passive breath, active breath, real breath, false breath, fighting breath, disturbing breath, external breath, internal breath, permanent breath, balancing breath, decided breath types, eye breath, shared breath, ko breath, shape of combined breaths, shape of fighting breaths, single shape of fighting breaths, double shape of fighting breaths, twin shape of fighting breaths, shape of disturbing breaths, immediate recapturing of hot stones as a shape of disturbing breaths, recycling ko threats as a shape of disturbing breaths, recycling due to self-removal as a shape of disturbing breaths, shape, life and death shape, mouth, tiger's mouth shape, large tiger's mouth, medium tiger's mouth, small tiger's mouth
- ko stone, single ko stone, double ko stones, triple ko stones, hot stone, single hot stone, double hot stones, twin hot stones, single hot stone rule, double hot stone rule, twin hot stone rule
- ko, fighting ko, disturbing ko
- eternal life position, triple ko fight
- ko threat, ko fight, fighting an unnecessary hot stone fight
- variation, variation of board position, invariation
- cycle, complete cycle, recycle, recycling, cyclic repetition, removed repeatedly, repeated removal of ko stones, cyclic removal of ko stones, recycling ko threats, repeated fight
- disturb, disturbing, disturber, initiated by the disturber, allowed to continue disturbing
- refuse to yield, refuse to give in

Major Problems Caused by Unclear Terms or Wording

Only the most important problems are discussed.



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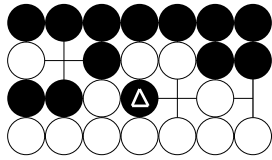


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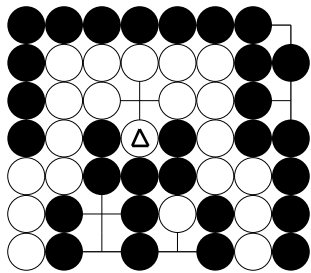
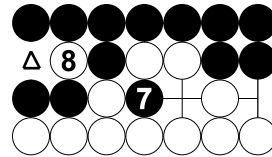
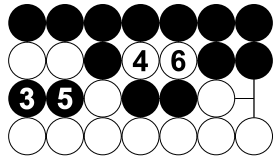
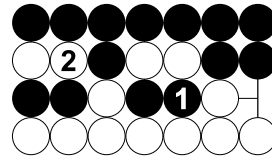
- What is alive and what is dead? Is a string alive if and only if it is adjacent to at least one breath? Is a string alive if and only if the opponent cannot force its removal? In diagram 0190, is the white string alive because it is adjacent to at least one breath? Is the white string dead because Black, by moving first, can force its removal regardless of White's replies?
- What is the purpose of speaking of life and death at all? Shall the rules compete with Japanese rules?
- How to determine the shapes and breath types in general? In diagram 0191, it is impossible even in theory to determine which of the marked breaths is either external

or internal for the big black string. Either but not both could be internal. If, however, one should claim both to be external, then any idea of considering balance of breaths becomes futile because two external breaths for the big black string would have to be considered equal to one internal breath for the right big white string here.

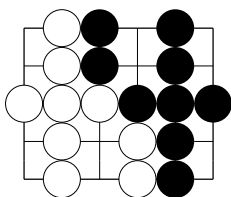
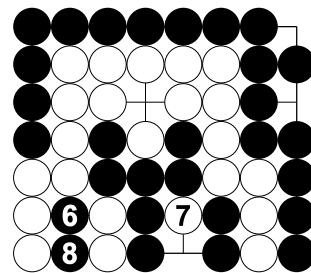
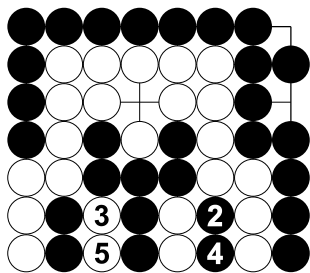
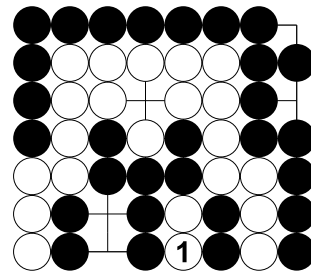
- What is the purpose of speaking of breath types and shapes at all? Shall the rules compete with the Japanese 1949 Rules or the World Amateur Go Championship 1979 Rules?



0066

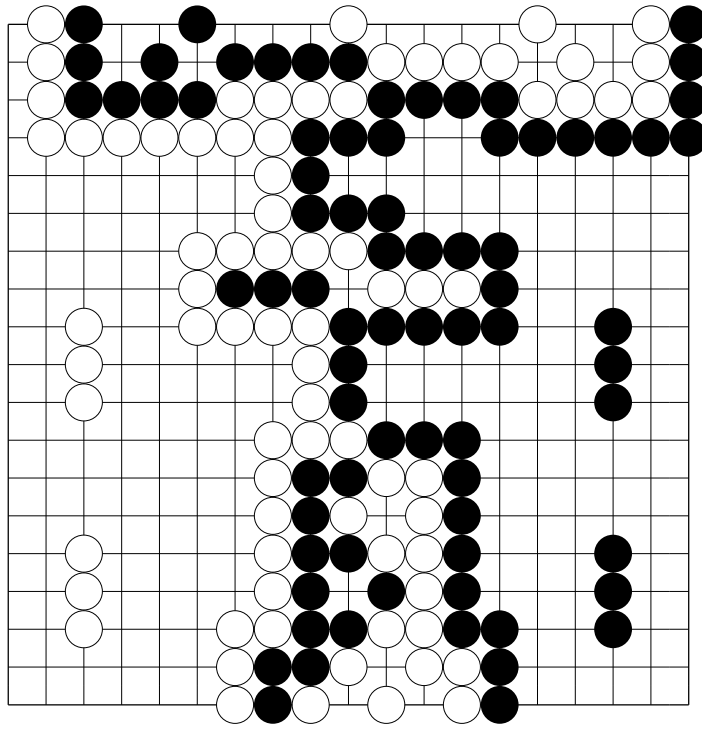


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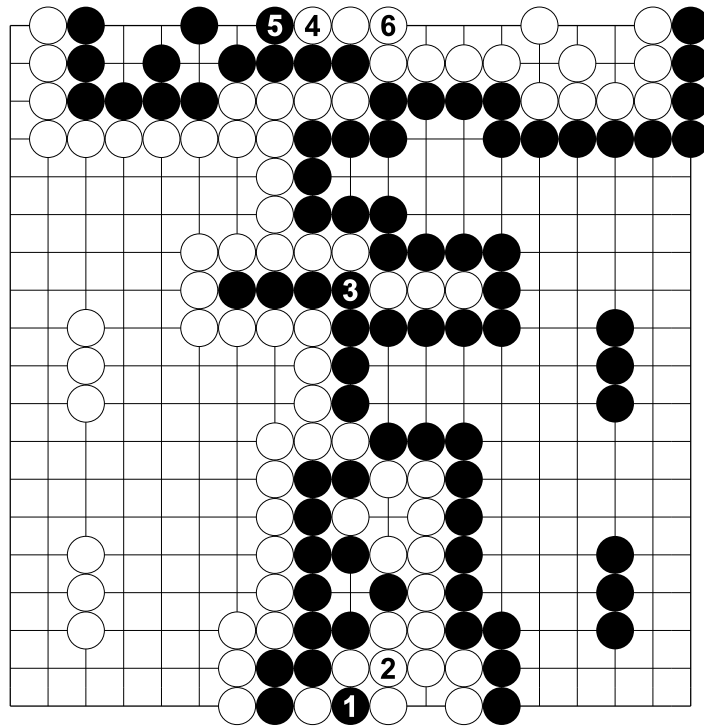


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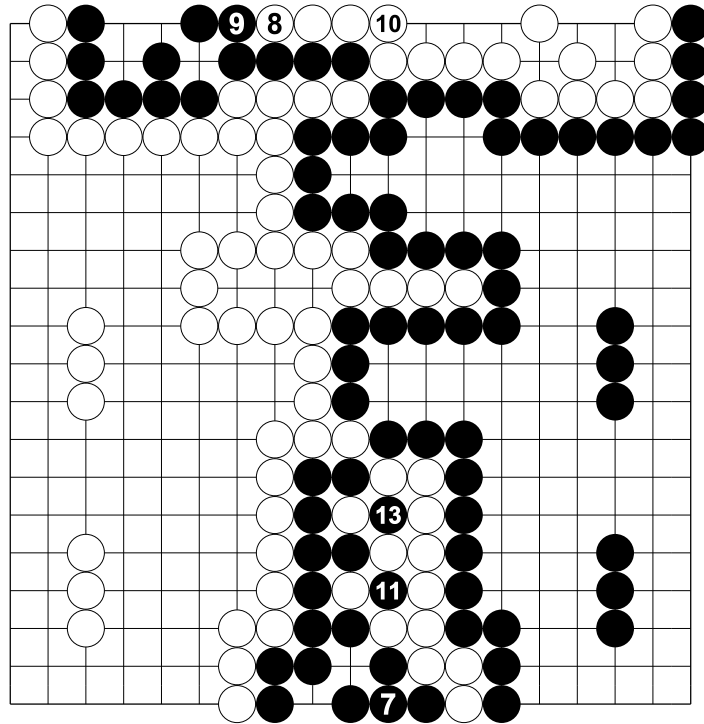
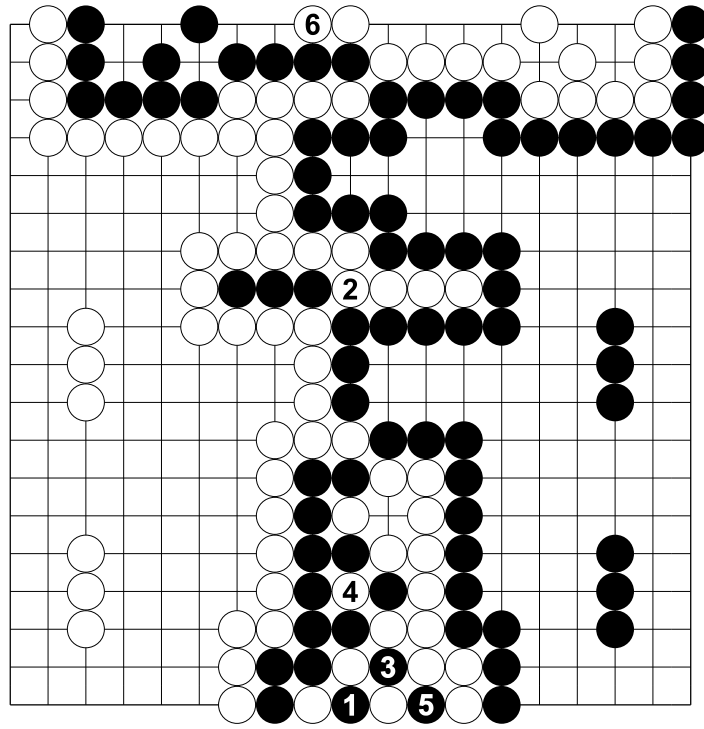
- How to distinguish ko stones from non-ko-stones? The author has proven a proposition formally and generally that any string in any position can be recreated in a cycle if no ko rules or ko bans apply yet. In Ing Ko Rules, the purpose of calling some strings ko stones is to apply rules to them *afterwards*. So for determination of a position's ko stones, no ko rules may be applied yet. - There is a chance to overcome the aforementioned proposition though: One might require that *at least* one player can *force* his opponent into some cycle that recreates the original position and during that a particular considered string is removed and then recreated. In diagram 0066, is the marked string a ko stone? If White moves first, he could simply remove the stone and Black has no chance to force creation of a cycle. If Black moves first, he can recreate the string but not while forcing White into a cycle that recreates the initial position. The Ing Ko Rules fail already because they do not speak of the requirements "at least one player" and "force". - Regardless one might continue search for some useful definition of "ko stone". The next likely candidate for a requirement is that *at least* one player can *force* his opponent into some cycle during that a particular considered string is removed and then recreated. In the diagram after the board-play 8, another eight moves are required to create a force cycle. If board-play 16 will be on the intersection of board-play 8, then the cycle will start after board-play 8 and end at board-play 16. So to be clear in the requirement, the forced cycle need not start with move 1 of a played move-sequence. Of course, it might have started with move 1 if the board-play 8 had been on the marked intersection next to it. - In diagram 0168, is the marked string a ko stone? Black to move first is not interesting. If White moves first, he can force a cycle but Black is not forced to capture the marked string at any time. One would have to conclude that it is not a ko stone or rather that one would like to alter the requirements again. Recall that simply letting the players cooperate does not work because of the aforementioned proposition. - Summarizing, it is still an open theoretical problem if any definition does exist that lets only a strict subset of all strings be ko stones and that always agrees to traditional judgements about which strings are ko stones. All these considerations are already far beyond the Ing Ko Rules, which fail to make them at all. Also notice diagram 0192, where a cycle can be played like in a Round-robin-ko, although one would not want to call the strings ko stones.



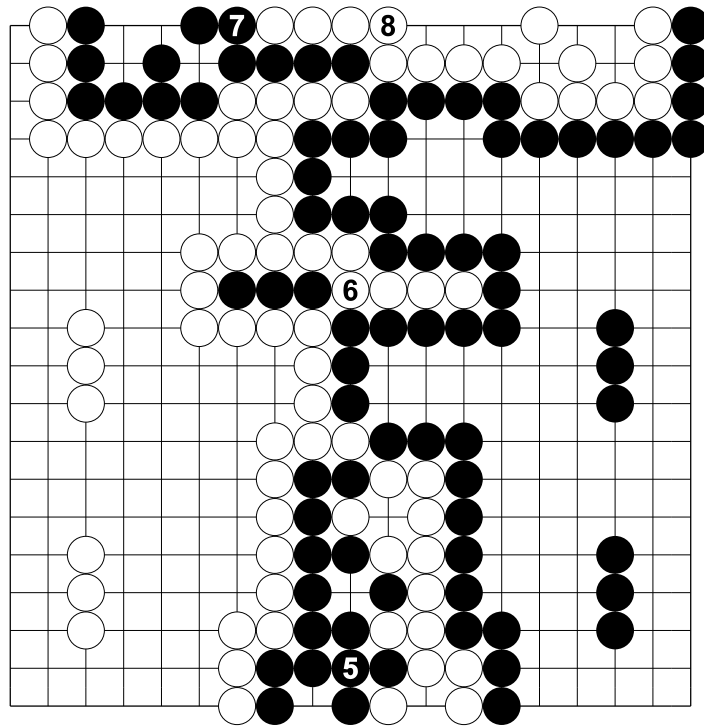
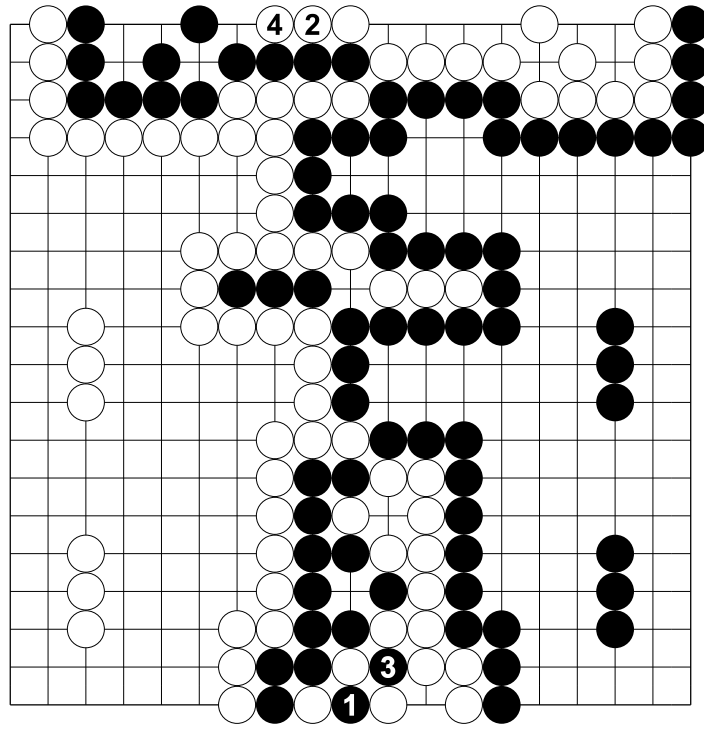
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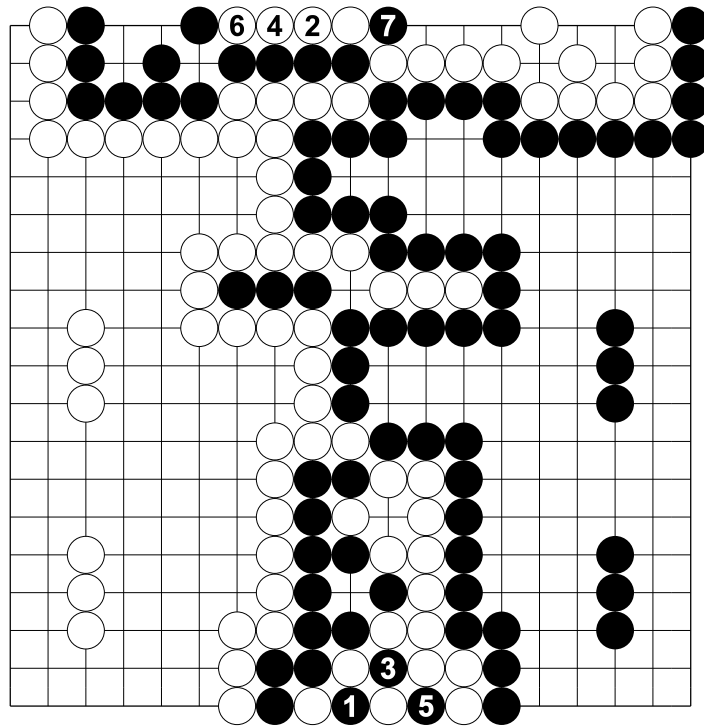
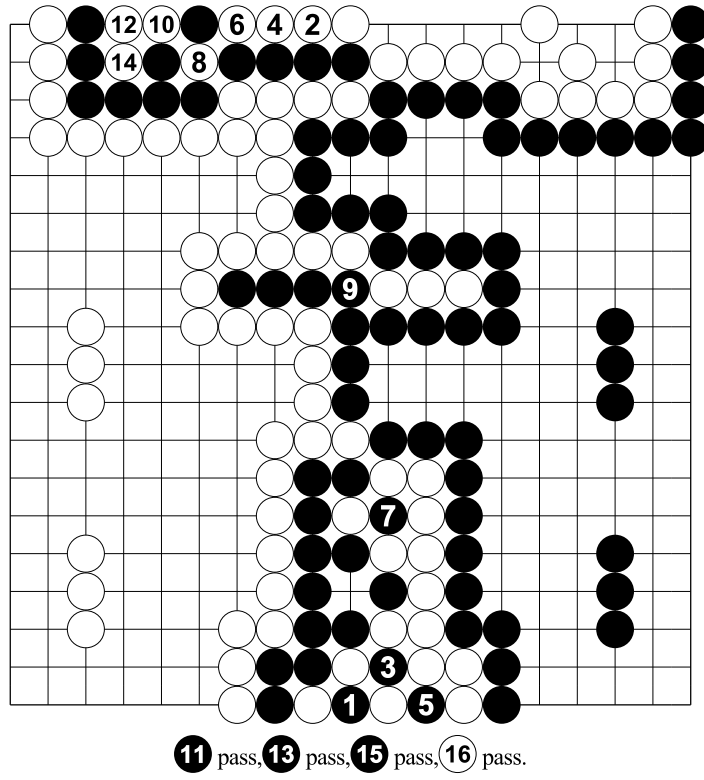
7 pass, 8 pass.

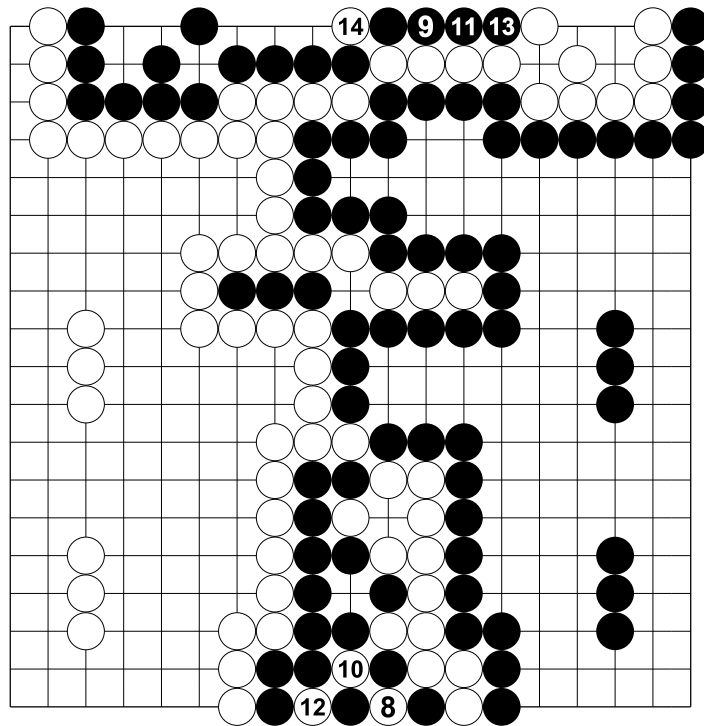


12 pass, 14 pass, 15 pass.

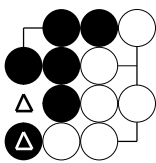


9 pass, 10 pass.

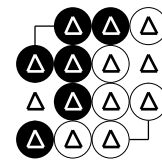
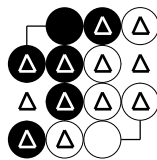
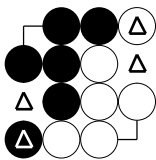
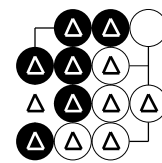
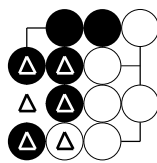




- Why may a string of four stones never be quadruple ko stones? Why may even bigger ko stone strings not exist in the Ing Ko Rules? Early Ing Ko Rules knew only single ko stones and double ko stones because of the false assumption that triple ko stones would not exist. Now the Ing Ko Rules know only single ko stones, double ko stones, and triple ko stones because of the false assumption that quadruple ko stones or bigger ko stones would not exist. As Matti Siivola has shown by diagram 0193, there are interesting quadruple ko stones.

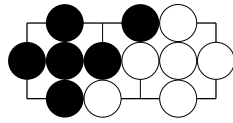


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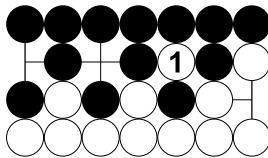
- What is a ko? Does it consist of moves or of intersections? If it consists of intersections, of which intersections does it consist? If we consider the lower left corner intersection in diagram 0055, which of the six diagrams shows all that ko's

intersections? Are there one, two, or three kos in the position? The Ing Ko Rules do not clarify this.



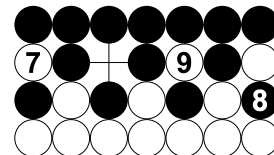
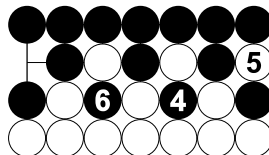
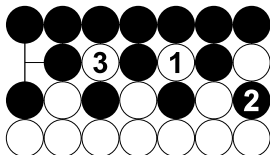
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- How to distinguish Fighting Kos from Disturbing Kos in general? The Ing Ko Rules do not specify this. E.g., in diagram 0194, are there two Fighting Kos, one Disturbing Ko, or two Fighting Kos and one Disturbing Kos at the same time?
- What is invariation? Since 1986 Ing Ko Rules have been created in opposition to the Positional-superko-rule. Thus surely "invariation" does not mean to be another word for Superko. But then - what is it? The Ing Ko Rules do not define it. - Shall, besides other things, invariation imply some Basic-ko-rule? The answer to this question is essential for knowing whether immediate recapture of a single ko stone in a Disturbing Ko is allowed. All official examples suggest that it is prohibited. However, then the Ing Ko Rules ought to contain an explicit Basic-ko-rule besides the Fighting-ko-rule and the Disturbing-ko-rule(s).
- When is a cycle complete? Is it complete when the next board-play would recreate the position? Is it complete when the previous board-play has just recreated the position? Because this is ambiguous in the rules, the Disturbing-ko-rule becomes even unclearer.



0110

- What is a disturbing board-play? How is it distinguished from not disturbing board-plays? Because this is unclear, one cannot know exactly which board-plays are prohibited by the Disturbing-ko-rule. E.g., does board-play 1 in diagram 0110 disturb the Quadruple-ko?



- Which is the first prohibited board-play in a Disturbing Ko? When it would recreate a position? When it would be the next board-play after a recreated position and be the same as the board-play that first left that position? When it would be the next board-play after a recreated position and disturb a Disturbing Ko that was disturbed during the previous cycle? When it would be the next board-play after a recreated

position and if the same player would first disturb a Disturbing Ko that was disturbed during the previous cycle as the first player to have disturbed a Disturbing Ko during the previous cycle? Something else? E.g. in the diagrams, which is the first prohibited board-play? 6, 7, 8, 9, or some other? The Ing Ko Rules leave this unclear.

Missing Ko Rules

As has been discussed earlier, a Basic-ko-rule is missing and would be needed within a Disturbing Ko.

However, the major gap is the Ing Ko Rules' failure to include a rule that treats several kos together. The Disturbing-ko-rule and the term invariation fail to specify this. While the 1986 Ing rules booklet at least mentioned the topic by speaking of "string kos", the 1991 and the 1996 rules booklets hide the topic instead of trying to solve it. The author of this document needed ca. 1,100 hours to develop a solution in his New Ko Rules. It is called the Prohibition Rule:

"From all positions with the same set of intersections of all kos and with the same configuration of stones on the board without the set, each player may only once play a ko stone in each Fighting Ko, become disturber of each Disturbing Ko, or otherwise play a stone on each intersection. As an exception for all such positions, the first played ko stone in a Fighting Ko is ignored."

Application of this rule and definitions of the terms are explained on the author's webpages.

Contrarily, the Ing Ko Rules do not explain move-sequences that go through several kos. They bury everything in the one word "invariation". Therefore there is no point in showing examples. Just imagine some position with a lot of Fighting Kos, Disturbing Kos, or otherwise repetitive shapes and ask for prohibited board-plays. It is ultimately clear that the word "invariation" does not specify them. The Fighting-ko-rule applies to one Fighting Ko. The Disturbing-ko-rule applies to one Disturbing Ko. Neither of these rules explains successive moves in several Fighting Kos, several Disturbing Kos, or several Fighting Kos or Disturbing Kos. Needless to say, the Disturbing-ko-rules' text *"A Disturbing Ko is the cyclic removal of ko stones initiated by the disturber by either fighting an unnecessary hot stone fight or recycling ko threats. [...] After one complete cycle, the disturber is never allowed to continue disturbing. For any Disturbing Ko, every move in the second cycle or subsequent cycles causes invariation, and the disturber can be forbidden from disturbing at any time [...]"* is extremely ambiguous: "Disturbing Ko", "cyclic removal", "ko stones", "initiated", "disturber", "fighting an unnecessary hot stone fight", "recycling ko threats", "complete cycle", "disturbing", and "invariation" are all undefined or ambiguous. Therefore it is futile to try a generalized application of the Disturbing-ko-rule to move-sequences that go through several kos. It is even unclear how the rule applies to just one local Disturbing Ko shape.

General Conclusion

Ing Ko Rules are not better than Superko, are not better than Japanese Rules, are difficult to understand, and contain many flaws. As rules to be applied for actual play, they are a total failure. Only for the researcher, Ing Ko Rules have had some value.