3C-1

Primitive Go Applies to Solving TSUMEGO

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1. Abstract

Next, I try to solve TSUMEGO (Go problem) using desired states list made by reverse tracking on PG continuity matrix [1]. PG solves 97 / 100 questions on the text "YON-RO NO GO NO HON" authored by Chang Hsu (CHOU U), but the rest three answers are different from author's because of different game rules, counting not JI but stones [2].

2. How to solve TSUMEGO

Reverse tracking makes many valuable products such as force-pass states list (~ending states list), desired states list, surefire ways from the game beginning state, winner-KOMI characteristics, and so on. Among them, the desired states list at any KOMI at any player is most useful to solve the Go problems. The list distinguishes the states which the player desires to meet, and lead him to win.

3. Selecting TSUMEGO text

The book "YON-RO NO GO NO HON" means an IGO book on 4RO board, which involves one hundred IGO questions by Chang Hsu, published from GENTOSHA Education in 2012. He wrote the book for children or novice player to teach IGO rules using 4RO board, but I use it as a Go problems' text. The license will be received.

4. KOMI = 0 solutions

In stead of black and white stones, red apples and green apples are used on the text, so I recognize a red apple as a black stone, and a green apple as a white one. Also the computer can not recognize the intent of author, I try to solve the questions at SENTE (turn, willing player) = black and KOMI = 0 at the first. Fig. 1 summarizes the result.

number of solutions	question number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1~20	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
21~40	1	1	1	1	2	2	1	1	1	3	1	1	1	1	1	6	1	1	4	1
41~60	3	1	1	1	1	1	1	1	1	1	4	1	4	1	0	0	0	0	1	0
61~80	0	0	0	1	1	0	3	2	0	1	2	1	1	1	1	1	1	3	1	1
81~100	1	1	1	2	1	1	1	1	2	4	1	2	4	1	3	1	0	0	0	1

PG answer of the question has not always one solution, but many cases as follows.

1) one solution : in 68 questions
2) multiple solutions : in 19 questions
3) no solution : in 13 questions

In 1) one solution case, the answer coincides with author's except question No. 64.

5. KOMI > 0 solutions

I suppose uneven KOMI induces above multiple solutions, so I solve the problem at heavier KOMI too. Fig. 2 summarizes the result.

number of solutions	question number																		
	9	25	26	30	36	39	41	51	53	67	68	71	78	84	89	90	92	93	95
KOMI=0	2	2	2	3	6	4	3	4	4	3	2	2	3	2	2	4	2	4	3
KOMI=1	2	2	2	3	6	4	1	1	3	3	1	2	3	1	2	3	1	4	3
KOMI=2	1	1	2	3	6	3			1	2		2	3		2	3		4	3
KOMI=3			2	3	6	3				1		1	1		2	2		1	2
KOMI=4			2	3	6	1									1	2			1
KOMI=5			1	1	1											1			

All answers are found within KOMI <= 5, each one solution coincides with author's.

6. KOMI < 0 solutions

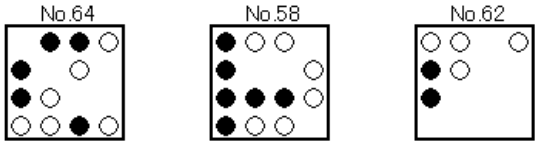
At PG, AGEHAMA (prisoner stones) is not taken into account when determining the game winner. So I try to decrease KOMI next time. Fig. 3 summarizes the result.

number of solutions	question number												
	55	56	57	58	60	61	62	63	66	69	97	98	99
KOMI=0	0	0	0	0	0	0	0	0	0	0	0	0	0
KOMI=-1	1	1	1	0	0	1	0	0	0	0	1	1	1
KOMI=-2				0	1		0	1	1	1			
KOMI=-3				0			0						
KOMI=-4				0			0						

Only 11 questions are solved within KOMI >= -2, these solutions also coincide with author's. But the rest two questions of No.58, No.62 still remain with no solution.

7. Residual three questions, No. 64, 58, 62

The board figures of these three questions are displayed as follows. (Fig. 4)



The author teaches us No.64 is a SEKI problem, he picks up a white stone with UCHIAGE at right down corner, but PG does at right up corner, to MEARI-SEKI. In No.58, author does two white ones, but PG generates the cyclic procedure by two white ones sacrifice after. In No.62, authors does OSAE, which means to cover the head of three white stones, but PG also leads to cyclic procedure by two or three ones sacrifice.

8. References

[1] Junichi Hoshi : Reverse Tracking on Primitive Go Continuity Matrix

[2] Junichi Hoshi : Invitation to Primitive Go