Learning a Game Commentary Generator with Grounded Move Expressions

Hirotaka Kameko†, Shinsuke Mori‡ and Yoshimasa Tsuruoka†

†University of Tokyo, Japan
‡Kyoto University, Japan

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• Using computer game players as
  • an opponent player
    • Chess: stronger than top human players
    • Shogi: as strong as top human players
  • a commentator
    • to know which player is better
    • to know which move is the best
Computer Player as a Teacher

Championship Match

Search Result:
P-4K (+300)
Mate in 15 moves

Black is better because...

Computer CANNOT Say!!
Human Player as a Teacher

Championship Match

Black is better.
The next move will be P-4K. White will be mated.

Black is better because...

Natural language is easy to understand for humans
Related Work

• Template-base comment generation [Kaneko, 2012]
  • ex.) Black will mate from <MOVE>.

• Our approach:
  • To generate a variety of comments
Shogi

- also known as Japanese chess

9×9 board
to capture the opponent’s King (same as Chess)
Comments are written in Japanese
Previous Work [kameko et al., 2014]

Game states

Automatically Comment Generation Model

広瀬は四間に飛車を振る
(Hirose selected forth-file Rook.)
In this position, if White plays Rx7f to mirror Black, Black will play Bx2b+ and White cannot capture the moved bishop, so White will lose.

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NOT for the current position

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Move Expression

- turn symbol (Black)
- (Black) R-2d
- piece expression (Rook)
- position expression (2d)
- +other information (promotion, dropping and disambiguation)
Proposed Method

• Acquisition of state-comment pairs
  • Mapping move expressions to the game tree

• Comment generation
  • Training a model using state-comment pairs
Mapping Move Expressions

If White plays $R-2e$ to turn the rook, Black has to play $P*2h$. 

$P*8g$

$R-8e$

$R-2f$ (Pass)

$R-2e$

$P*2h$
Mapping Move Expressions

- **Input:** a position, comments, and the previous two moves

If White plays R-2e to turn the rook, Black has to play P*2h.
Mapping Move Expressions

- Listing up the legal trees (candidate trees)

If White plays R-2e to turn the rook, Black has to play P*2h.

ILLEGAL MOVE!!
Mapping Move Expressions

• Selecting the right tree (commented tree)

If White plays $R\cdot 2e$ to turn the rook, Black has to play $P\cdot 2h$.

BAD MOVES!!
by a computer program
Overview (Training)

Preprocessing for Japanese (an unsegmented language)

Game states

Neural network

Commentaries

Language Model

広瀬は四間に
飛車を振る
(Hirose selected
forth-file Rook.)

Segmented:
広瀬は四間に
飛車を振る。

0 美濃 (Mino castle)
1 四間 (4th-file)
1 飛車 (Rook)
0 横歩 (side-pawn)
Overview (Generation)

四間飛車を選択。
(White selected 4th-file rook.)
Multi-layer Perceptron

input: a game state
output: words which are in the comment for the state

It gives higher scores to words that should appear in the comment
Log-Linear Language Model

maximize $P(S \mid p)$

$\approx P(S_N \mid \text{length}(S_N) = n)$

$\times \prod_{i} P(w_i \mid p, w_{i-2}, w_{i-1})$

$S = w_1, w_2, \ldots, w_n$: a sentence

This is $\rightarrow$

$w_i$: $i^{th}$ word of the sentence $S$

do, walk, ... : ☹️

$a, an, the, \ldots$: 😊

$p$: a game state (a position or a move)
Corpus

• Game records with comments by human experts
  • Championship matches and preliminary tournaments
  • about 300,000 comments (includes noisy comments)
    • → We acquired 44,166 trees
Generated Comments

Move: P-4f

<table>
<thead>
<tr>
<th>Word</th>
<th>Score</th>
<th>Word</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>腰掛け (reclining)</td>
<td>0.99</td>
<td>指 (action)</td>
<td>0.99</td>
</tr>
<tr>
<td>方 (plan)</td>
<td>0.99</td>
<td>銀 (silver)</td>
<td>0.98</td>
</tr>
</tbody>
</table>

▲ 4 六歩から腰掛け銀を目指す指し方もあるところだが、
(Black can play P-4f and aim for reclining-silver strategy, but...)

Our system can generate correct sentences for some positions
Summary and Discussion

• We have generated commentaries of Shogi game
  • The error rate is very high

• Future work
  • using richer information when generating
    • result of searching