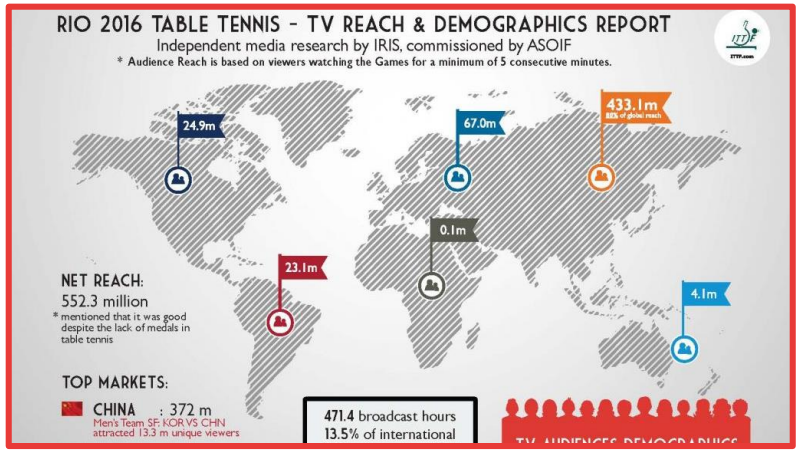
iTTVis: Interactive Visualization of Table Tennis Data

Yingcai Wu, **Ji Lan**, Xinhuan Shu, Chenyang Ji, Kejian Zhao, Jiachen Wang, and Hui Zhang

Table Tennis is Popular

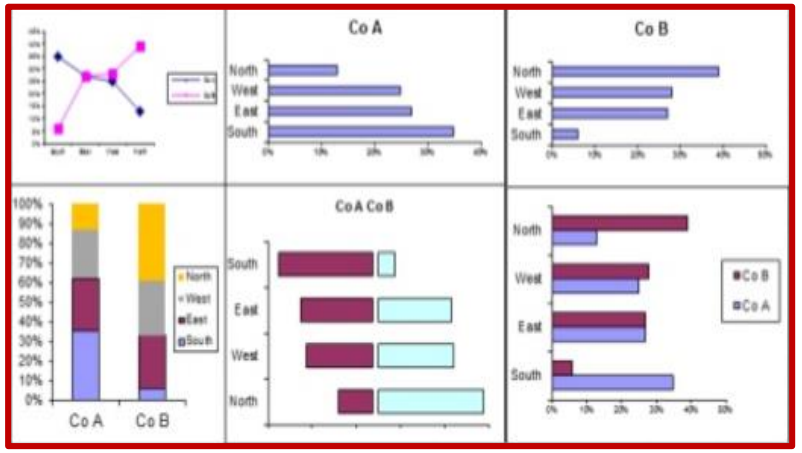
- **300 million** active participants
- **552 million** television viewers



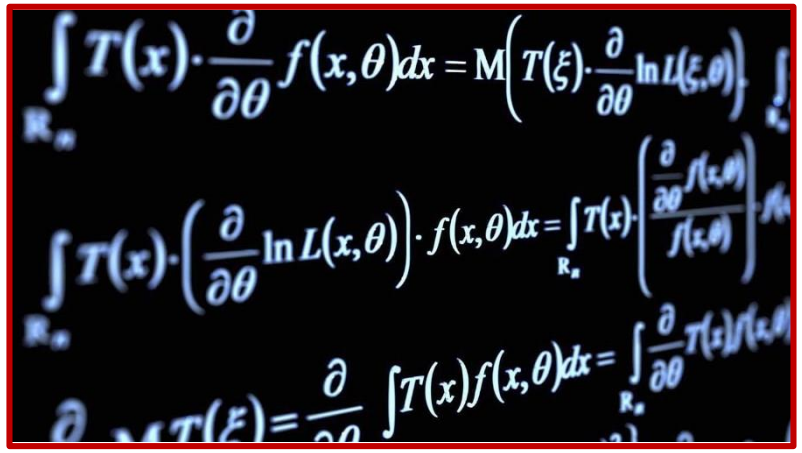
Traditional Analysis Methods VS Visualization

- Traditional analysis methods

Video analysis



Statistic charts



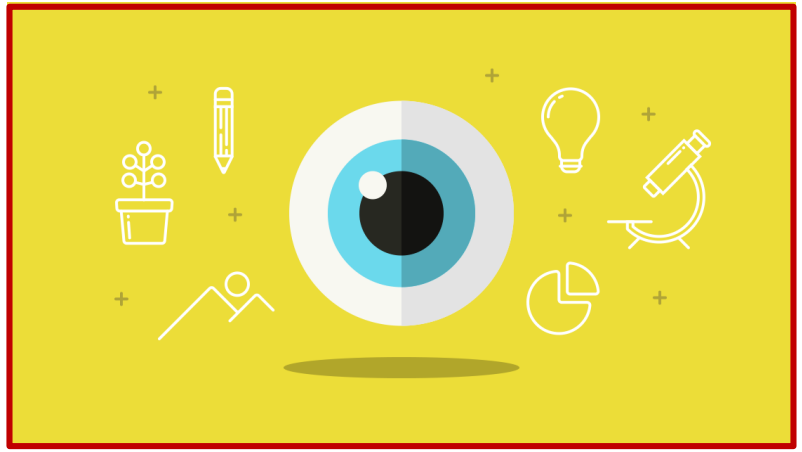
Mathematical models

Traditional Analysis Methods VS Visualization

- Visualization

Overview to detail

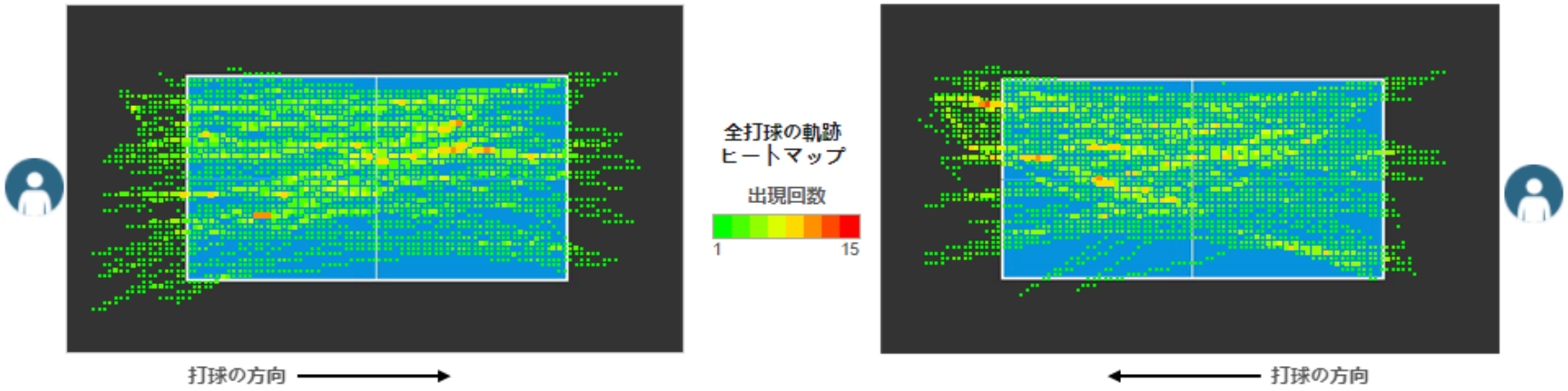
Pattern detection

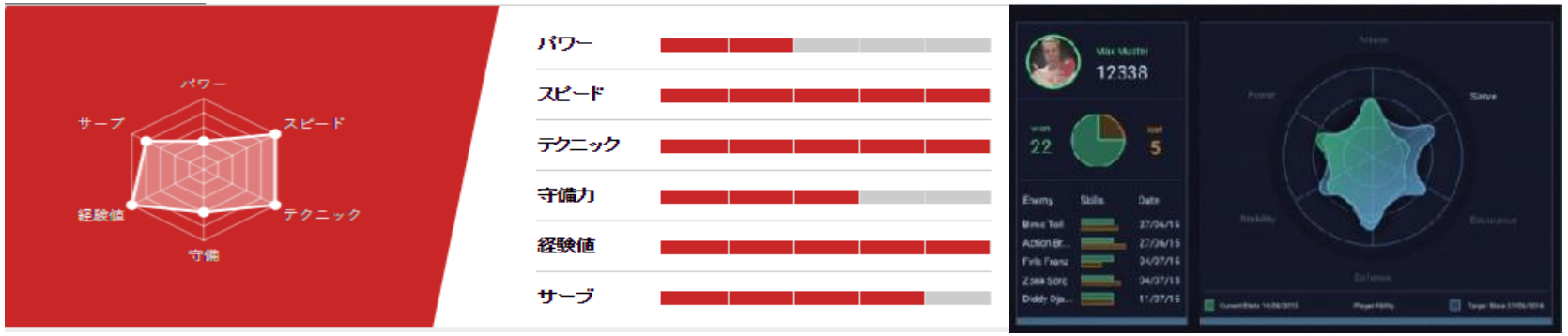


Fast communication

Relevant Visualization Work

- Visualization for table tennis

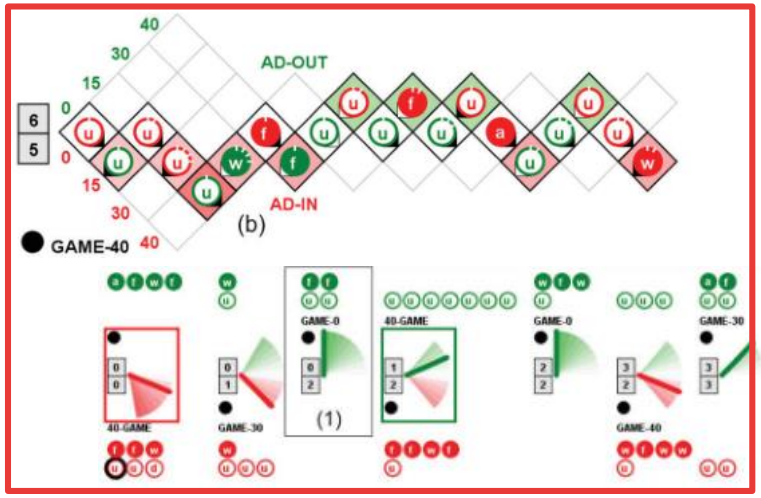




Relevant Visualization Work

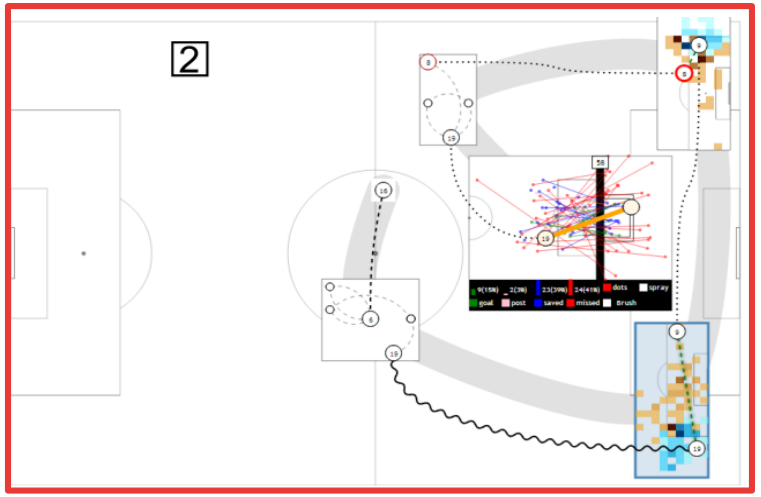
- Sports visualization

T. Polk et al. , 2014



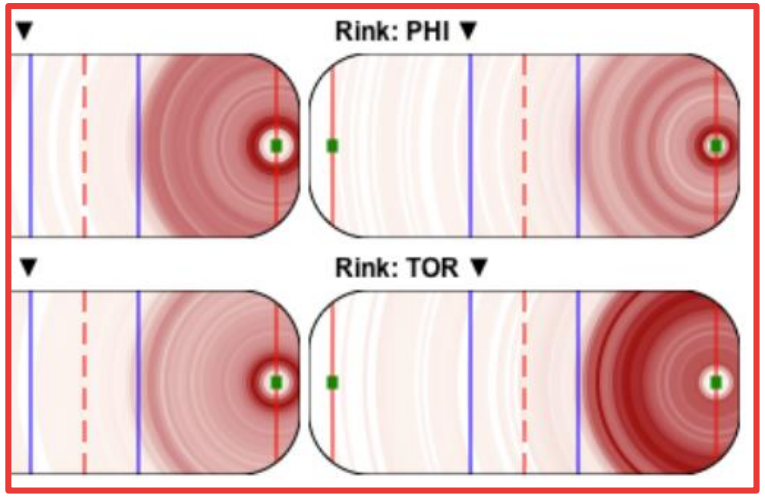
TenniVis

C. Perin et al. , 2013



SoccerStories

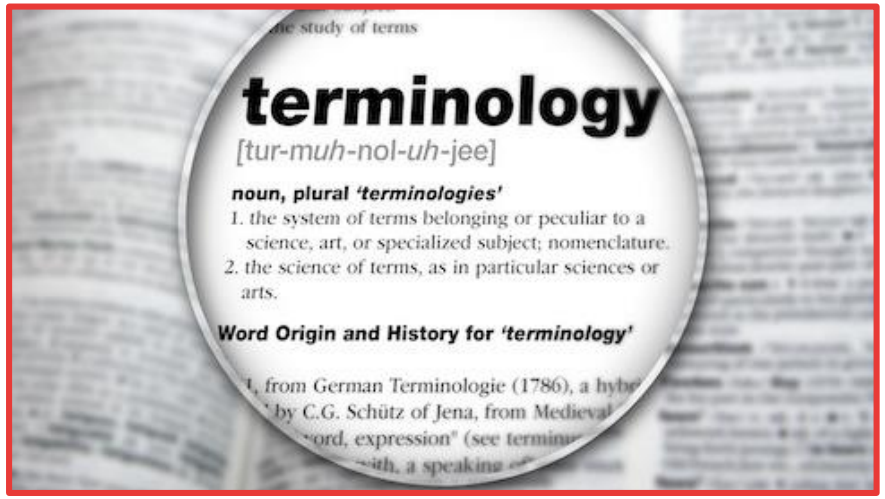
H. Pileggi et al. , 2012



SnapShot

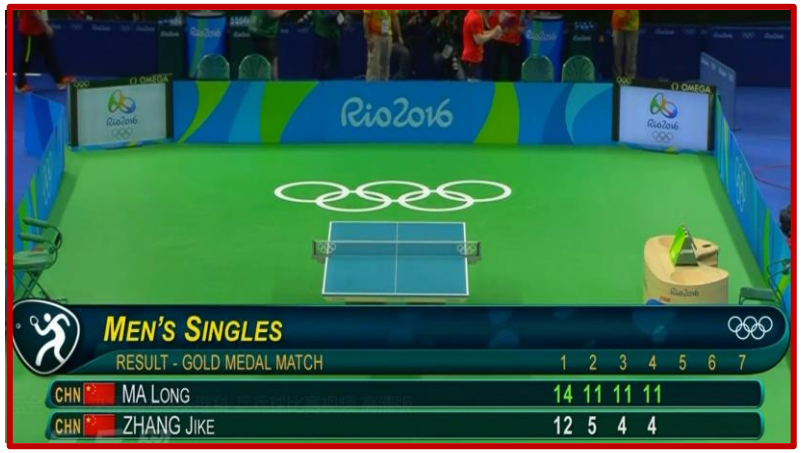
Key Challenges(1/2)

- Difficult to understand and characterize the sophisticated domain problems of analyzing table tennis data



Key Challenges(2/2)

- Difficult to provide a comprehensive and easy-to-understand visual representation of complex table tennis data



Time-varying

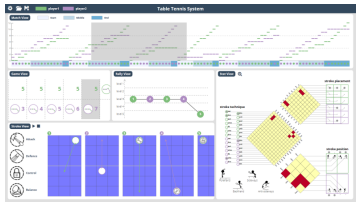
Location-based

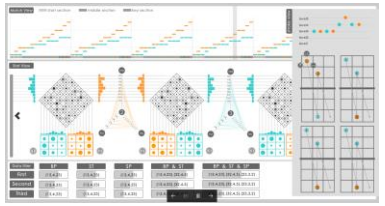
Interrelated

Design Process

Design Process

01/08/2016



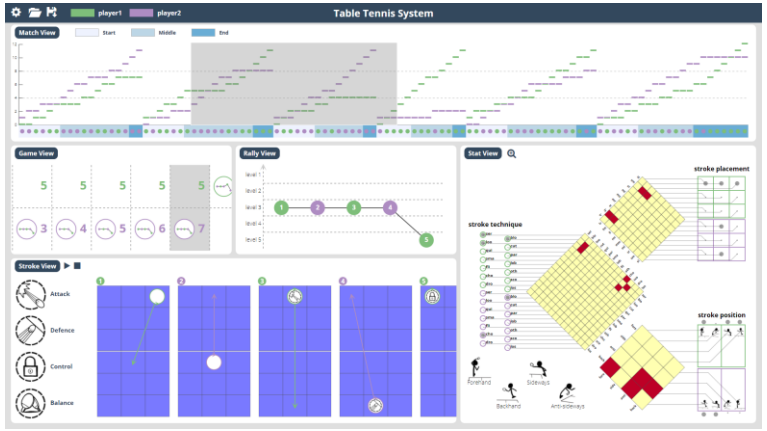


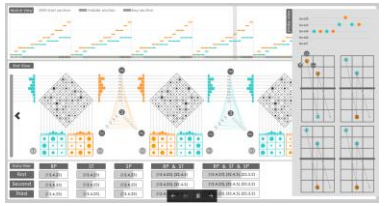
Characterizing domain problems

Design Process

01/08/2016

12/12/2016





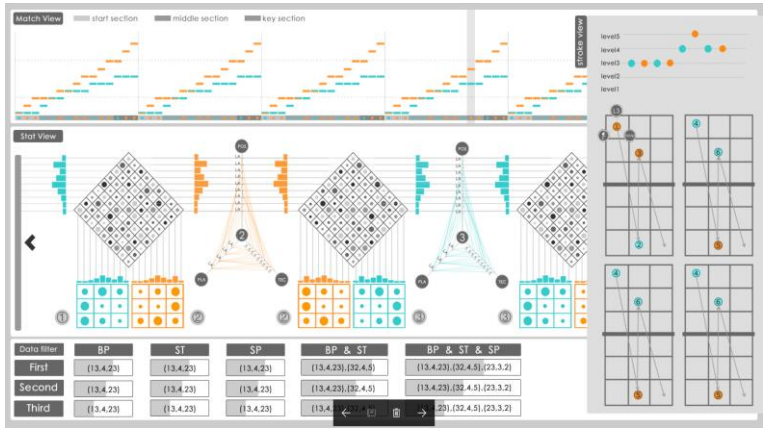
Designing an alpha prototype

Design Process

01/08/2016

12/12/2016

20/01/2017



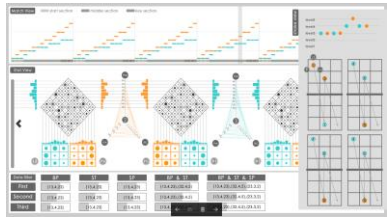
Re-designing the beta system

Design Process

01/08/2016

12/12/2016

20/01/2017



15/02/2017

Enhancing the beta system

Design Process

Data Structure

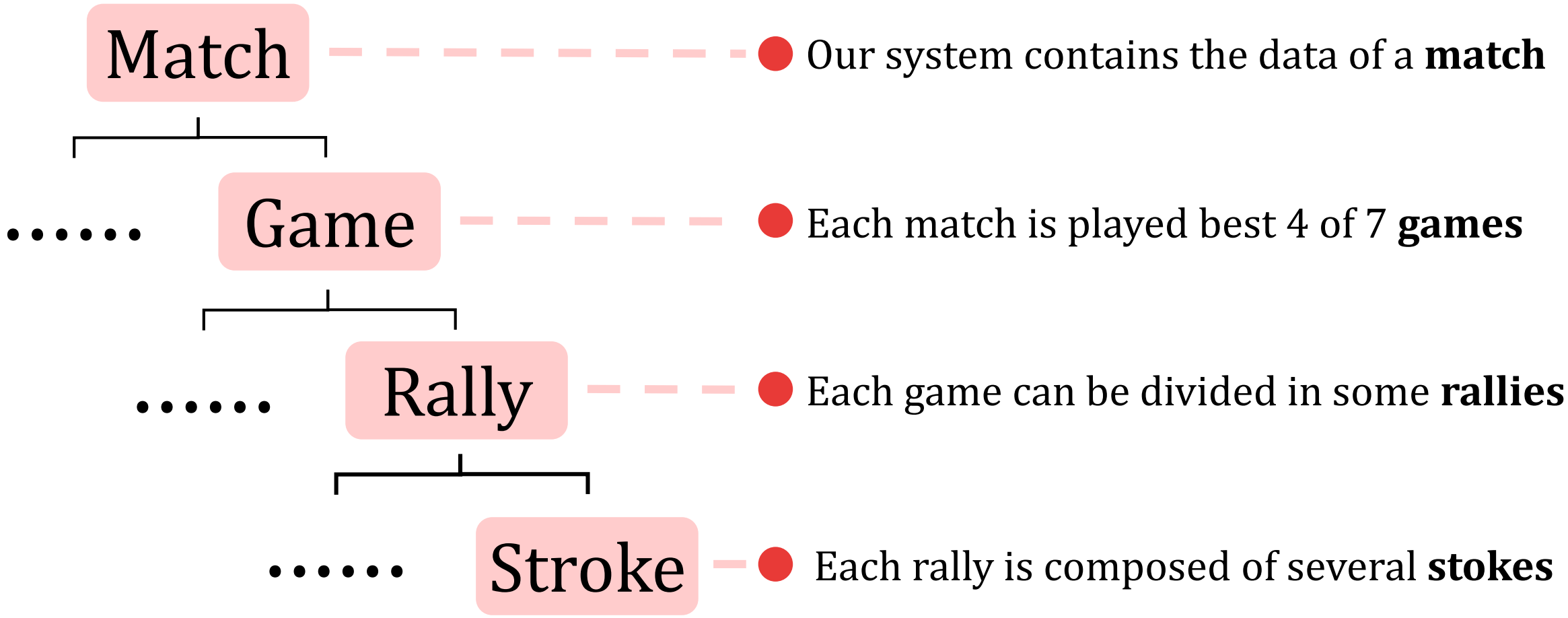
Domain Requirements

→ **Key Challenges(1/2)**

Visualization System

→ **Key Challenges(2/2)**

Data Structure



Data Structure

Rally

- Each rally contains a score

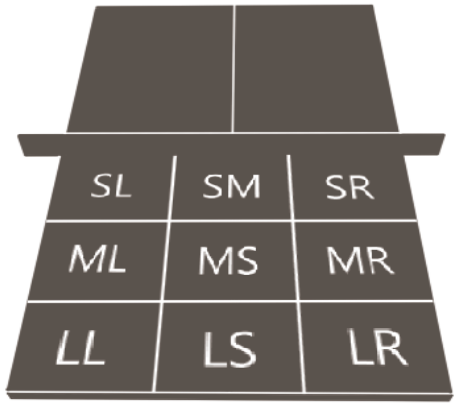
……

Stroke

- Each stroke contains three stroke attributes

Serve, Drop shot
Block, Chop, Loop
Parrel, Quick, Lob
Smash, Cut, Flick

Stroke technique



Stroke placement

Stroke position

Domain Requirements

Time-oriented analysis of an entire table tennis match

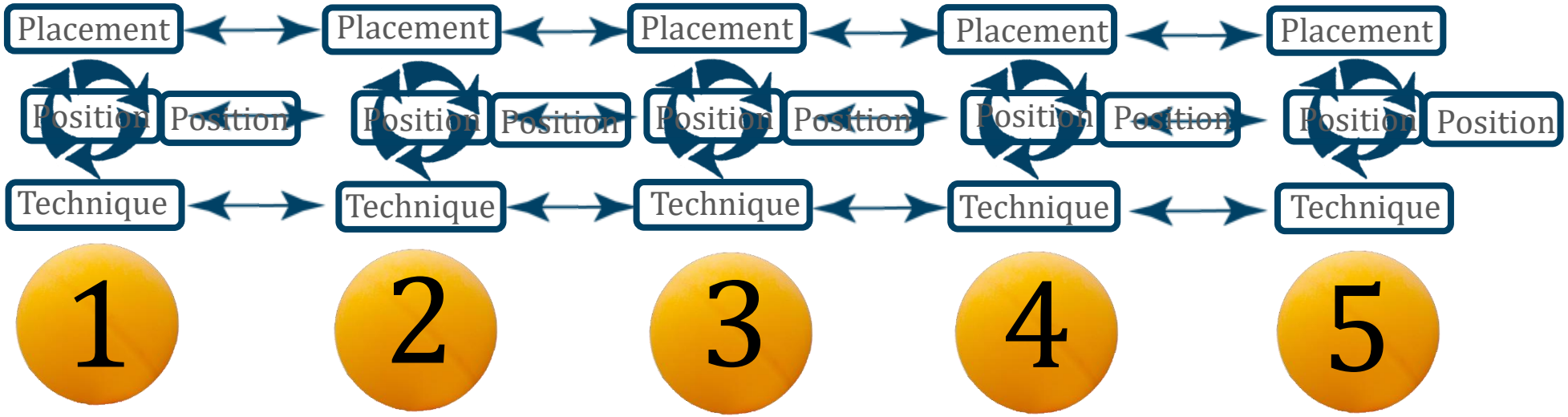
- *How do the scores evolve over time through a match ?*
- *How can analysts navigate into key rallies on the match timeline and examine the details ?*

key rallies

Domain Requirements

Statistical analysis of three essential attributes

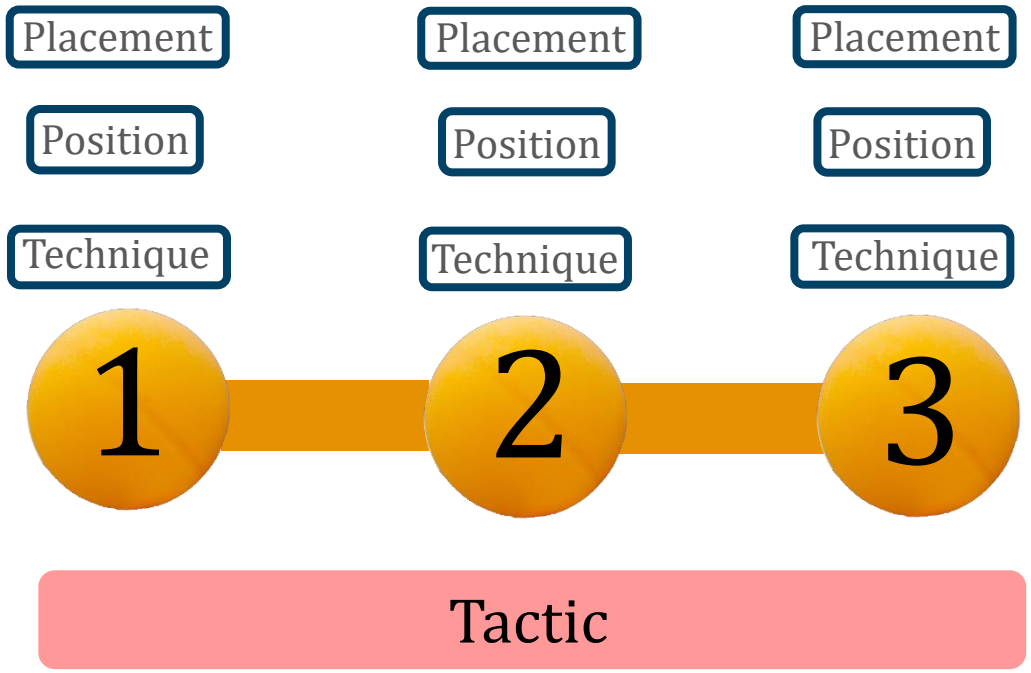
- *How do stroke attributes **intra-relate** within a stroke?*
- *How do stroke attributes **inter-relate** between adjacent strokes?*



Domain Requirements

Pattern mining of tactics in table tennis matches

- *What are the frequent patterns of tactics?*
- *What are the scoring rates of tactics?*

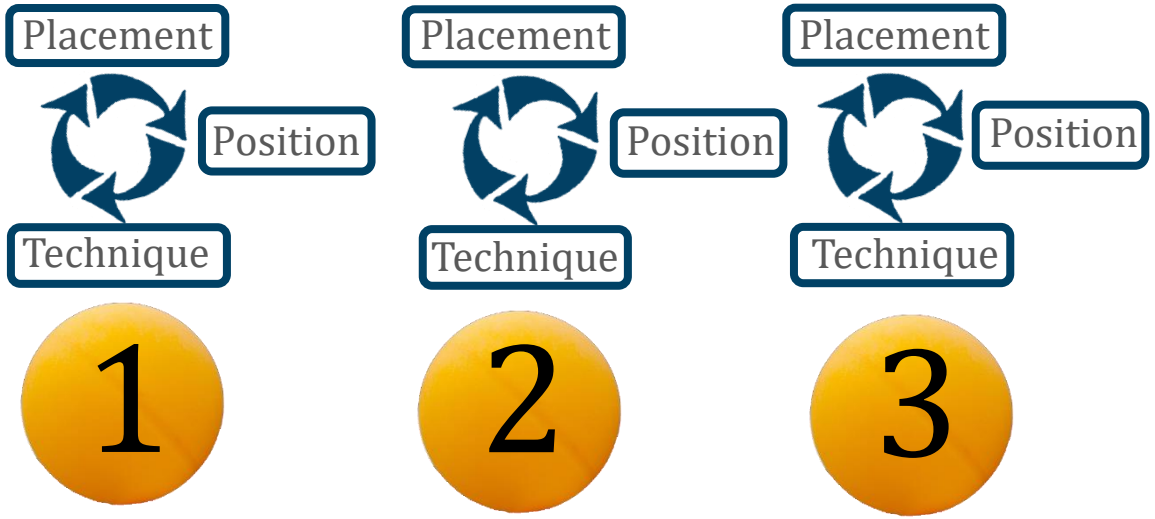


Domain Requirements

Cross-analysis between the timeline and statistics

- *How do the timeline and statistics relate to each other ?*

key rallies



System Overview

Match View	Time-oriented analysis of a table tennis match
Stat View	Statistical analysis of three essential attributes
Tactic View	Pattern mining of tactics in a table tennis match
Cross-View interaction	Cross-analysis between the timeline and statistics

System Overview

Match View

Time-oriented analysis of a table tennis match

Stat View

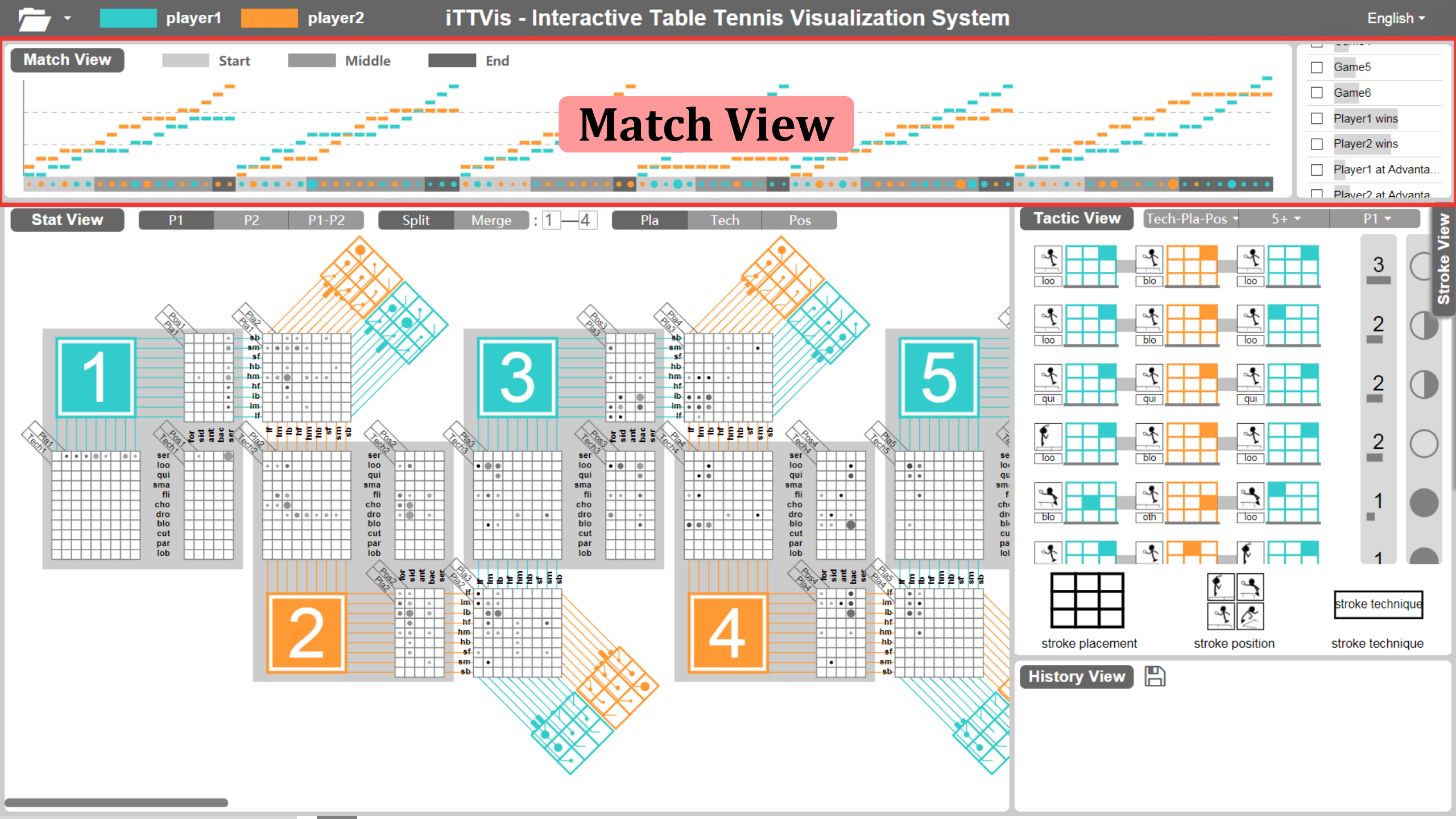
Statistical analysis of three essential attributes

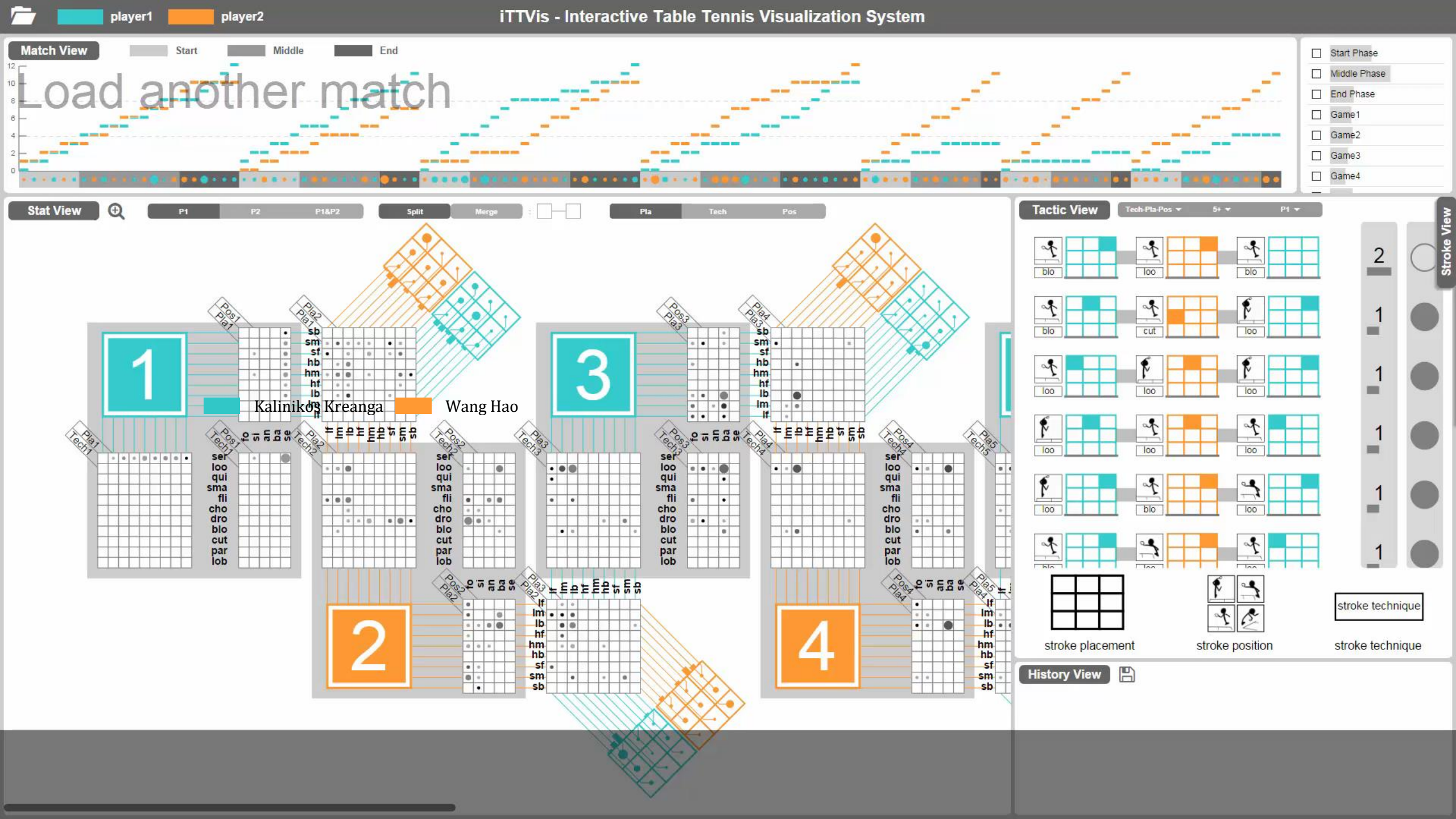
Tactic View

Pattern mining of tactics in a table tennis match

Cross-View interaction

Cross-analysis between the timeline and statistics


player1
player2
iTTVis - Interactive Table Tennis Visualization System
English
Match View
Start
Middle
End
Match View
Game5
Game6
Player1 wins
Player2 wins
Player1 at Advanta...
Player2 at Advanta...
Stat View
P1
P2
P1-P2
Split
Merge
1
4
Pla
Tech
Pos
Tactic View
Tech-Pla-Pos
5+
P1
Stroke View
stroke placement
stroke position
stroke technique
History View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iTTVis - Interactive Table Tennis Visualization System
Match View
Start
Middle
End
Load another match
Start Phase
Middle Phase
End Phase
Game1
Game2
Game3
Game4
Stat View
P1
P2
P1&P2
Split
Merge
Pla
Tech
Pos
Kalinikos Kreanga
Wang Hao
Tactic View
Tech-Pla-Pos
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System Overview

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Time-oriented analysis of a table tennis match

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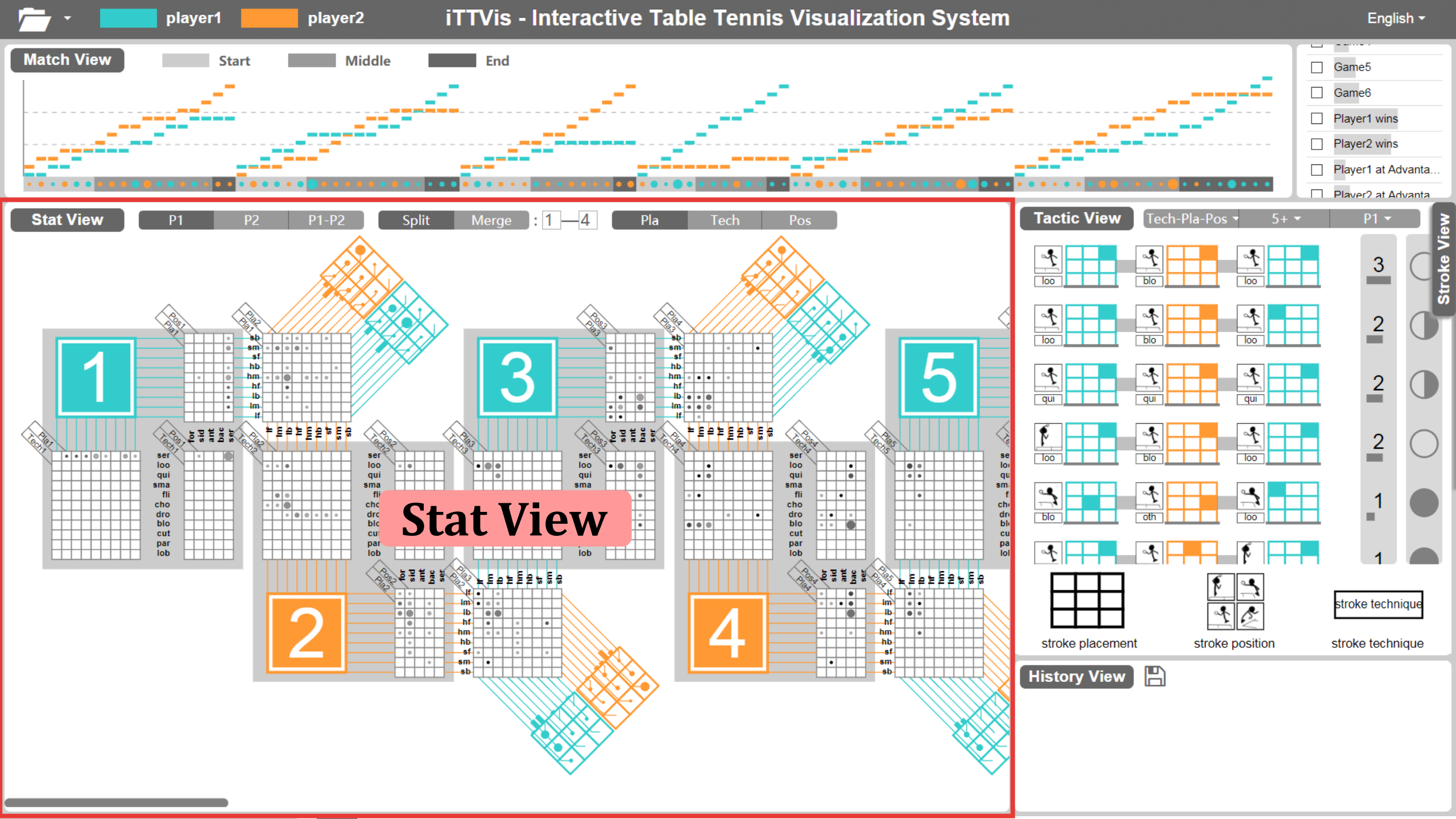
Tactic View

Pattern mining of tactics in a table tennis match

Cross-View interaction

Cross-analysis between the timeline and statistics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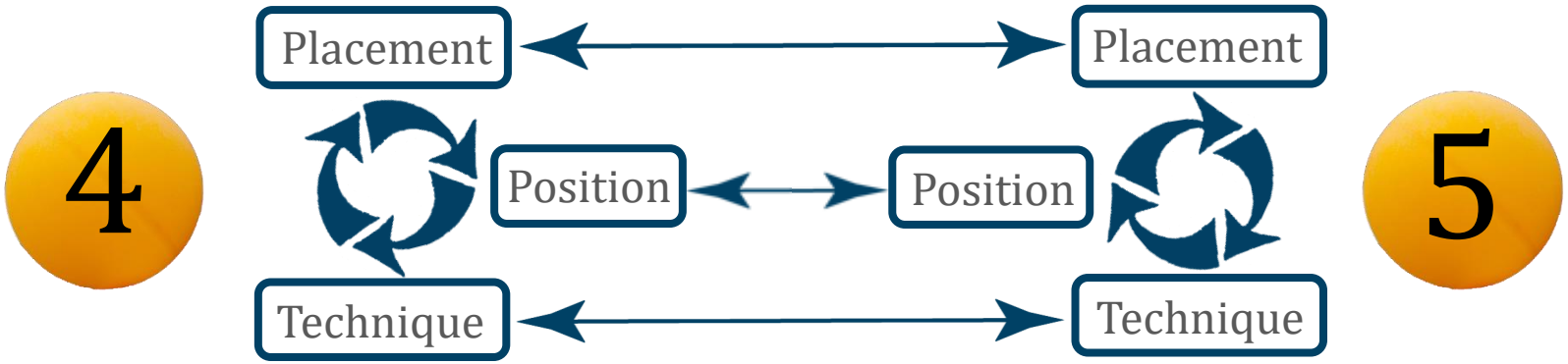
Design of Stat View



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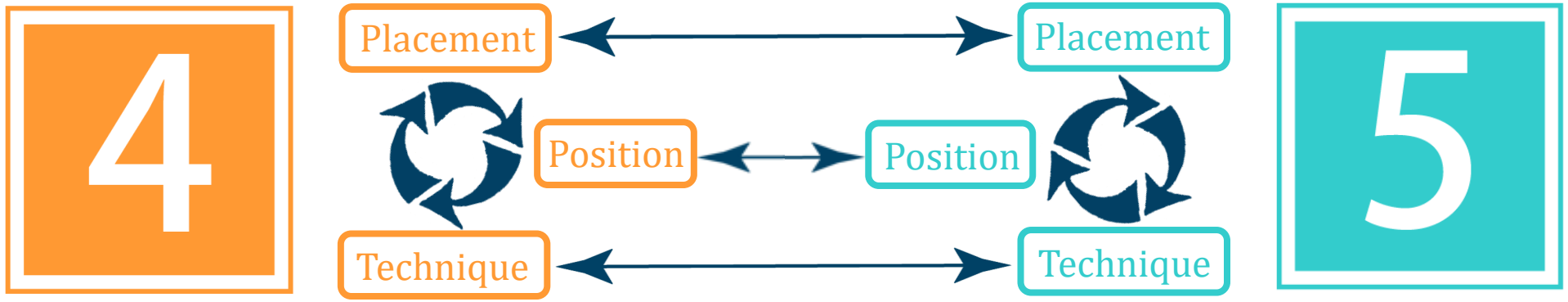

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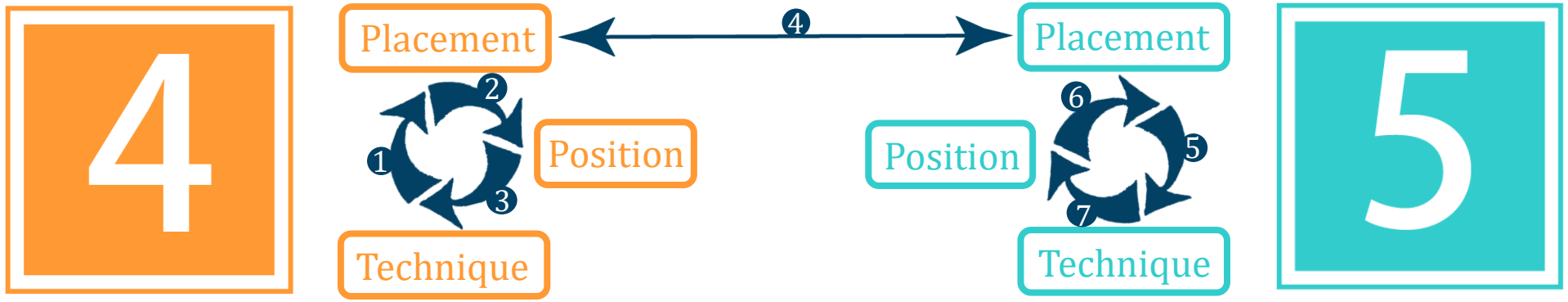

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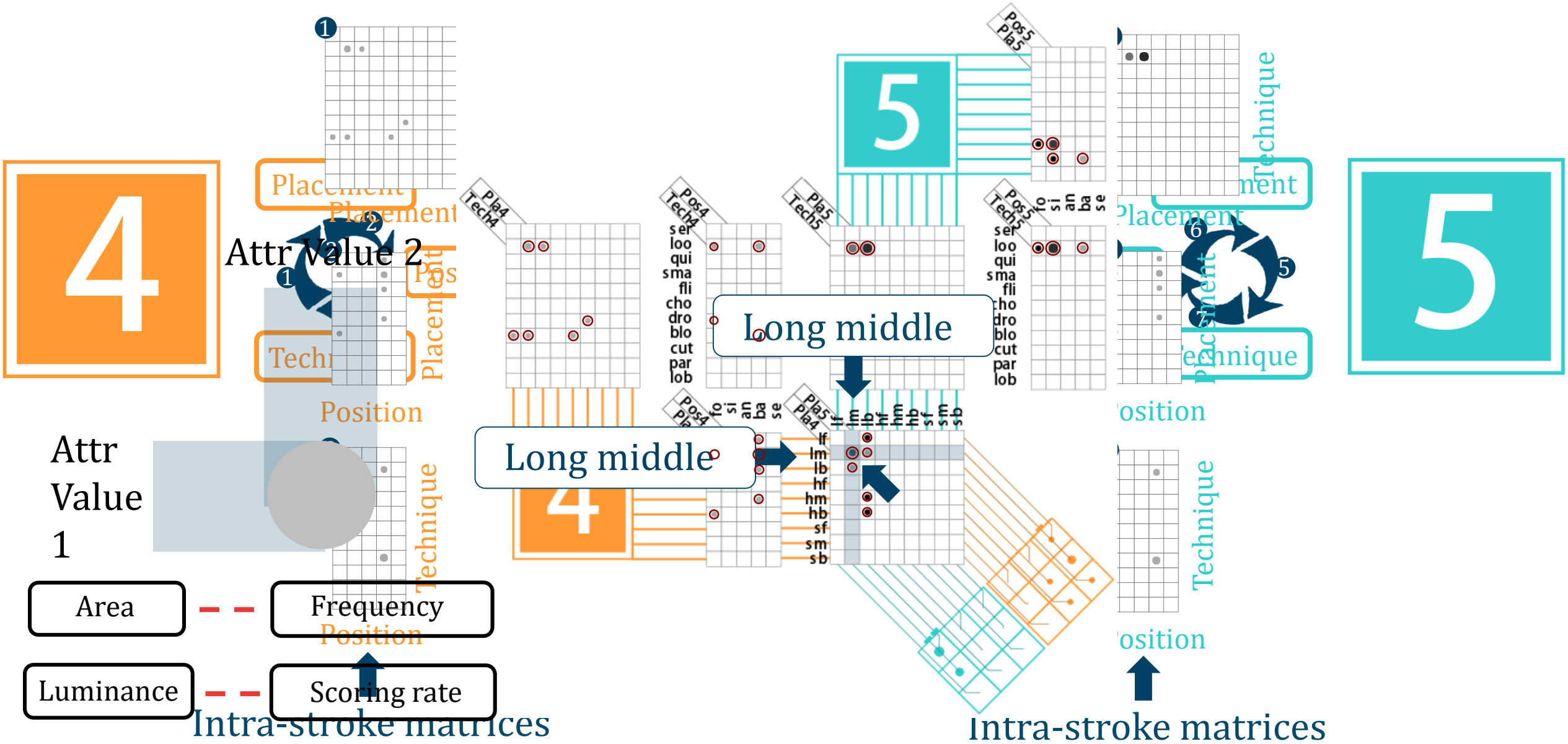

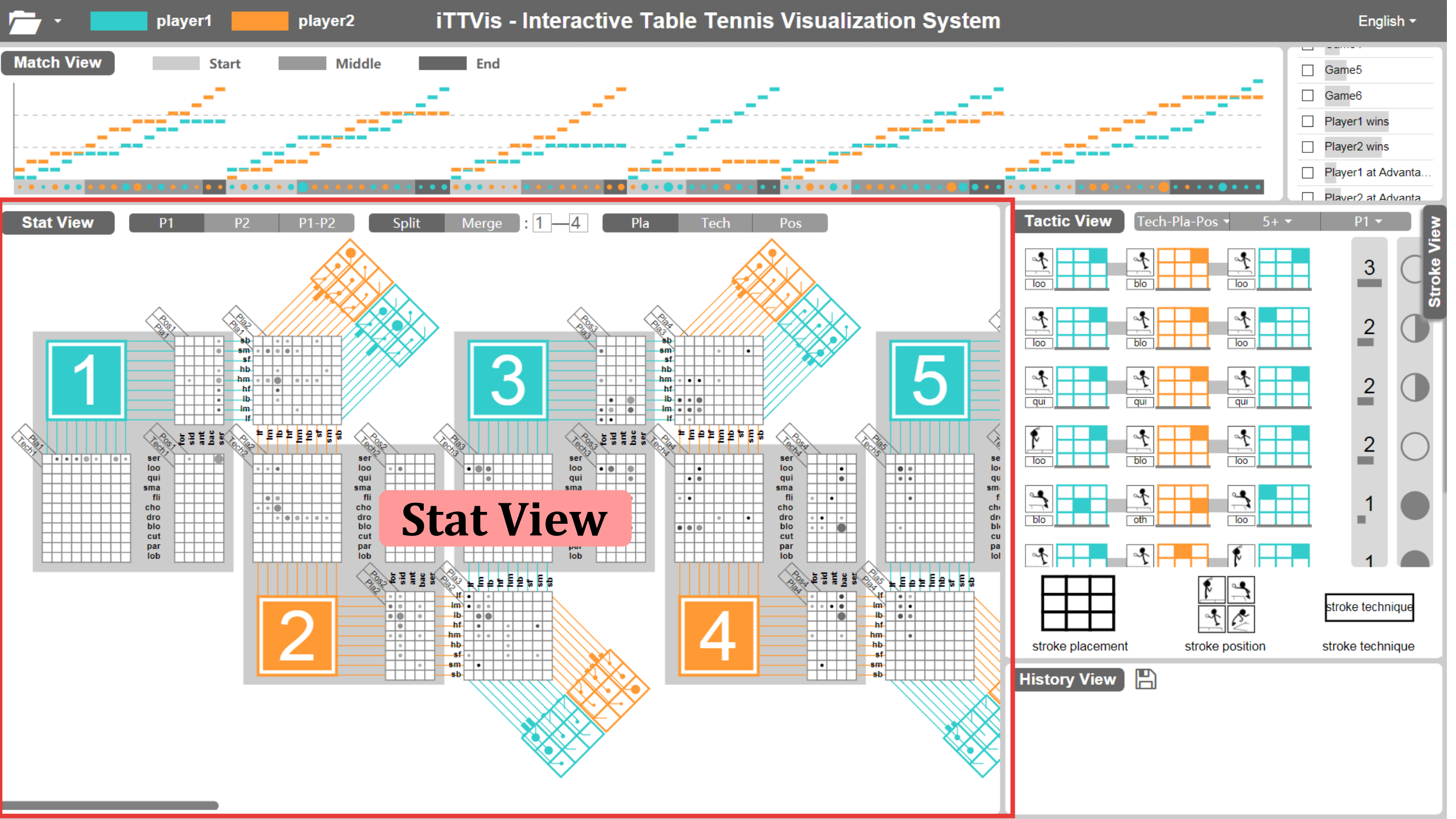
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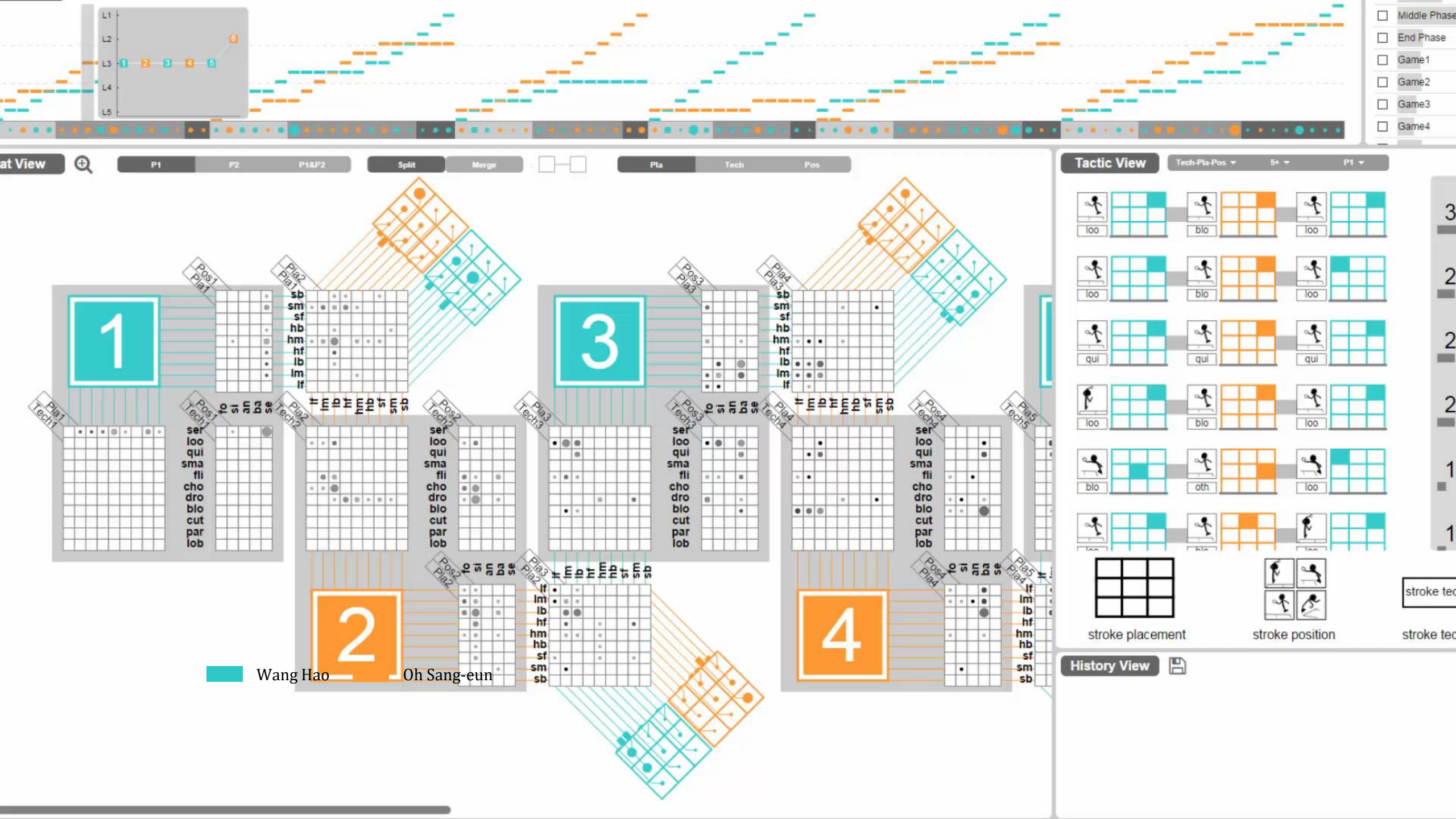
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System Overview

Match View

Time-oriented analysis of a table tennis match

Stat View

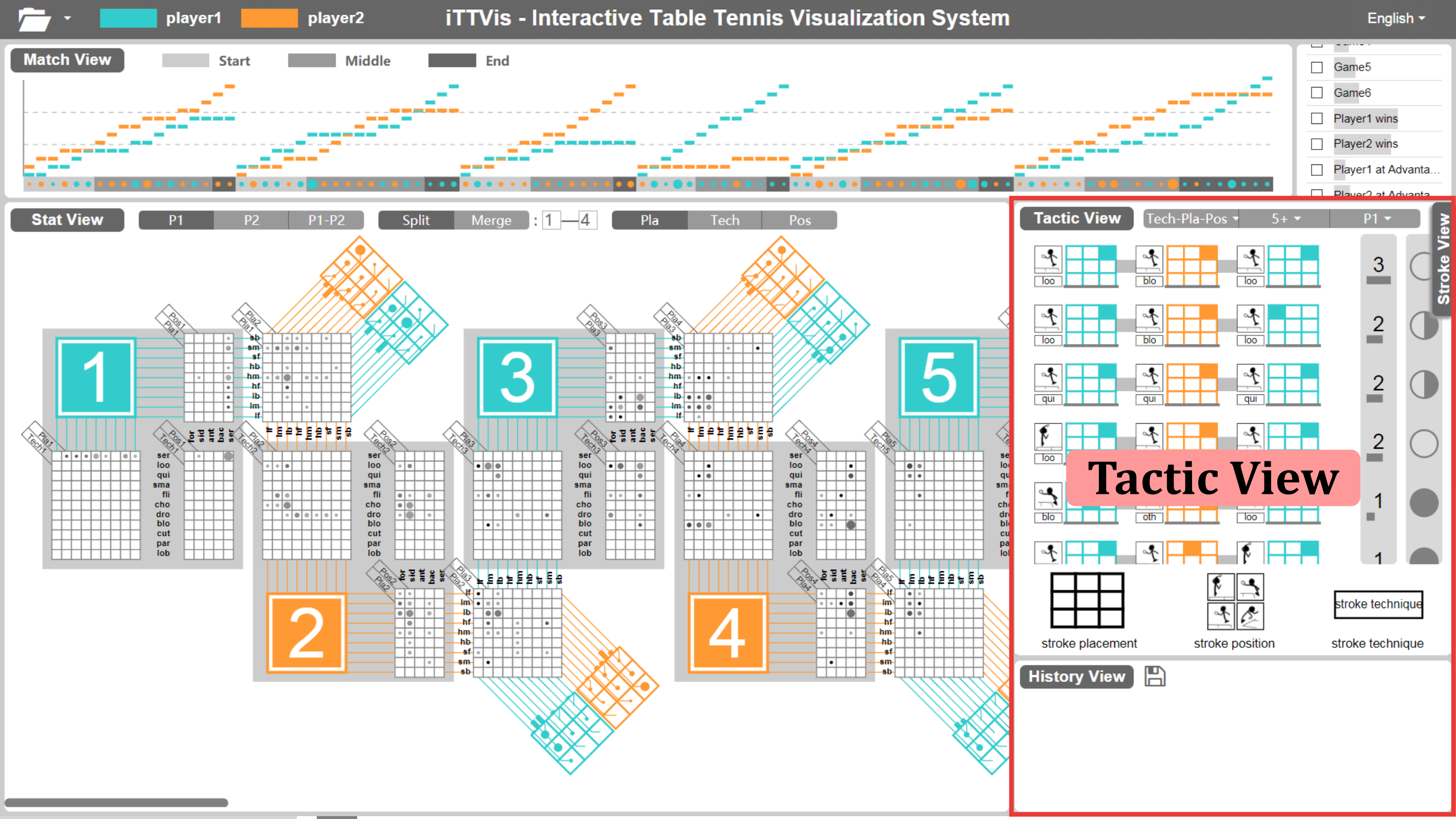
Statistical analysis of three essential attributes

Tactic View

Pattern mining of tactics in a table tennis match

Cross-View interaction

Cross-analysis between the timeline and statistics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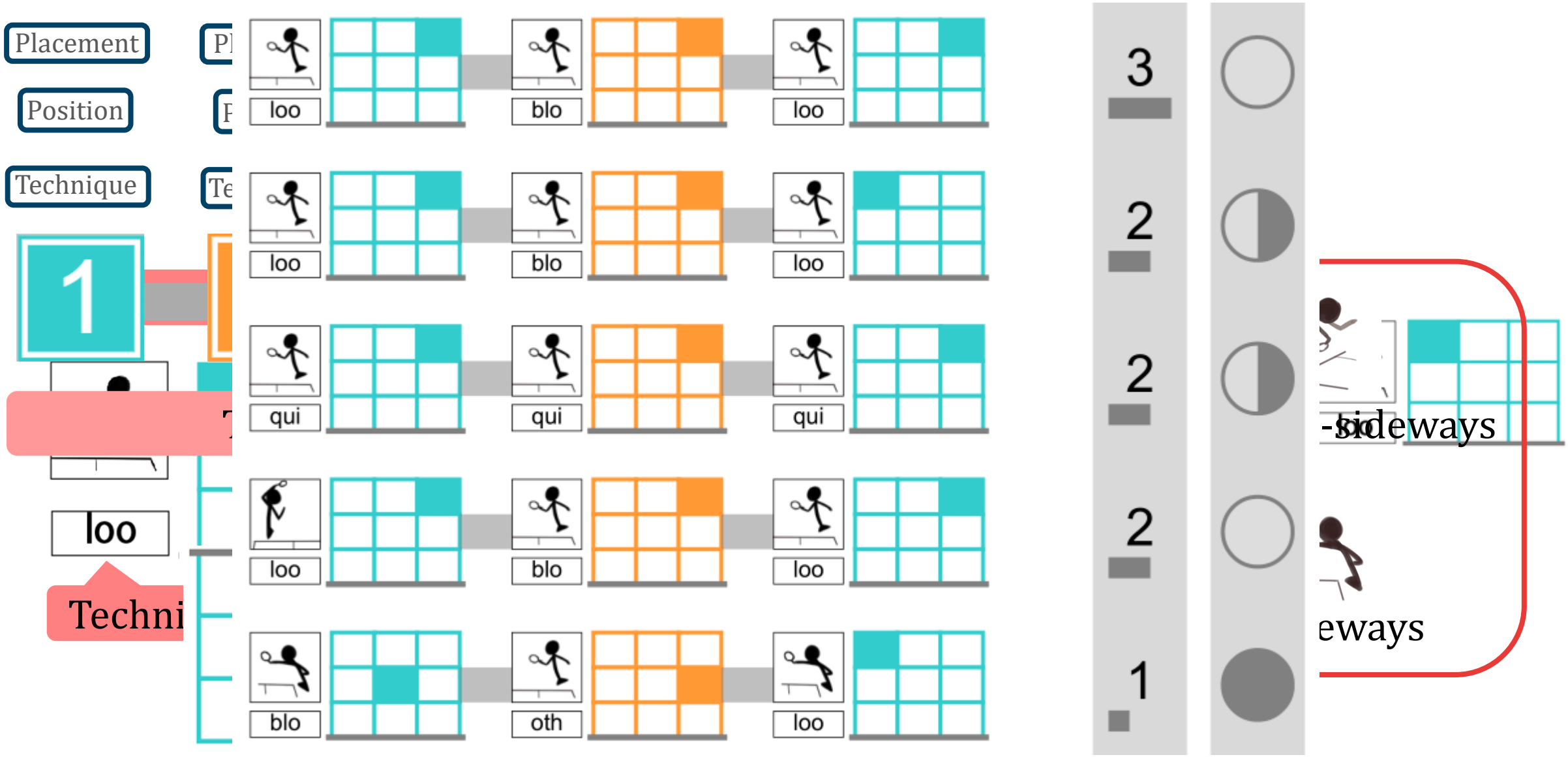
Design of Tactic View



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User Feedback

Advantages

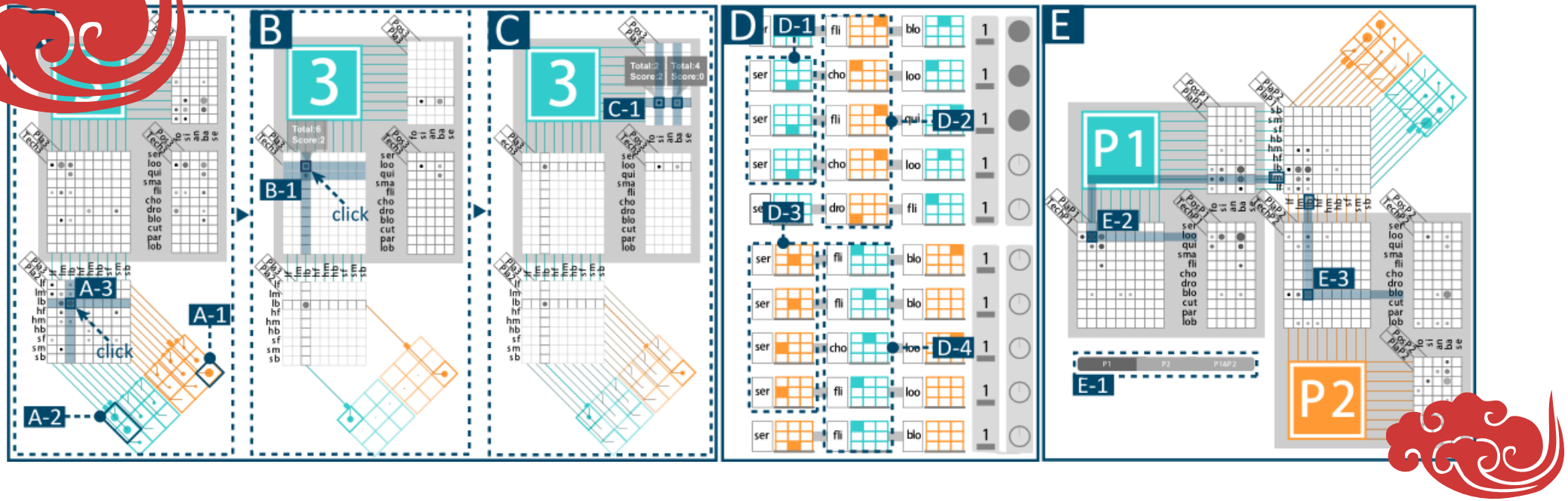
- Employing matrices to represent the correlations
- Supporting flexible cross-view filtering and selections
- Designing icons and glyphs to enhance the intuitiveness

Suggestions

- Integrating prediction and supporting table tennis doubles

Conclusion

- Problem characterizing
- New insights
- A heuristic design



Future Work

- Support comparison of multiple matches
- Allow prediction of the winning rate

Q&A

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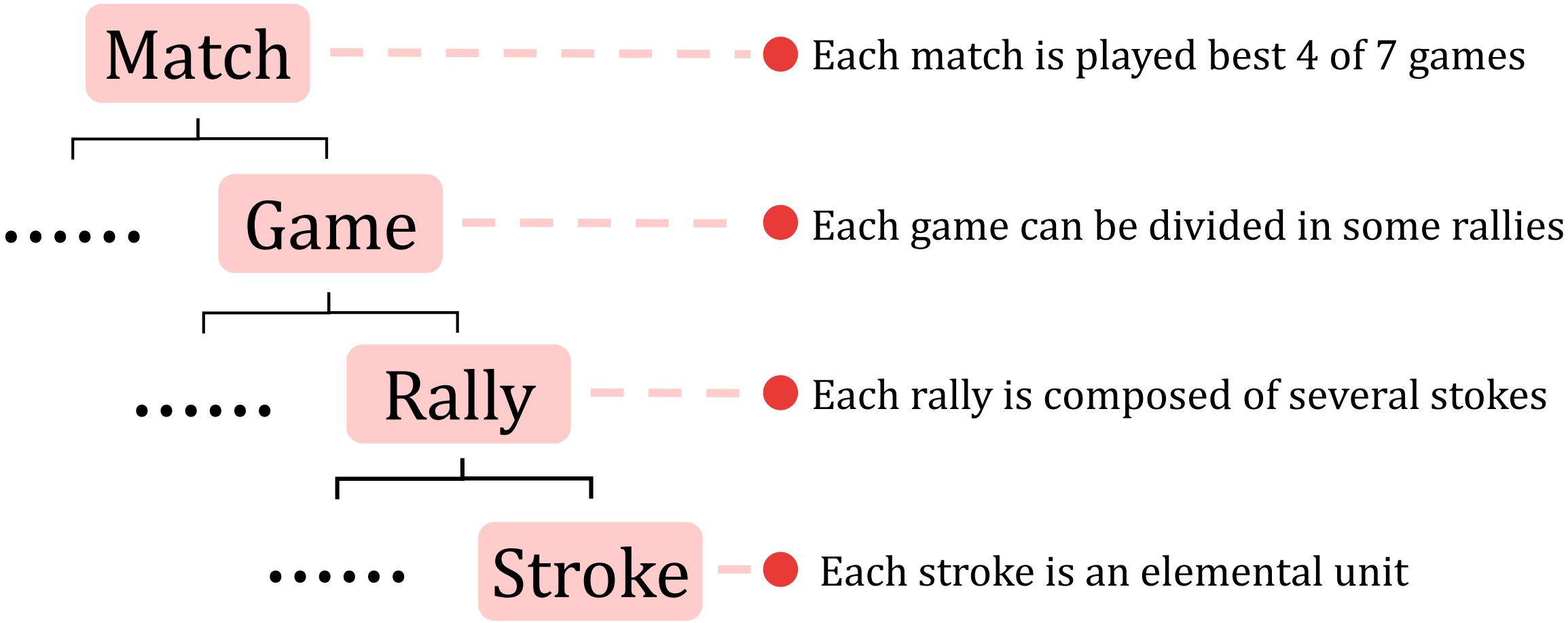
lanjiZJU@gmail.com

Follow along at
http://www.ycwu.org/projects/ittvis.html

Co-author

User study

Data Structure



Data Structure

Stroke

- Three stroke attributes

Serve, Drop shot
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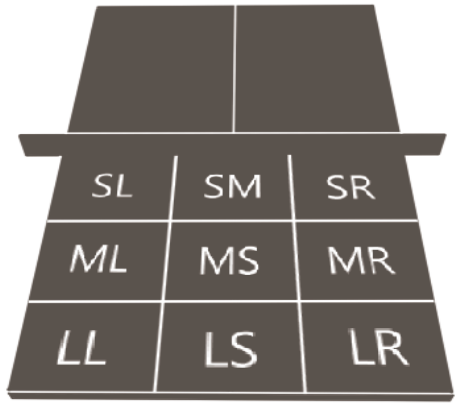
Smash, Cut, Flick

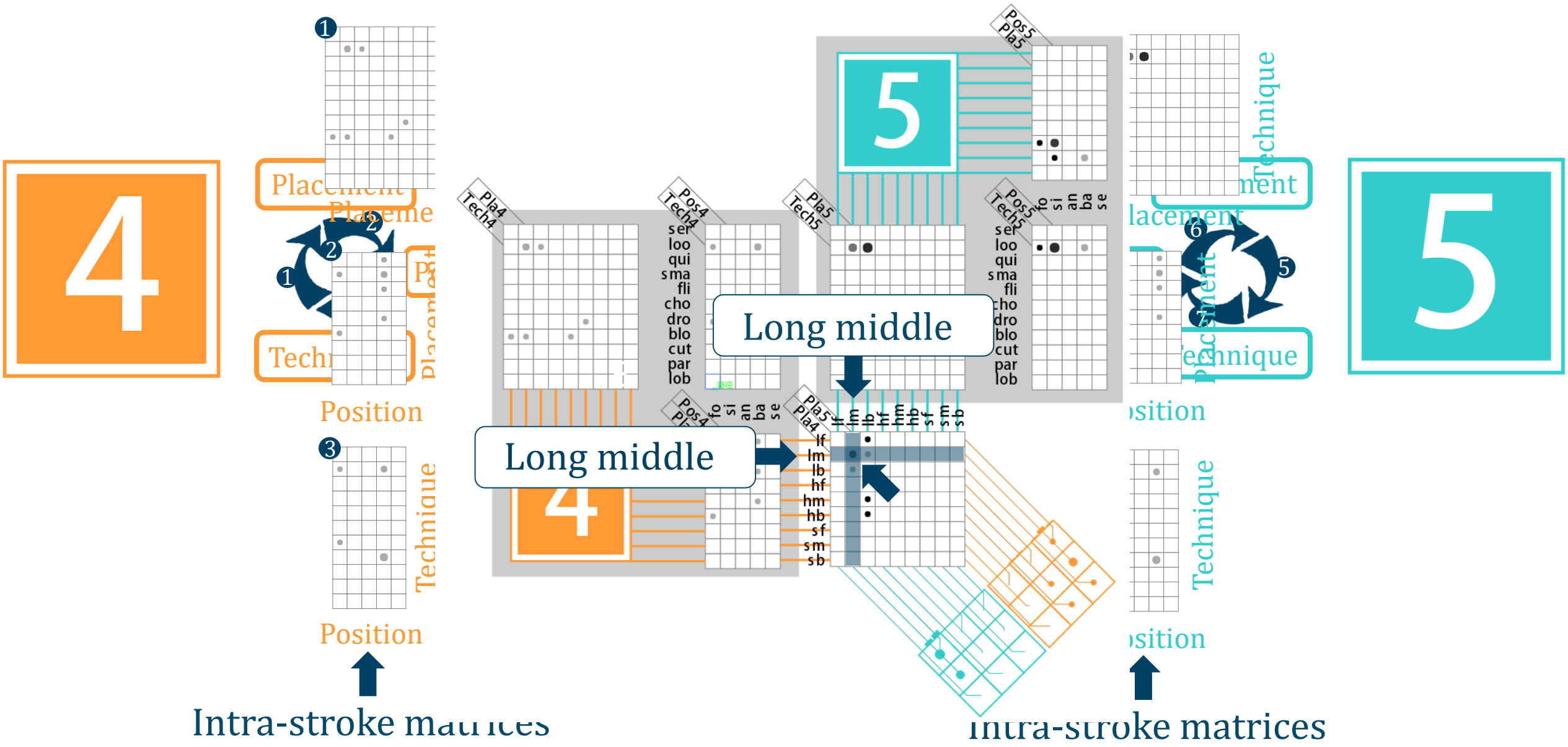
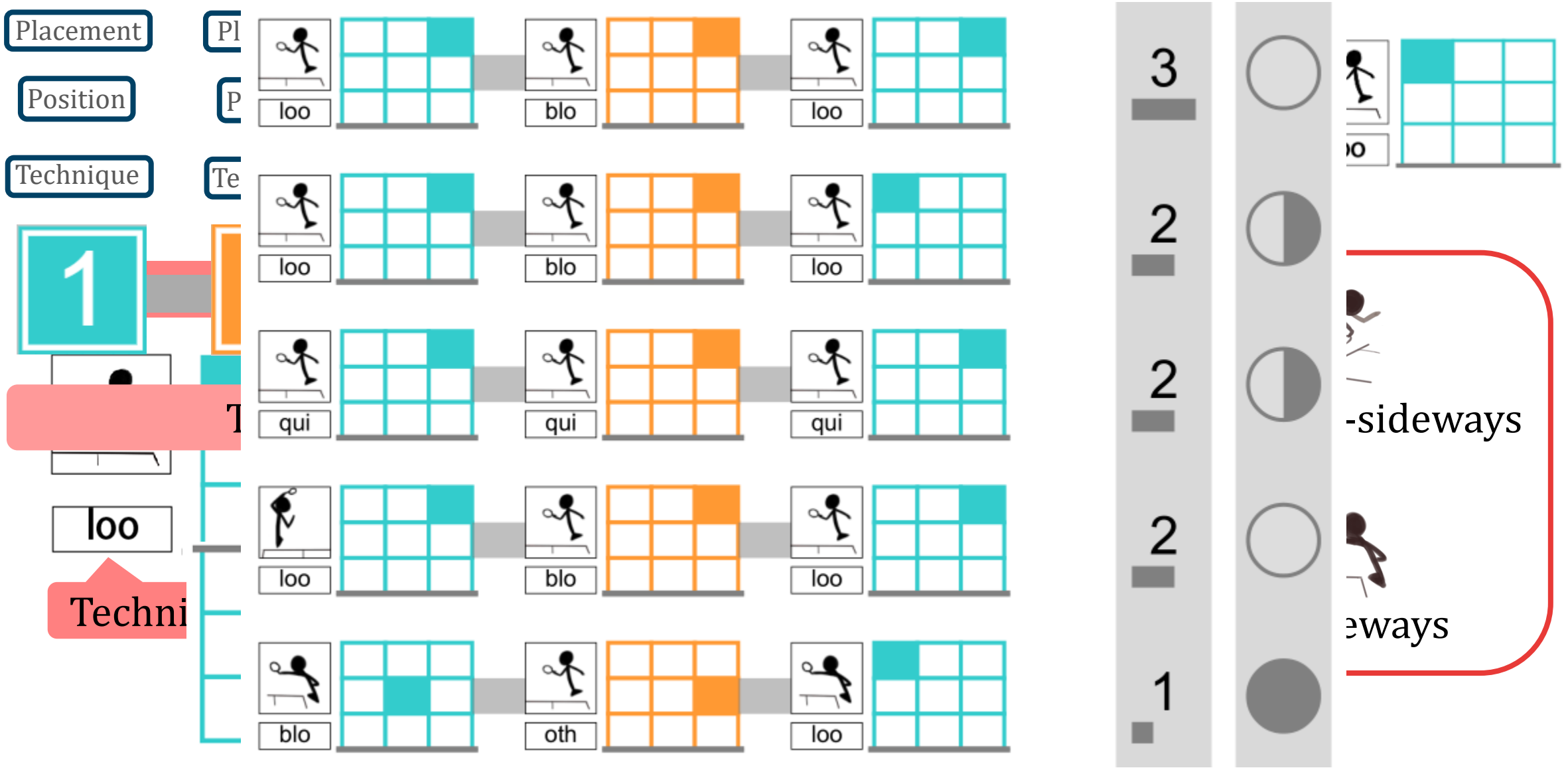
Stroke technique



Stroke placement

Stroke position

Design of Stat View



Design of Tactic View