MyBrush: Brushing and Linking with Personal Agency

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CMV, Brushing and Linking

- CMV stands for coordinated multiple views
- Brushing

- Linking

Personal Agency

- People "*strongly desire that they are in charge of the interface and that the interface responds to their actions*"[1]

- *"Interaction techniques that facilitate a high sense of personal agency are likely to have a strong empowering effect for users"*[2]

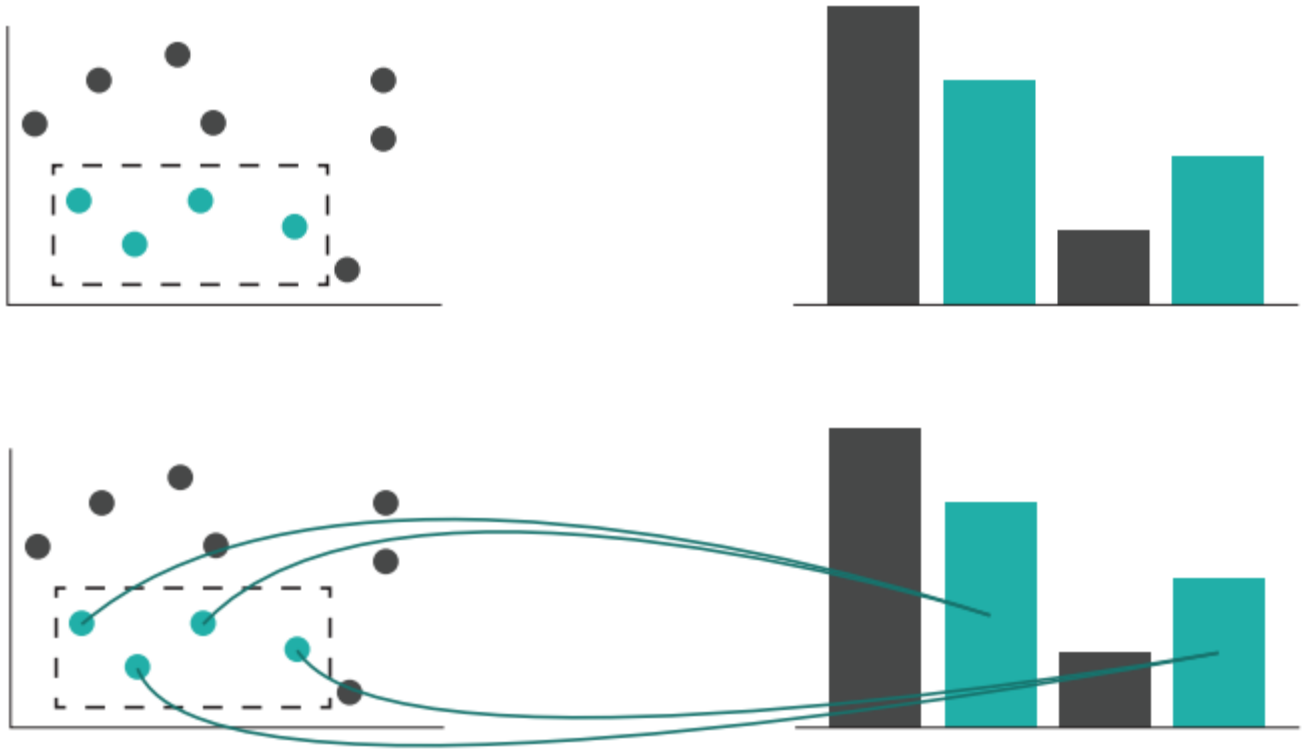
[1] B. Shneiderman and C. Plaisant. *Designing the User Interface: Strategies for Effective Human-Computer Interaction (4th Edition)*. Pearson Addison Wesley, 2004

[2] D. Coyle, J. Moore, P. O. Kristensson, P. Fletcher, and A. Blackwell. *I did that! Measuring users' experience of agency in their own actions.* CHI '12, pp. 2025–2034, New York, NY, USA, 2012.

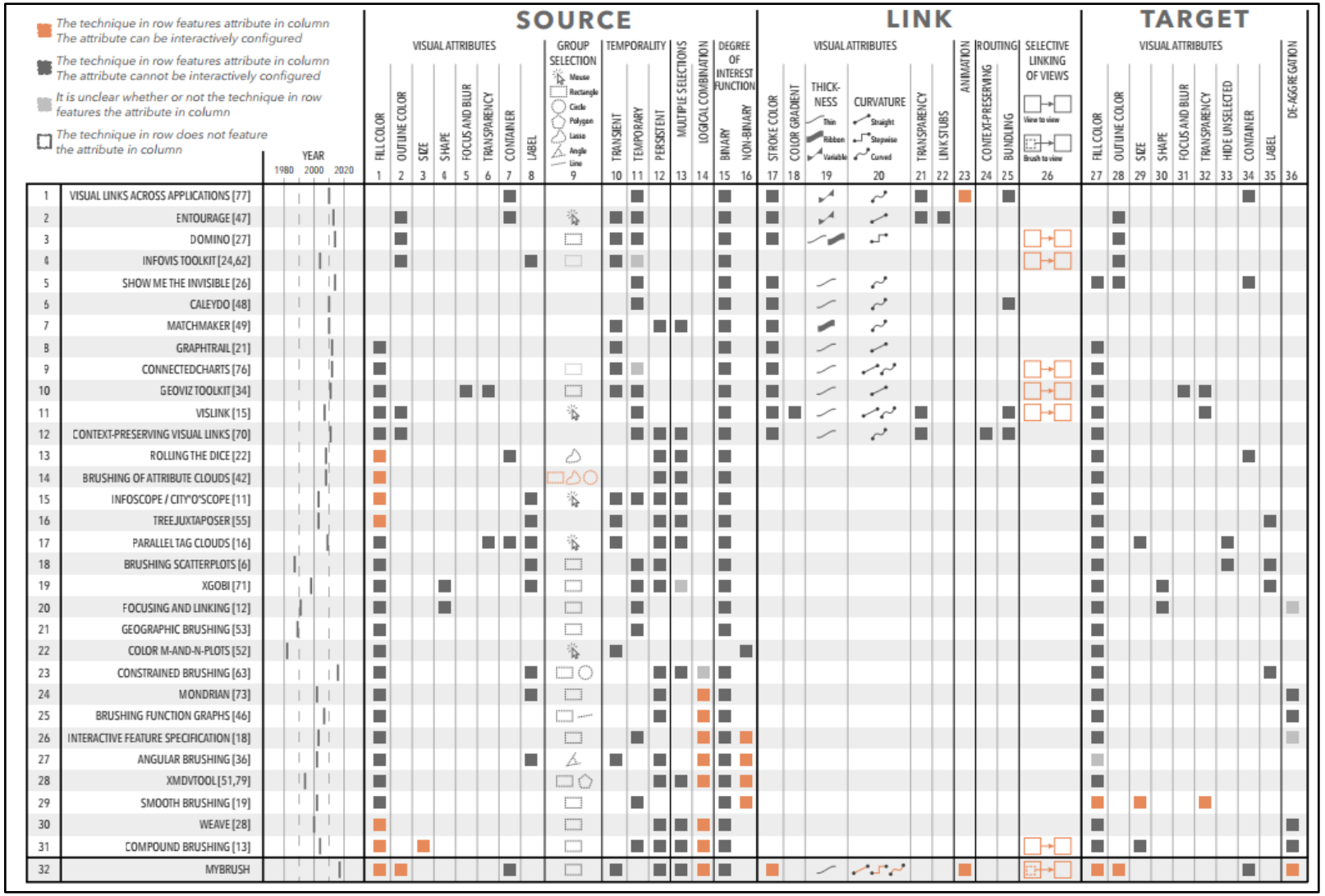
Source, Link, and Target

1. **Source** is the set of one or more selected data points in a view.
2. **Link** is the expression of relationship between the source and the related data points in other views (target).
3. **Target** is the set of data points that are related to the source

Example



Existing techniques



Source

- Visual attributes
  - Fill color
  - Outline color
  - Size
  - Shape
  - Focus and blur
  - Transparency
  - Container
  - Label
- Temporality
  - Transient
  - Temporary
  - Persistent

- Group selection
  - Mouse
  - Rectangle
  - Circle
  - Polygon
  - Lasso
  - Angle
  - Line

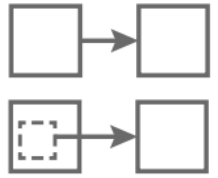
- Multiple selections
- Logical combination
- Degree-of-interest functions
  - Binary
  - Non-binary

Link

- Visual attributes
  - Stroke color
  - Color gradient
  - Thickness
    - Thin
    - Ribbon
    - Variable

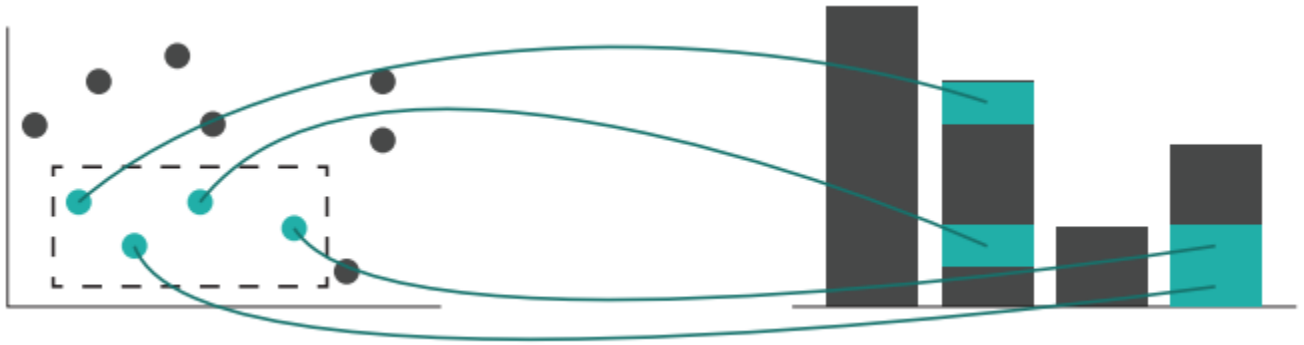
  - Curvature
    - Straight
    - Stepwise
    - Curved

  - Transparency
  - Link stubs
- Animation
- Routing
  - Context-preserving
  - Bundling
- Selective linking of views
  - View to view
  - Brush to view



Target

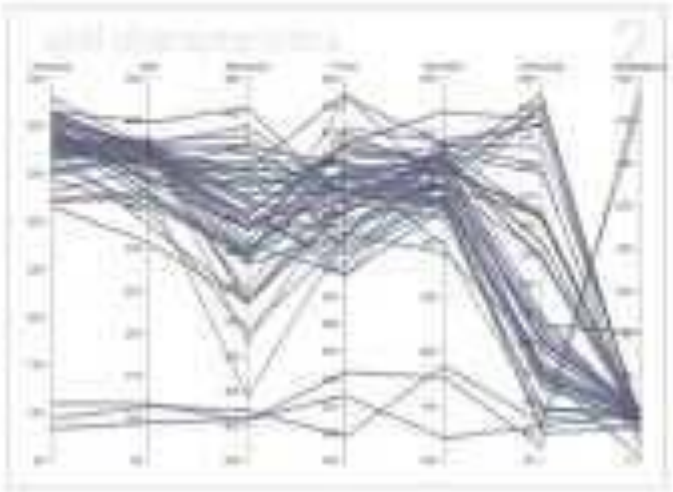
- Visual attributes (similar to source's attributes)
  - Fill color
  - Outline color
  - Size
  - Shape
  - Focus and blur
  - Transparency
  - Container
  - Label
  - **Hide unselected**
- De-aggregation

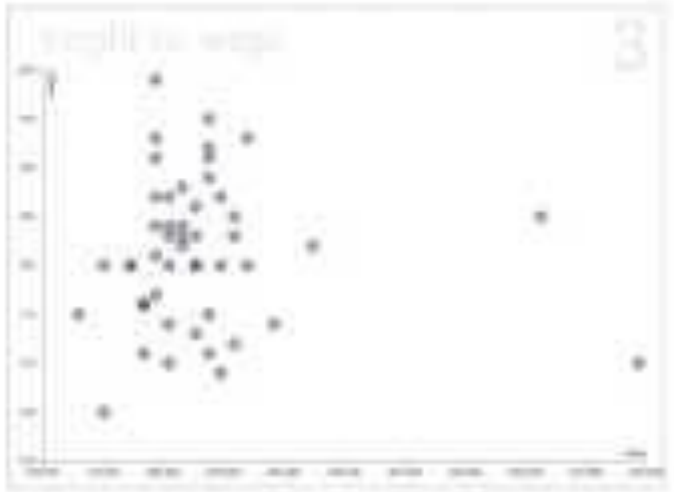


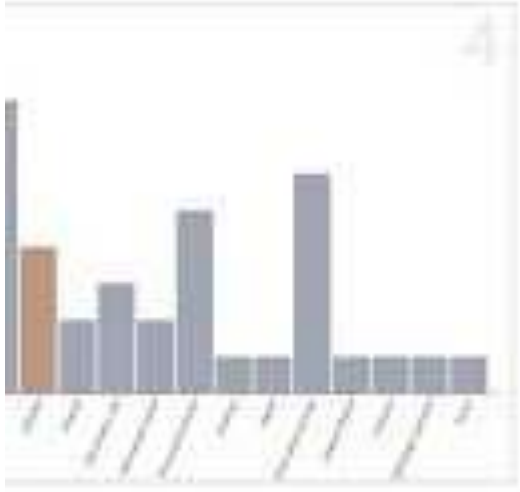
Design goals

- **DG1.** Provide direct access to brush components.
- **DG2.** Offer choice in degree of personal agency.
- **DG3.** Support complex personal agency.

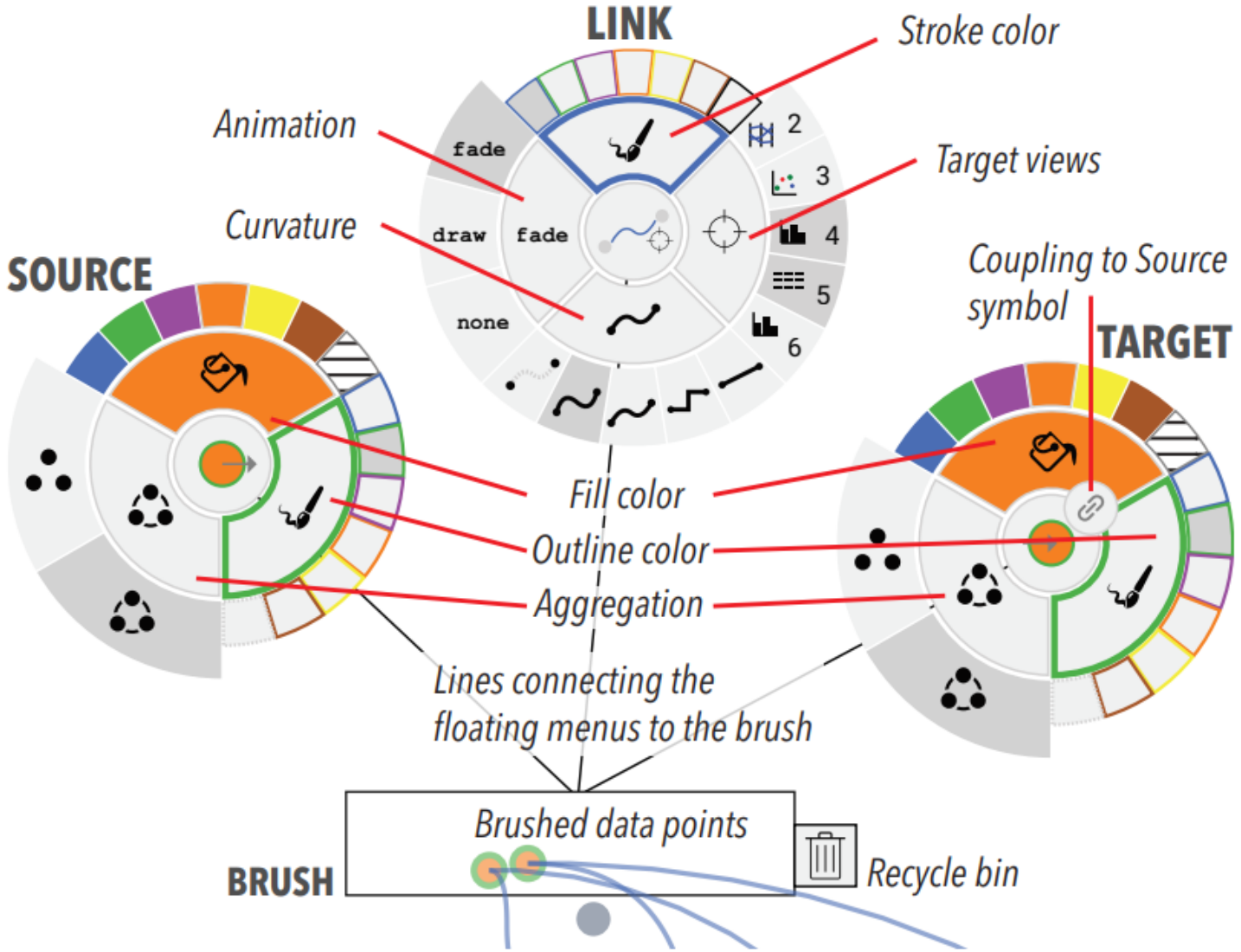
Demo



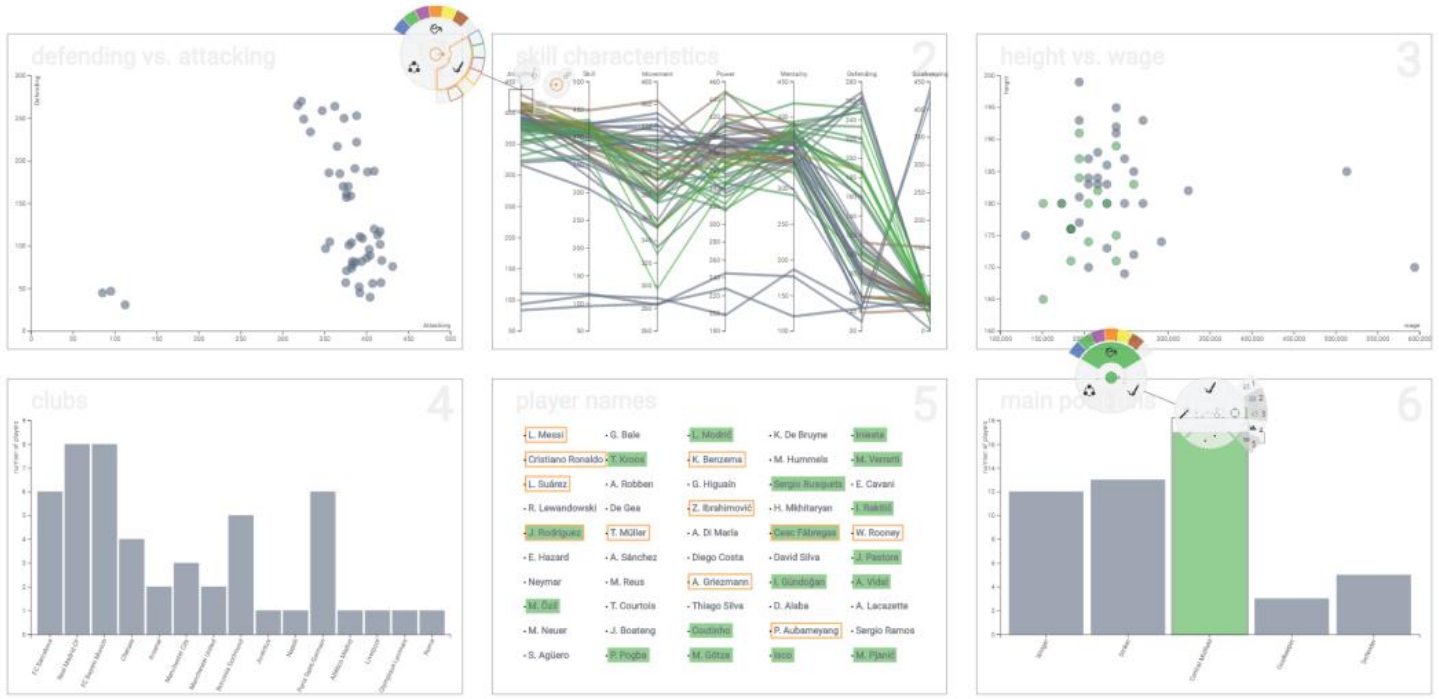




Flexibility of MyBrush



Qualitative study



12 participants (5F, 7M):

- vis group (2F, 2M)
- sports group (4M)
- mixed group (3F, 1M)

- six views
- sofifa.com dataset of the 50 most valuable soccer players
- shown at 65” multi-touch SMART Board 6000 series with 3840×2160px resolution
- prelude (10 min), training (10 min), exploration (30 min), wrap-up (10 min)

Users' feedback

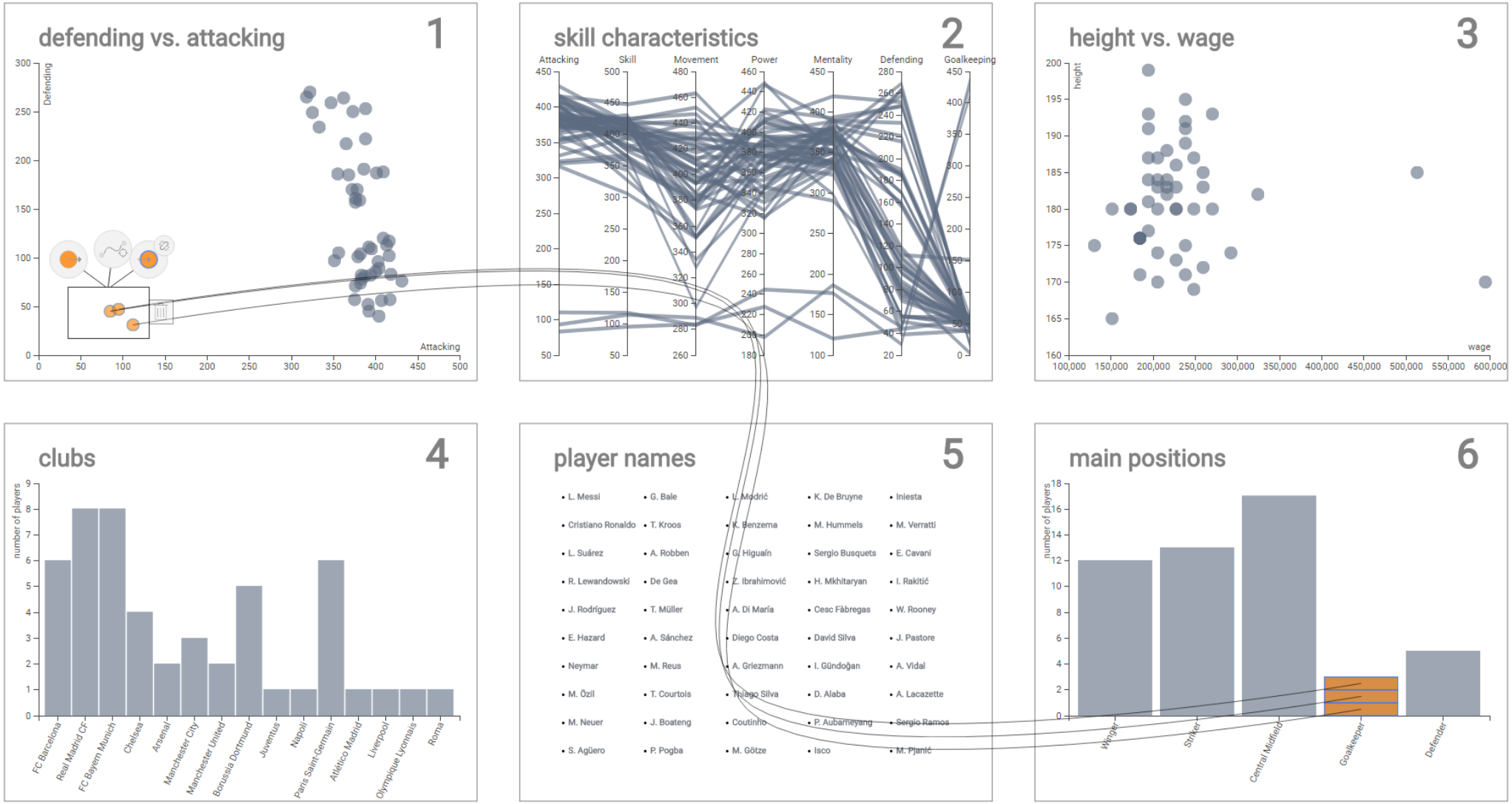
- *"had a bit of a learning curve"*, but *"it was easy to learn" and "very fun"*
- the brush menus were *"nicely done"* and "*very helpful"*
- *they were able to "so easily connect this many views*
- *"I really like the many possibilities cause every person is gonna try differently"*
- *"I could learn about the players [...] and was able to search for answers to the questions I had"*

Limitations (mentioned in the paper)

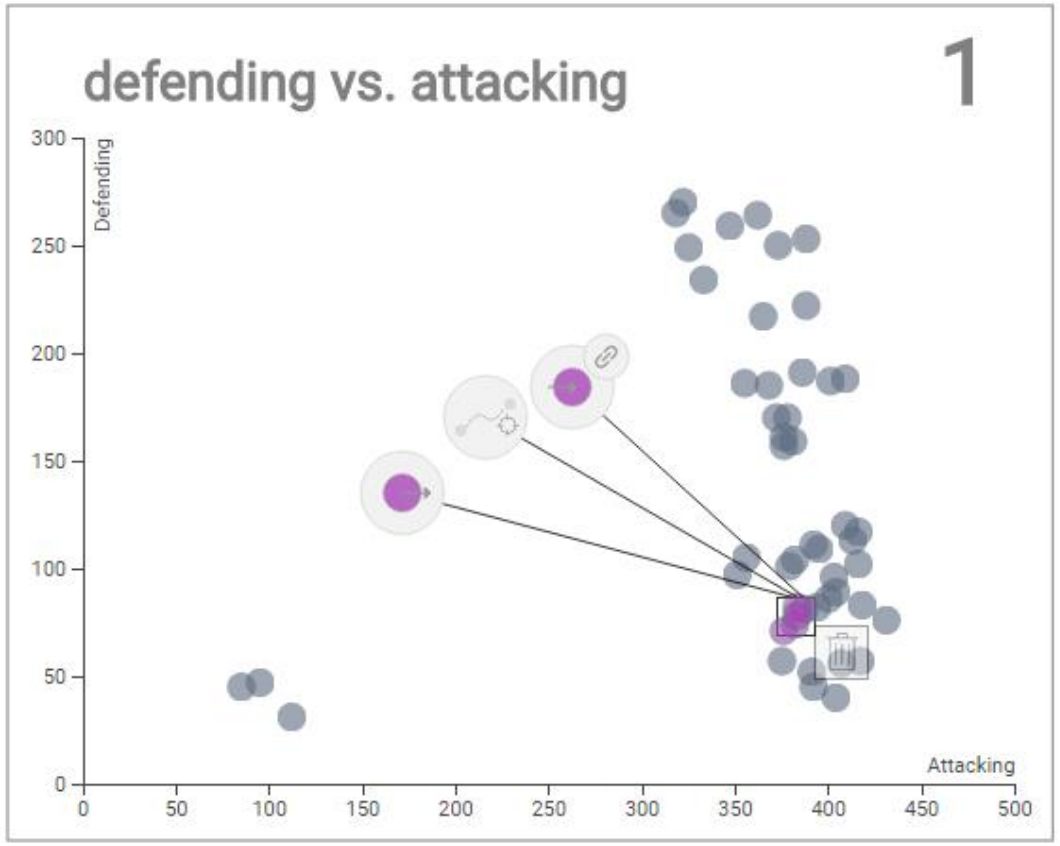
- Scalability
  - Explicit links (link bundling, routing)
  - More features -> change of UI
  - Mobile devices
- More configurable attributes needed (?)
- Ordering
- Conflict resolution
- Collaborative interfaces

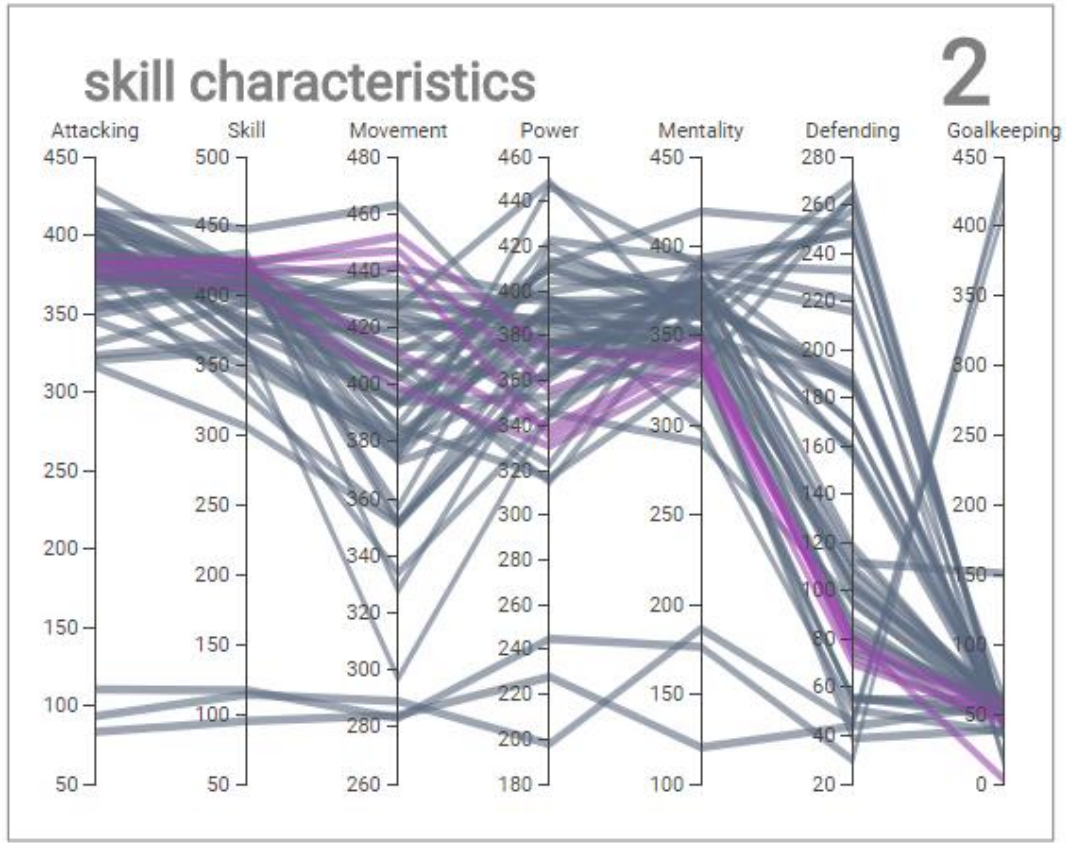
Critique (screen-dependent)

Critique (intractable links)

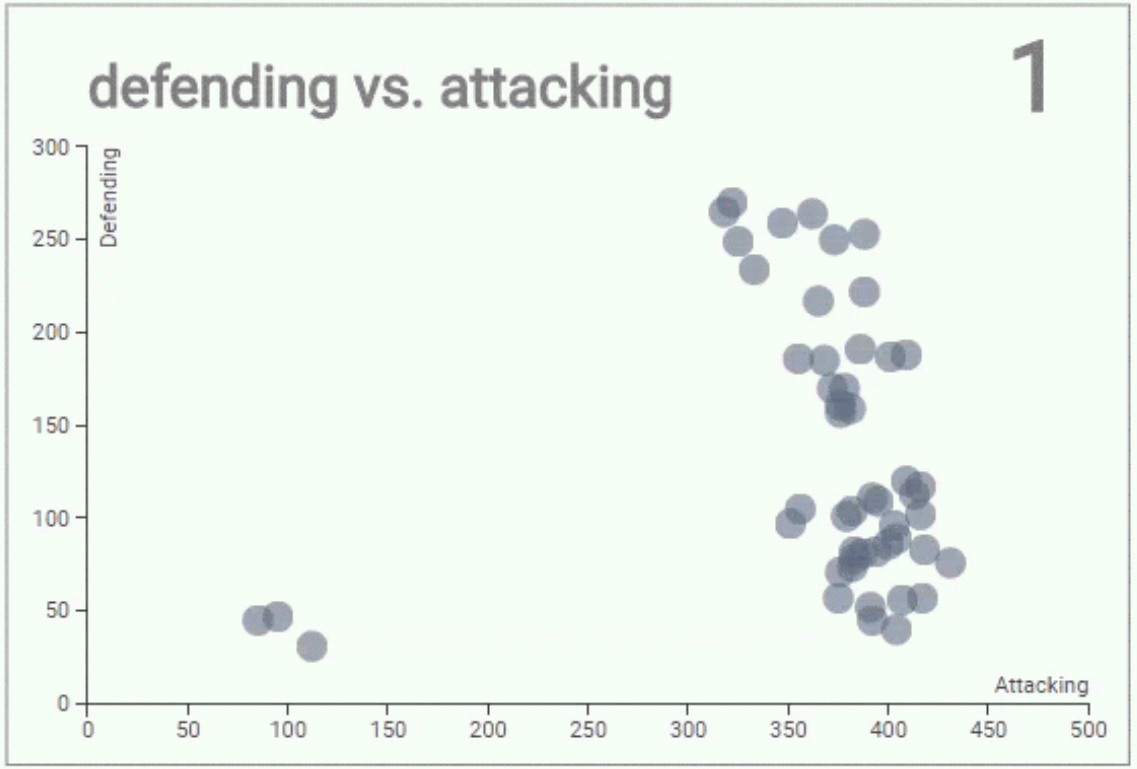


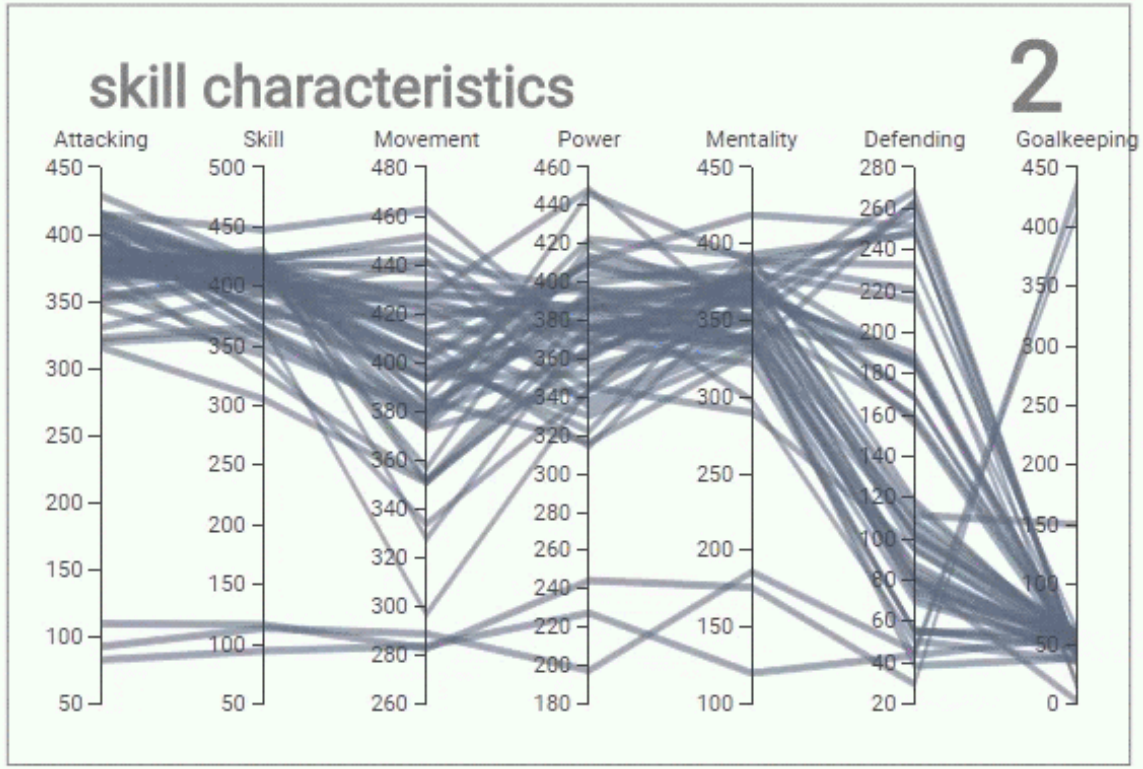
Critique (hard to choose individual points)



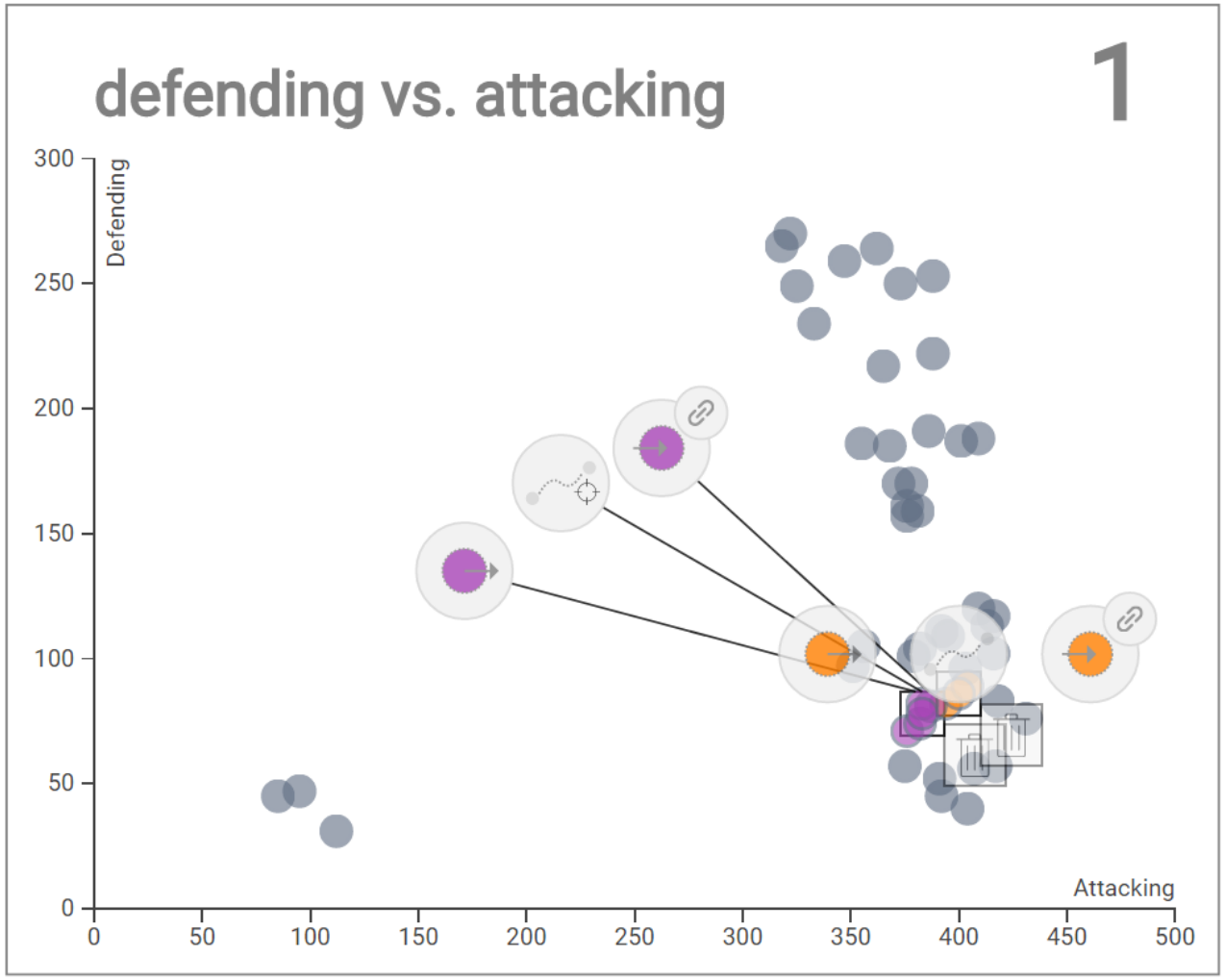


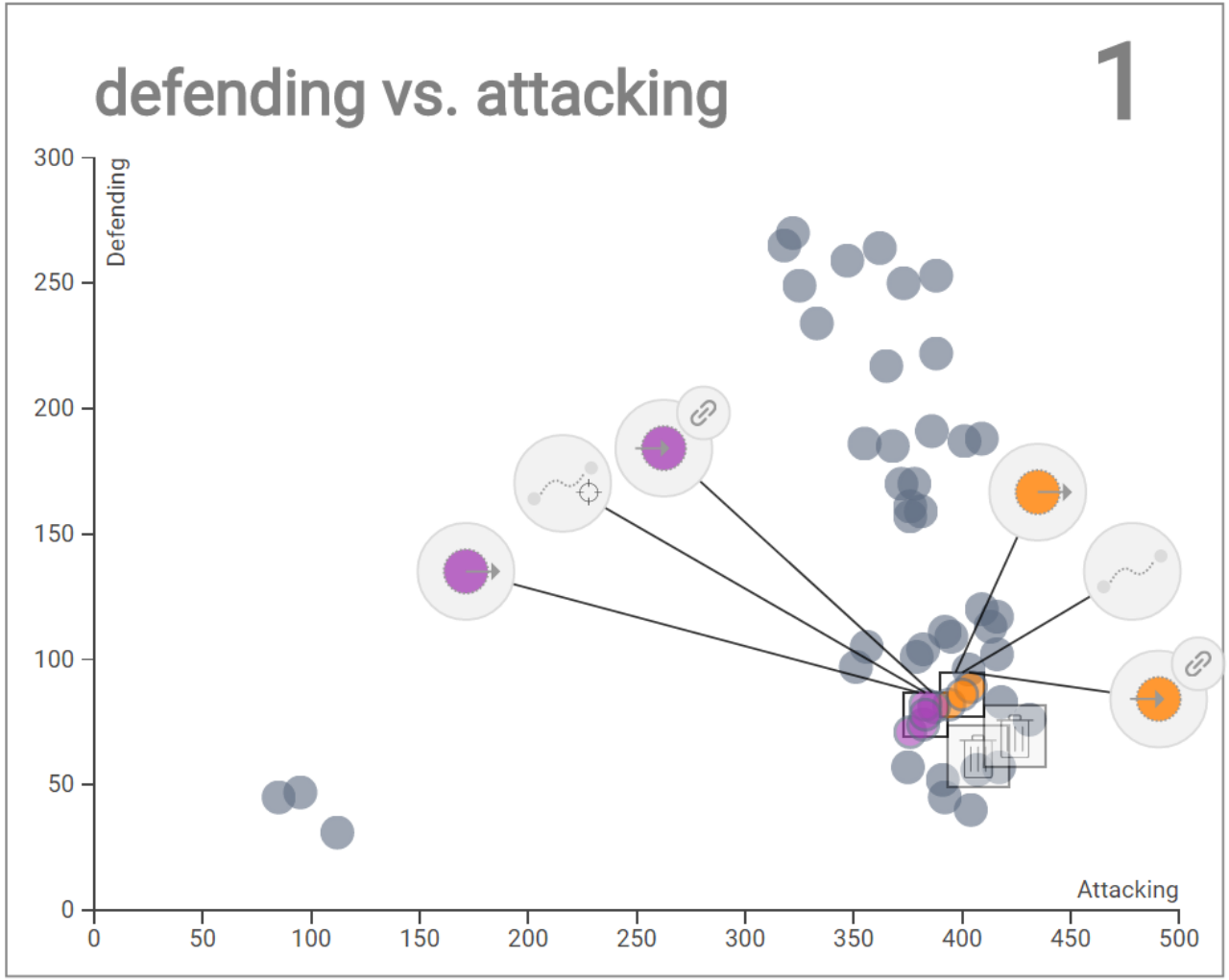
Critique (unnatural behaviour)





Critique (lacking UI)





Critique (summarized)

- Very screen-dependent
- Links can be virtually intractable
- Hard to choose individual points
- Unnatural behaviour for some views
- Lacking in UI elements
  - Zoom-in, zoom-out
  - Undo, redo
  - Overlapping layers

- Involves *personal agency*
- Clean breakdown
  - Source
  - Link
  - Target
- Immediate visual feedback
- Allows more complicated analysis
- Flexibility at design choices

Summary

- Includes extensive survey of existing brushing and linking papers.
- Deconstructed brushing and linking into three components:
  - Source
  - Link
  - Target
- Introduced MyBrush – a tool for flexible brushing and linking.
- Conducted a qualitative study and received positive feedback.
- Minor UI problems, scalability is the main issue.

Links

Demo:

- https://philippkoytek.github.io/mybrush/

Paper:

- http://innovis.cpsc.ucalgary.ca/supplemental/MyBrush/2018_VIS_mybrush.pdf

Source code:

- https://github.com/philippkoytek/mybrush

Thank you!
Questions?