

# A Review of *Outlier-Preserving Focus+Context Visualization in Parallel Coordinates* by Novotný and Hauser

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Bibliographic Database Information:

Label is **Novotny2006**.

Category is **Information Visualization**.

## General Idea

- Use of parallel coordinates difficult with very large datasets.
- Parallel coordinates and star coordinates are effective but expensive in terms of screen space.
- User of parallel coordinates limited to a few thousand data items per view.
- Authors present idea to separately handle outliers.
- Enable scalable visualization of really large datasets.
- 2D bin map.
  - Represents line distribution between 2 adjacent axes in “frequency-based” form.
  - Used to identify isolated bins that do not align with major trends in the dataspace.
  - Visualization of outliers separate for different treatment.
  - Outliers are preserved.
  - Cluster remaining bins to extract trends.
- Sophisticated scheme to decide when to go back to original data and when to use bin maps only.

## 2D Binning for Parallel Coordinates

- Applied to 2D visualization space.
- 2D histogram of distribution of all line segments between the two axes.
- Lower memory use.
- Scalable approach.
- Some basic interactions in Parallel Coordinates.
  - Inverting axis orientation.
  - Adjusting mapping function so that it zooms to certain sub-interval.
  - Bin data after mapping function.

## Outlier Detection

- Outlier separation and clustering
- Outlier represented in focus + context.
- Outliers detected with low-pass filter.
- Isolation filter and median filter.
- Bins below a certain threshold marked.
- 2 reasons to include
  - They sometimes influence decisions (e.g. network security administrators).
  - Without them the quality of the representation is decreased.

## Implementation Notes

- Executed on large datasets (largest dataset contained 3 million records in 16 dimensions).
- Interactive frame rates
- Rendered to a texture.
- Binning is the most costly process.

## References

- [1] M. Novotný and H. Hauser, “Outlier-Preserving Focus+Context Visualization in Parallel Coordinates,” *IEEE Transactions on Visualization and Computer Graphics*, vol. 12, no. 5, Sep. 2006, pp. 893–900.