R2S2: a Hybrid Technique to Visualize Sport Ranking Evolution

Charles Perin and Frédéric Vernier

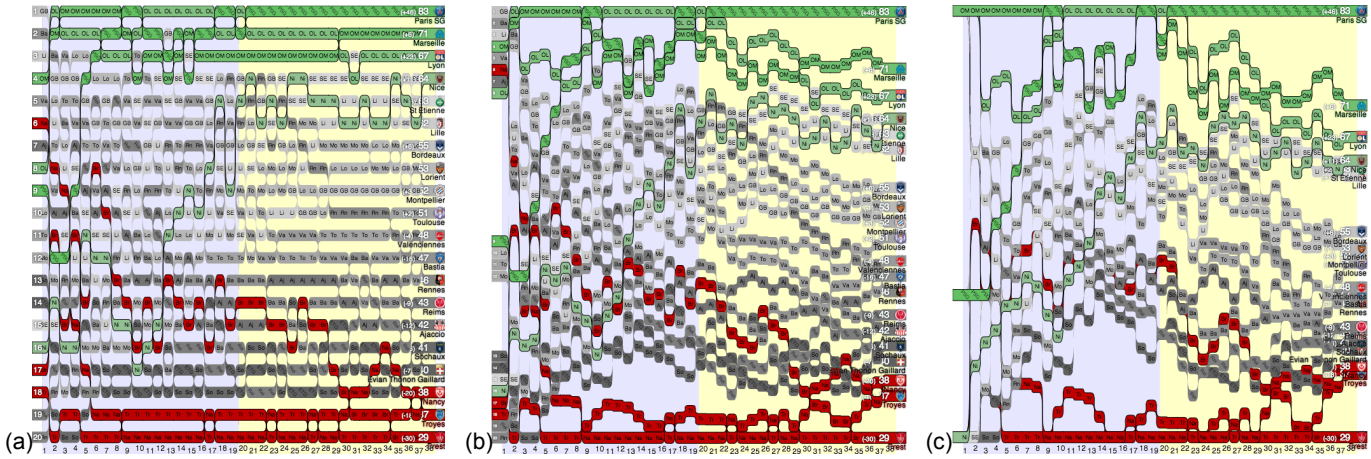

Fig. 1. From (a) Rank Chart to (c) Slope Graph using (b) the hybrid R2S2 as an intermediate step, with less overlapping than using a Slope Graph while showing the major gaps, which is not the case for the Rank Chart.

Abstract— This article presents *R2S2*, a hybrid visualization technique as an intermediate step between Rank Chart and Slope Graph to better understand and analyze team evolutions during soccer championships. Currently used rank tables for soccer are relative (ranked-based) and do not convey the absolute difference between teams. R2S2 provides a way to visualize these differences using the Slope Graph technique (value-based). By interactively setting the parameters of R2S2, we make the distance between teams appear, minimizing the overlaps caused by the Slope Graph technique.

Index Terms—Sport, Ranking, Rank Chart, Slope Graph, Time Series, Hybrid Visualization.

1 Introduction

Sport visualization is a broad domain since there are many different sports with different rules and practices. However, ranking teams along time is a common ground for all team sports we are aware of. This paper proposes *R2S2* (for Rank Chart To Slope Graph) to provide a way to clearly visualize the temporal evolution of ranking in sport competitions by revealing magnitude of gaps between teams and minimizing overlaps. Our goal is to help sport fans to follow their favorite team (players ranking is similar) while keeping an eye on the opponents. This work focuses on a closed group of teams with no element entering or leaving the ranking during the considered time span.

2 Related Work

As our proposition is a hybrid visualization between Rank Charts and Slope Graphs [3, 5] we first review existing work of these two techniques before discussing the poor ranking tables currently used to convey ranking in sport.

Slope Graphs (*SG*): Edward Tufte [5] defines *SG* as "Slope Graphs compare changes over time for a list of nouns located on an ordinal or interval scale". This definition emphasis the slope as the visual cue to convey important information. However, many empty areas appear in *SG* even if log scales can be used to reduce this unwanted effect and more problematic, elements may overlap.

Rank Charts (*RC*): *RC* are a variant of *SG*, replacing the proportional layouts of elements with a more compact ordinal one. It produces denser and overlapping-free visualizations but also hides the real gap between elements. As in sport visualization the ranking may be the ultimate goal of every team, such simplification makes sense. Nevertheless, to understand the temporal evolution of ranking it is important to be aware of underlying gaps between teams.

Ranking Tables: Unfortunately, sport fans cannot rely on *SG* or *RC* to picture their favorite sport. The most common artefact to convey rankings in sport is a Ranking Table. As the principal media to get such information (shifted from newspaper to website) it is often possible to retrieve the Ranking Table at a given time, but difficult to picture the temporal evolution over the season.

3 The R2S2 System

To describe our system (on-line at `http://vernier.frederic.free.fr/Infovis/R2S2/`) we follow visualization pipeline from data to final view. We first describe the data and its processing, then the hybrid layout of the elements along a continuum between *RC* and *SG*. To end the first way along the pipeline we introduce the top-level elements: colors, background and label positioning. We finally present the interactions in the reverse order along the pipeline to close the loop: the game inspector, team highlighter and the slider to smoothly transform the *RC* into *SG* and vice versa.

3.1 Data

R2S2 builds the rank table by parsing a set of games. It computes the number of points of every team according to the rules of the given sport (*i. e.,* 3 points for a win for soccer). The ranking is computed

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using rules to distinguish the ties. Such computation is incrementally repeated at every time/day of competition, keeping a link from the ranked teams to the original games played (*e. g.,* with score, location).

3.2 Spatial Layout

R2S2 embeds both *RC* (Figure 1(a)) and *SG* (Figure 1(c)) layouts. As illustrated in Figure 1, using a *RC* there is no overlap but no gaps between teams either, the y scale being linear, from $rank_{min}$ to $rank_{max}$. Using this technique the ranking is easy to read but the visualization does not convey at all the magnitude of the gaps between teams. Using a *SG*, the y scale is linear too, but from p_{min} to p_{max}, p being the number of points for a team at a day. Mapping the team positions to their absolute number of points instead of their ranking makes distances between teams increase. However, using this technique the visualization suffers from too much occlusion.

R2S2 features a smooth interactive transition to reach the best tradeoff between the two layouts. Figure 1(b) shows how using the interactive hybrid layout, we *maximize* the distance between teams (*SG* feature) and visually *minimize* the overlap (*RC* feature). For example, in (a) no teams overlap. In (c) teams overlap because in soccer, the number of points of teams is often equal or close. But, we figure out that there is a huge gap between PSG (first), a first group of challengers fighting for European slots, a second group of challengers fighting to avoid to be demoted, and finally one isolated team at the last position. We also observe that PSG strengthened his first position from the half of the season to the end. In (b) hybrid R2S2 removes most of the overlaps and we still observe these three groups and the trends of teams.

3.3 View

Unlike the original *SG*, R2S2 focuses more on the positions of the elements than the slopes between them. We stretch the space devoted to element and slopes to leave enough space to repeat two to three letters describing the team. The *S* shape of the slope links is similar to [1]. The view of R2S2 is also the right place to introduce several visual cues to show sport related information like the half season break (blue/yellow backgrounds) and promoted/demoted teams (in green and red, respectively). We also map the final ranking on a shade of gray and numbers are printed in a standard way on the column on the right.

3.4 Inspector

Shneiderman's mantra of InfoVis ends with "details-on-demand" and we believe that the complicated computation of points and rankings deserves a way to relate the intermediate rankings to the related games (with score, location and other important information for fans who watched it). However a game is not related to a single team's ranking at a given date but to two of them. We then designed a Speech-Balloon like inspector, linking the pointed team with the corresponding game to the opponent in the graph. It is then easy to evaluate the difference of ranking of the two opponents (Figure 2) as well as comparing the historical context (team going up versus teams going down). Finally, to help with the historical context, the pointed team pointed is highlighted with a 3 pixels wide black border. Figure 2 shows the team Lyon playing against 3 teams after getting down from the leader position to the 4th and finally finishing 3rd.

4 Future Work

R2S2 is a small piece of a bigger picture as it shows only one league during one season. R2S2 visualizations could be tiled horizontally to show more seasons, and vertically to show the minor leagues and interactions between leagues when teams are promoted or demoted. The worst teams (in red) of League n during season t are moved to league $n+1$ in season $t+1$, (and best teams go the other way) and linked, links between tiles showing this information. Figure 3 illustrates this promising perspective. In this toy example, the black team is a regular top-team of the Ligue 1, winning two times in a row the championship (2012, 2013). The lightest red team is demoted the first year and promoted the next year. The darkest green one has the typical behavior of a team being promoted and demoted the year after.

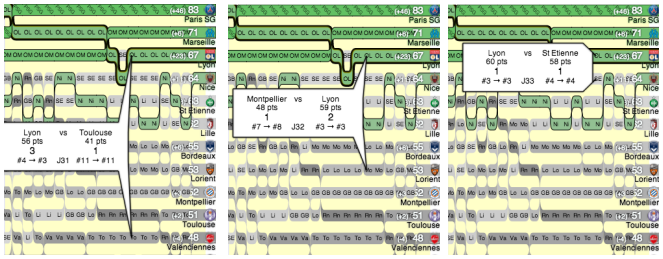

Fig. 2. Game Inspector on team Olympique Lyonnais (OL) playing against 3 different teams in a row with a decreasing gap of ranking.

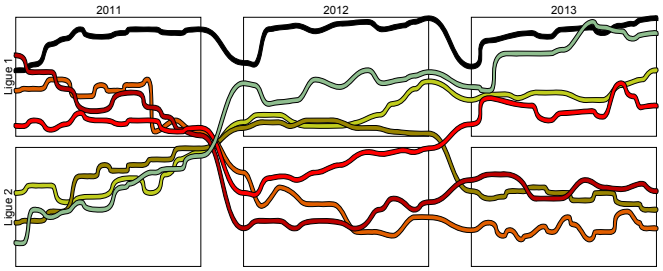

Fig. 3. Linking H2R2 graphs of successive seasons and leagues at different levels to analyze team evolutions during longer time spans.

European cups for the leaders of the top league would be more challenging to visualize since these competitions are often a complex mix between a league system and a direct elimination tournament. However, we believe that using dedicated linked visualizations such as for NodeTrix [2] or—more recent and focused on soccer—SoccerStories [4] is a promising way of representing different championships and their interaction through international competitions.

We found the task of following a team may still be difficult using the current version of R2S2. Adding some selection and brushing to highlight some teams could enhance the readability of the visualization. Finally, customizing the color scales could improve data exploration.

5 Conclusion

Visualizing time series is a well known activity in the InfoVis community but applying this knowledge to sport ranking tables is challenging. Although data are sometimes cleaner than "real life" datasets due to human-established rules built to be easily understood by the fans, humans created a set complex rules, landmarks, strategies and terms to talk about their favorite sport long time after the games are over. In this exploratory work, we propose a way to visualize the temporal dimension of soccer championships efficiently, using a hybrid technique embedding both Rank Chart and Slope Graph. On one hand, *RC* do not show the magnitude of changes and gaps between teams. On the other hand, *SG* suffer from empty areas and involve overlap. We propose R2S2, a hybrid technique to visualize sport ranking evolution. It fills the gap between *RC* and *SG* by interactively finding the best tradeoff between the two techniques. Showing the magnitude of gaps between teams while minimizing overlap enhance the effectiveness of the visualization. We also highlight linked charts as a promising direction to prospect and identify several areas for improvement.

References

[1] Fortune500. last access: Sep. 2013. http://in.somniac.me/2010/01/fortune-500-visualization/.

[2] N. Henry, J.-D. Fekete, and M. J. McGuffin. Nodetrix: a hybrid visualization of social networks. *IEEE TVCG*, 13(6):1302–1309, Nov. 2007.

[3] C. Park. Blog post about slopegraphs. last access: Sep. 2013. http://charliepark.org/slopegraphs/.

[4] C. Perin, R. Vuillemot, and J.-D. Fekete. SoccerStories: A Kick-off for Visual Soccer Analysis. *IEEE TVCG*, Oct. 2013.

[5] E. Tufte. Open forum on slopegraphs. last access: Sep. 2013. http://www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=0003nk.