Visual Soccer Analytics:
Understanding the Characteristics of Collective Team Movement Based on Feature-Driven Analysis and Abstraction

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CPSC 547 Presentation
Yann Dubois
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Single Soccer Game

- Mainly geometrical data
- Data every 100 milliseconds
- Manually annotated events (fouls, goals …)
Overview

https://www.janetzko.eu/project/soccer/

Data

https://www.janetzko.eu/project/soccer/
The need of a software

• Increasing demand from clubs

• Now we can

• Video analyst: 3 working days per opponent team

• Current support from system is limited

• Visualisation to not get overwhelmed by data
Improve previous work

- No (good) automatic identification of situations
  - Need expert verifications
  - Doesn’t support domain knowledge
  - 1: classification method but no explanation
Why

Tasks

• Support experts in exploring characteristics of situations

• Incorporation of meaningful features describing situation

• Visualisation with interactive re-ranking of features and search for similar situations
Workflow

Figure 1. Previous workflow
Workflow

- **Intervals**: General time interval
- **Move**: Ball possession
- **Event**: Foul / goal / …
Interval selection:

- Manual or automatic
- Shows data of interest
- Main reason of use
Binning:

- Smooth out noise $\Rightarrow$ better classification
- Less Data
- 100 milliseconds $\Rightarrow$ 2 seconds time frame
Classification model:

- Compute features of binned data
- 5 classification algorithms:
  - Logistic model trees, Logistic base, Functional trees, decision stump and Support vector machines
- Training set: 33% of intervals
- Returns classified set of 2s intervals
Game moves and Feature ranking:

- Derive Game moves from interesting 2s intervals
- Extract interpretable features of each moves
- Relevant if unusual values
### Table 1. Meaningful features

<table>
<thead>
<tr>
<th>Glyph</th>
<th>Description</th>
<th>Expert Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Glyph" /></td>
<td>Covered distance of the ball</td>
<td>Build up play or win of the ball</td>
</tr>
<tr>
<td><img src="image2" alt="Glyph" /></td>
<td>Number of passes</td>
<td>Team or solo action</td>
</tr>
<tr>
<td><img src="image3" alt="Glyph" /></td>
<td>Number of players with touch of the ball</td>
<td>Team or solo action</td>
</tr>
<tr>
<td><img src="image4" alt="Glyph" /></td>
<td>Straightness of the ball</td>
<td>Straight direct or on the scout play</td>
</tr>
<tr>
<td><img src="image5" alt="Glyph" /></td>
<td>Distance of passes</td>
<td>Short passing game or long passes</td>
</tr>
<tr>
<td><img src="image6" alt="Glyph" /></td>
<td>Speed of move</td>
<td>Fast counterattack or careful build up play</td>
</tr>
<tr>
<td><img src="image7" alt="Glyph" /></td>
<td>Number of overcome players</td>
<td>Combination play or counterattack</td>
</tr>
</tbody>
</table>
Ranking change:

• User can reranking features

Similarity search:

• Search similar moves based on events and ranking features
Visual design

**Time:**
- Navigation and Show events

**Move:**
- Show moves duration and main feature

*Figure 4. and 5.*
Move characteristic:

- Shows ranked features
- Connector to see better
- Drag and drop re-ranking

Figure 6.
How
Overview

Figure 1.
Evaluation

Data

• 66 professional soccer matches

• Manually annotated events (foul, pass, cross…)

• Temporal resolution: 100 milliseconds
Expert evaluation

• 2 experts: involved in pre-study and expert study
• Coach working at Bayern Munich
• Official referee
• “Ground truth” by additional expert: 35 situations
## Results

Table 2. Evaluations results

<table>
<thead>
<tr>
<th>Classification</th>
<th>Precision</th>
<th>Recall</th>
<th>F-Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Classification</td>
<td>61.53% (8 of 13)</td>
<td>22.85% (8 of 35)</td>
<td>33%</td>
</tr>
<tr>
<td>Second Classification (First round of user feedback)</td>
<td>58.82% (20 of 34)</td>
<td>57.14% (20 of 35)</td>
<td>57%</td>
</tr>
<tr>
<td>Third Classification (Second round of user feedback)</td>
<td>55.76% (29 of 52)</td>
<td>82.85% (29 of 35)</td>
<td>66%</td>
</tr>
</tbody>
</table>
Evaluation

Results

• Experts liked reducing complexity with meaningful features

• Agreed on features

• Proposed to add information on outcome

• Really liked similarity search (and re-ranking)

• Think that video analyst would use it
+ strengths

• Answer well their task

• Method that you can tweak (reranking) but default => not overwhelming

• Very detailed

• Features seem meaningful
- weakness

- No video for double check
- Unnecessarily long
- Need to read 1st paper to understand some features
- I would use air / ground and not straightness of ball
- **weekness**

- Validation by 2 “experts” but no video analyst
- 66 games dataset in validation but only use 1
- Very important to have a global view of a tactic not precise movement every 2 seconds
- Only single game
- Do not critique their paper
Thank you!