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

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

How

Table 1. Meaningful features

<table>
<thead>
<tr>
<th>Glyph</th>
<th>Description</th>
<th>Expert Interpretation</th>
</tr>
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<tbody>
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Why
• No (good) automatic identification of situations
• Need expert verifications
• Doesn't support domain knowledge
• 1: classification method but no explanation

How

Improve previous work

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

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

Interval selection:

• Manual or automatic
• Shows data of interest
• Main reason of use

Binning:

• Smooth out noise => better classification
• Less Data
• 100 milliseconds -> 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

Move characteristic:

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

Visual design

• Navigation and Show events

Overview

Figure 1. Previous workflow

Figure 3. New workflow

Figure 4. and 5.

Figure 6.
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

Evaluation
Results
Table 2. Evaluations results

<table>
<thead>
<tr>
<th></th>
<th>Precision</th>
<th>Recall</th>
<th>F-Measure</th>
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</thead>
<tbody>
<tr>
<td>First Classification</td>
<td>61.23% (8 of 13)</td>
<td>22.85% (8 of 35)</td>
<td>33%</td>
</tr>
<tr>
<td>Second Classification</td>
<td>58.82% (20 of 34)</td>
<td>57.14% (20 of 35)</td>
<td>57%</td>
</tr>
<tr>
<td>Third Classification</td>
<td>55.76% (29 of 52)</td>
<td>82.85% (29 of 35)</td>
<td>66%</td>
</tr>
</tbody>
</table>

Discussion
+ strengths
• 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

- 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

Discussion
+ strengths
• Answer well their task
• Method that you can tweak (reranking) but default => not overwhelming
• Very detailed
• Features seem meaningful

- weakness
• 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!