Visual Soccer Analytics:

Understanding the Characteristics of Collective Team Movement Based on Feature-Driven Analysis and Abstraction

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ISPRS International Journal of Geo-Information, Special Issue Advances in Spatio-Temporal Data Analysis and Mining, 2015

CPSC 547 Presentation
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What: Data

Single Soccer Game

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

Overview

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

Why

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

Why

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

How

Workflow

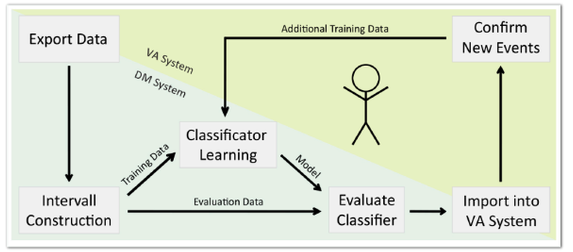


Figure 1. Previous workflow

How

Workflow

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

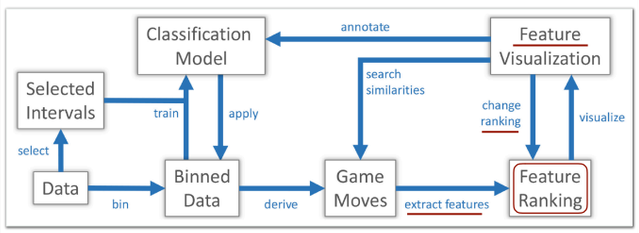
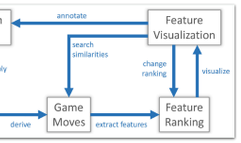


Figure 3. New workflow

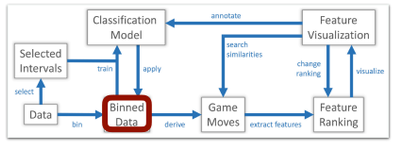
How
Workflow



Interval selection:

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

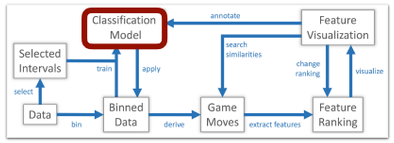
How
Workflow



Binning:

- Smooth out noise => better classification
- Less Data
- 100 milliseconds -> 2 seconds time frame

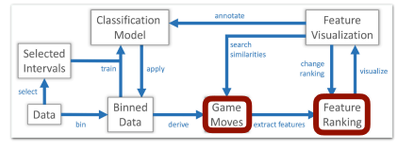
How
Workflow



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

How
Workflow



Game moves and Feature ranking:

- Derive Game moves from interesting 2s intervals
- Extract interpretable features of each moves
- Relevant if unusual values

How
Workflow

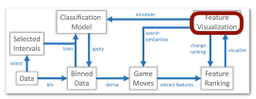
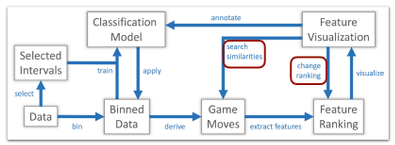


Table 1. Meaningful features

Glyph	Description	Expert Interpretation
	Covered distance of the ball	Build up play or win of the ball
	Number of passes	Team or solo action
	Number of players with touch of the ball	Team or solo action
	Straightness of the ball	Straight direct or on the scout play
	Distance of passes	Short passing game or long passes
	Speed of move	Fast counterattack or careful build up play
	Number of overcome players	Combination play or counterattack

How
Workflow



Ranking change:

- User can reranking features

Similarity search:

- Search similar moves based on events and ranking features

How
Visual design

Time:

- Navigation and Show events

Move:

- Show moves duration and main feature

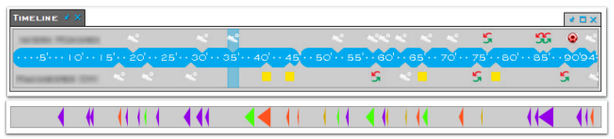


Figure 4. and **5.**

How
Visual design

Move characteristic:

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

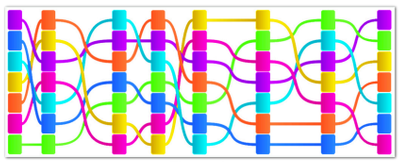


Figure 6.

How

Overview

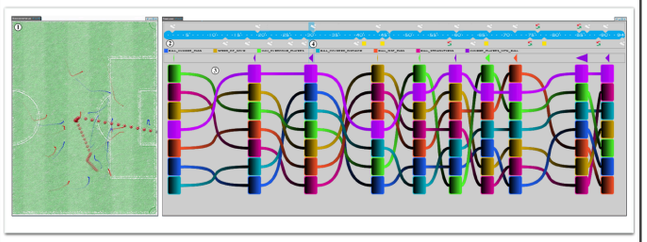


Figure 1.

Evaluation

Data

- 66 professional soccer matches
- Manually annotated events (foul, pass, cross…)
- Temporal resolution: 100 milliseconds

Evaluation

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

	Precision	Recall	F-Measure
First Classification	61.53% (8 of 13)	22.85% (8 of 35)	33%
Second Classification (First round of user feedback)	58.82% (20 of 34)	57.14% (20 of 35)	57%
Third Classification (Second round of user feedback)	55.76% (29 of 52)	82.85% (29 of 35)	66%

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

Discussion

+ strengths

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

Discussion

- weekness

- 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

- 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 !