

Move it or lose it: Exploring the relation of defensive disruptiveness and team success.

Kempe, Matthias & Goes, Floris ,

University of Groningen, University Medical Center Groningen, Center for Human Movement Sciences, The Netherlands

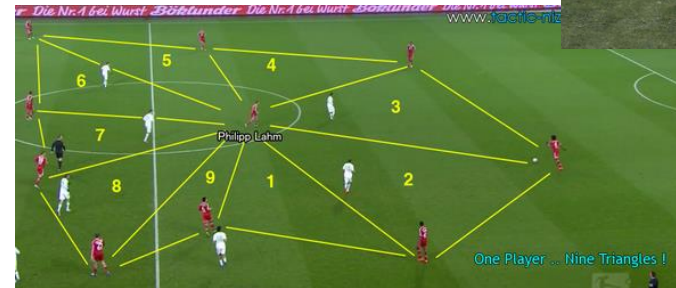
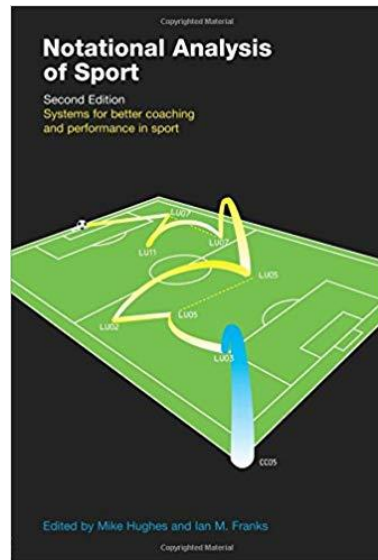


@kempe_matthias

Contact: m.kempe@umcg.nl

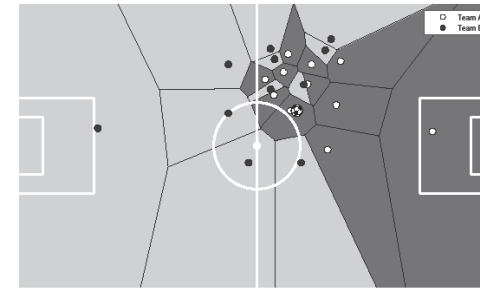
Starting Point: How to measure tactical performance?

State of the art = Notational Analysis

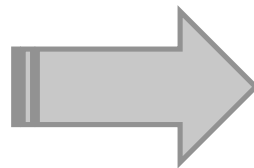
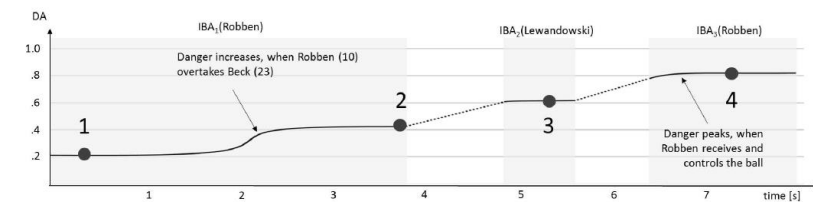


New Wave: Approaches using tracking data

Space control (Rein et al, 2017)



Dangerosity (Link et al, 2016)



All Goal related

The Groningen Approach- Soccer as a dynamic system?!

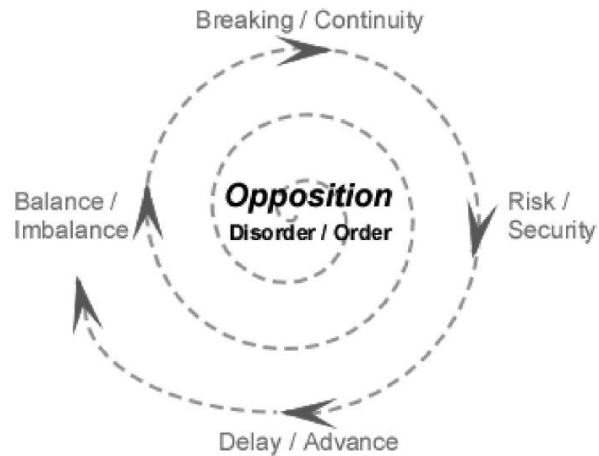


Figure 1. Dialectic aspects of game play brought about by the opposition (adapted from Gréhaigne & Godbout [2012]). Reproduced with permission from Dr Marie-Paule Poggi.



European Journal of Sport Science

Publication details, including instructions for authors and subscription information:
<http://www.tandfonline.com/loi/tejs20>

Length, width and centroid distance as measures of
teams tactical performance in youth football

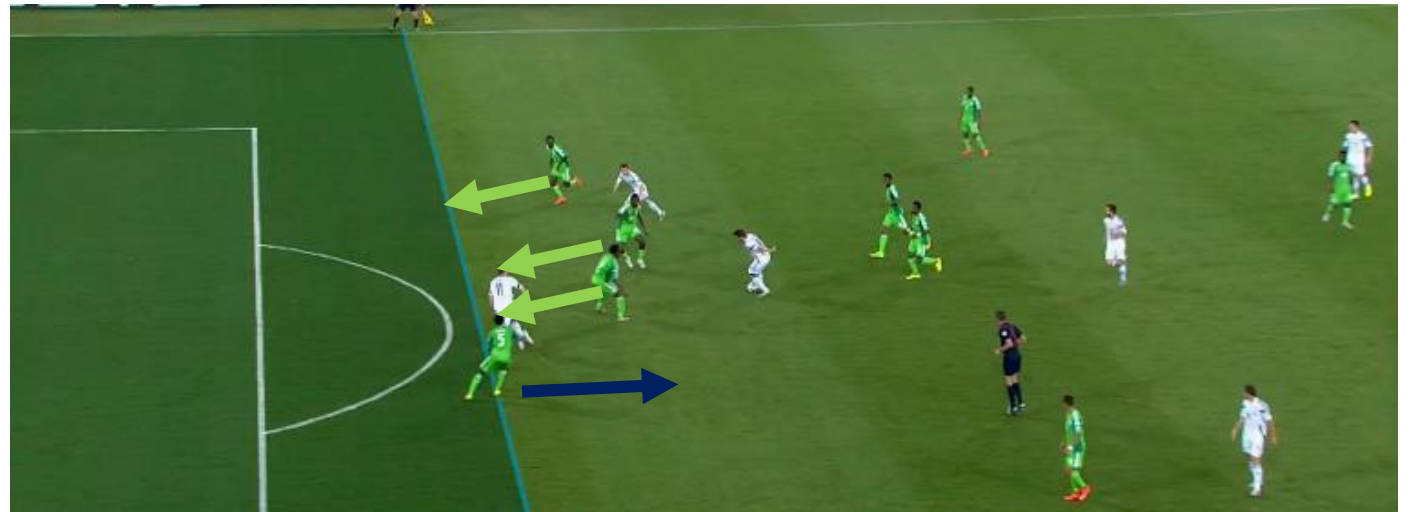
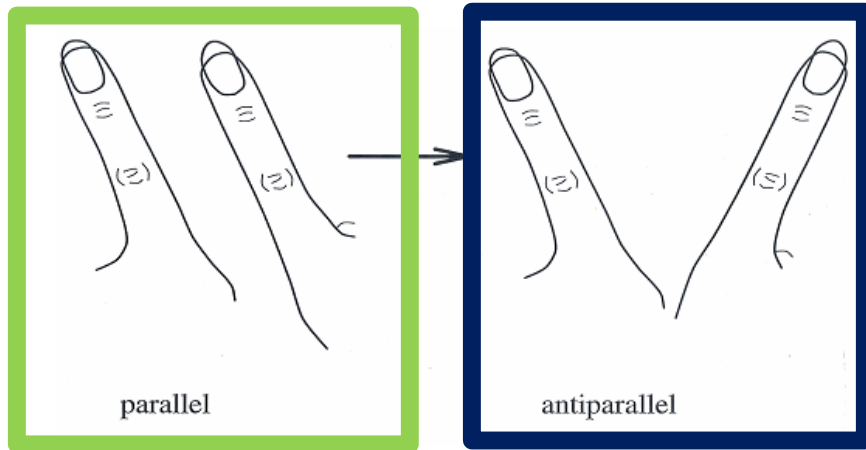
Hugo Folgado ^{a d}, Koen A. P. M. Lemmink ^{b c}, Wouter Frencken ^{b c} & Jaime Sampaio ^d

Variability of inter-team distances associated with match events in
elite-standard soccer

WOUTER FRENCKEN¹, HARJO DE POEL¹, CHRIS VISSCHER¹, & KOEN LEMMINK^{1,2}

¹UMCG, University of Groningen, Center for Human Movement Sciences, Groningen, Netherlands, and ²Hanze University of Applied Sciences, School of Sport Studies, Groningen, Netherlands

Creating Space = Dynamic System ?

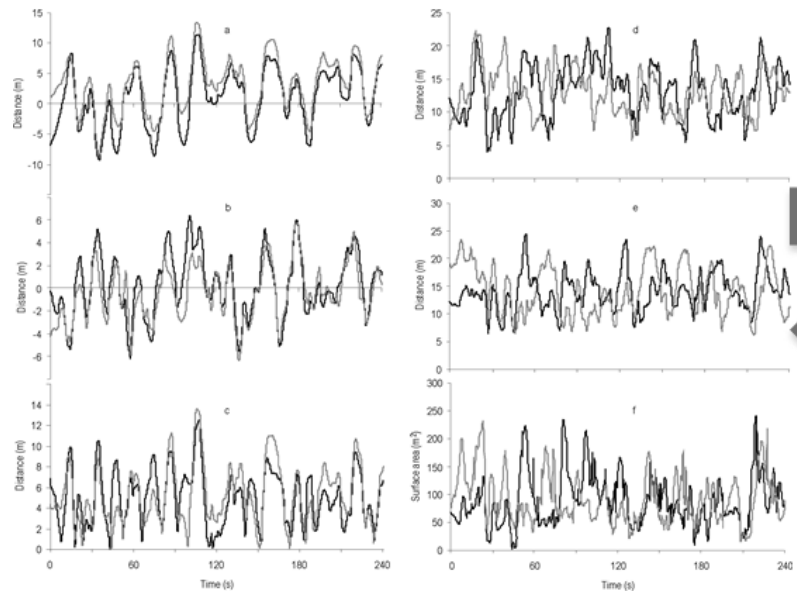


Variability of inter-team distances associated with match events in elite-standard soccer

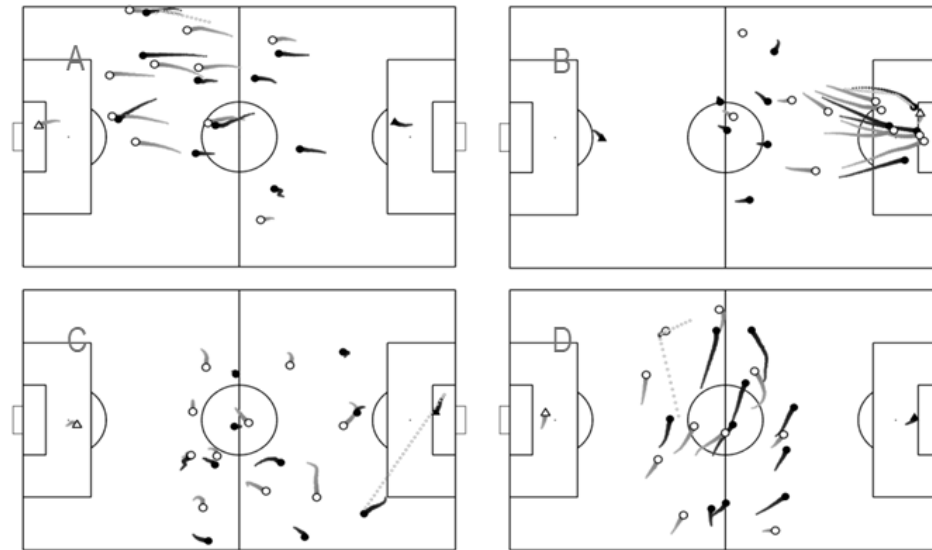
WOUTER FRENCKEN¹, HARJO DE POEL¹, CHRIS VISSCHER¹, & KOEN LEMMINK^{1,2}

¹UMCG, University of Groningen, Center for Human Movement Sciences, Groningen, Netherlands, and ²Hanze University of Applied Sciences, School of Sport Studies, Groningen, Netherlands

Variability



(Critical) events



New approach: Create moments of bad synchronization (disruption)

ORIGINAL ARTICLE

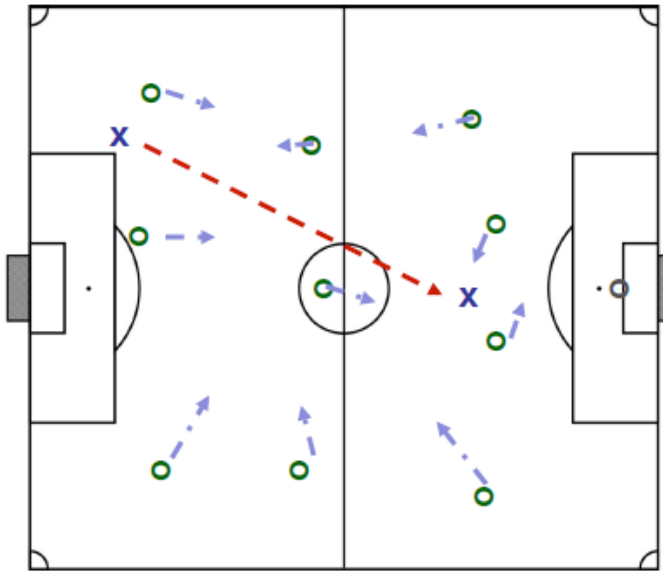
Not Every Pass Can Be an Assist: A Data-Driven Model to Measure Pass Effectiveness in Professional Soccer Matches

Floris R. Goes^{1,*}, Matthias Kempe¹, Laurentius A. Meerhoff² and Koen A.P.M. Lemmink¹

1. Idea : Player Movement ↑ = Disruption ↑
2. Idea : Change in Structure ↑ = Disruption ↑
3. Idea : Change in Subunits ↑ = Disruption ↑

1. Idea

(Indicted) Movement \rightarrow Disruption = Passing Performance



I-MOV

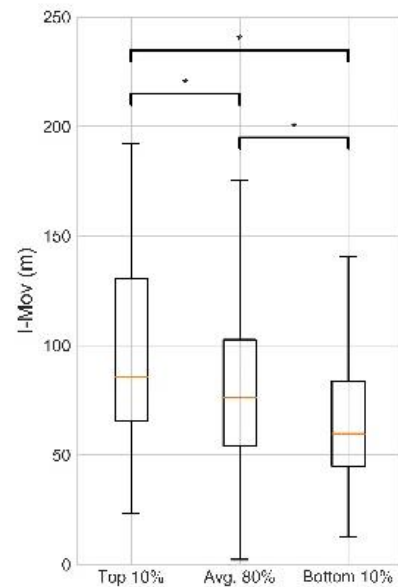
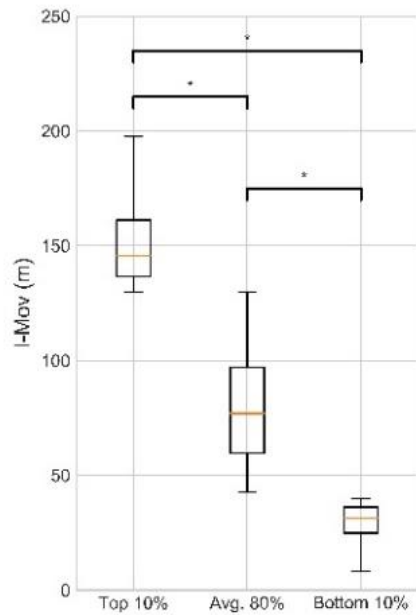
$$\text{I-MovX} = (|X_{t_0^1} - X_{t_0^1}| + \dots + |X_{t_0^n} - X_{t_0^n}|) / n$$

$$\text{I-MovY} = (|Y_{t_0^1} - Y_{t_0^1}| + \dots + |Y_{t_0^n} - Y_{t_0^n}|) / n$$

$$\text{I-Mov} = \text{I-MovX} + \text{I-MovY}$$

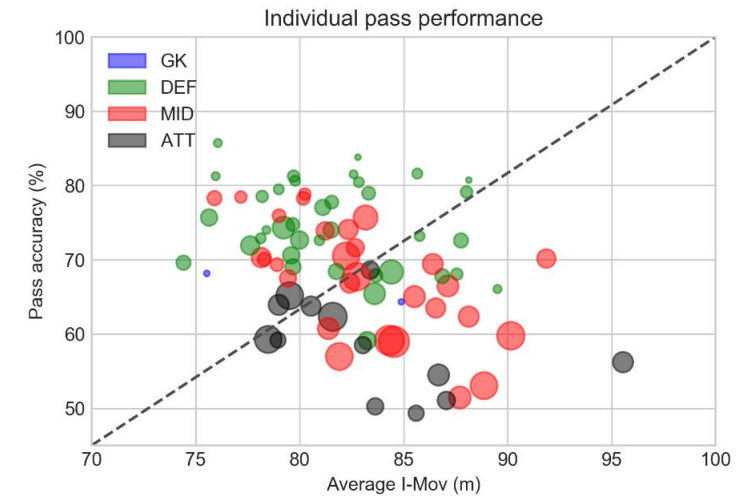
Validating I-Mov

Differentiate
 Passes & Players



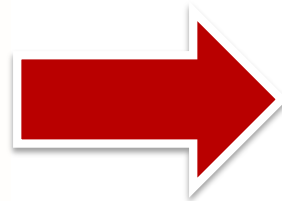
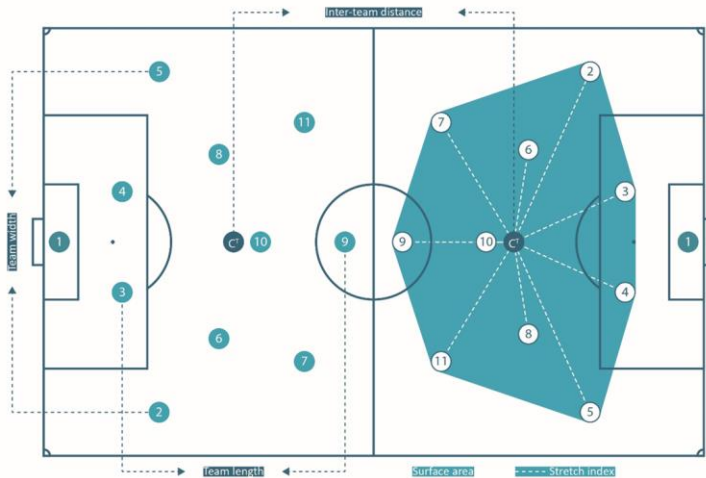
Connects to Player Performance

Conferences > 2018 IEEE 14th International ...
Smart Data Scouting in Professional Soccer: Evaluating Passing Performance Based on Position Tracking Data
 3 Author(s) Matthias Kempe ; Floris R. Goes ; Koen A. P. M. Lemmink View All Authors
 87 Full Text Views

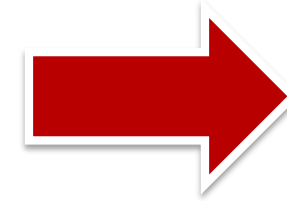


Complex Approach: Idea 2 & 3

Disruptiveness Variables



- C_X
- C_Y
- C_{XDEF}
- C_{YDEF}
- C_{XMID}
- C_{YMID}
- C_{XATT}
- C_{YATT}
- S_{area}
- S_F



PCA

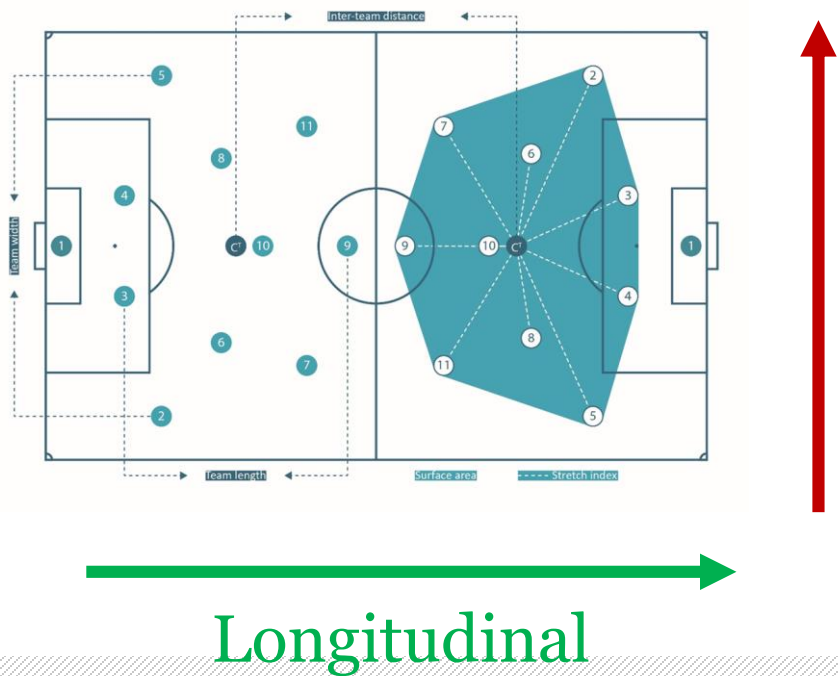
$$D-Def = |PC1| + |PC2| + |PC3|$$

Disruptiveness characteristics

- Centroids
- Surface areas
- Spread

Validating D-Def

$$D-Def = |PC1| + |PC2| + |PC3|$$

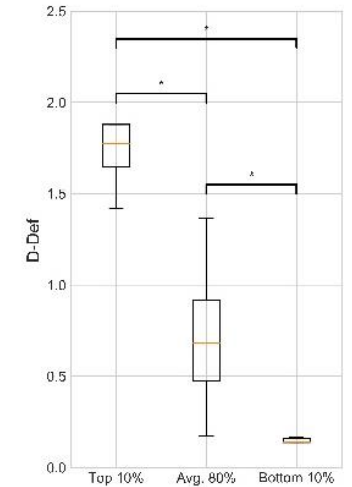
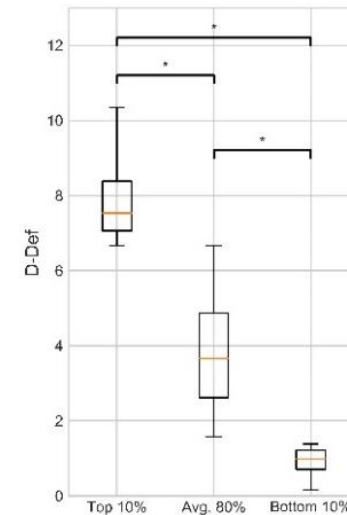


ORIGINAL ARTICLE

Not Every Pass Can Be an Assist: A Data-Driven Model to Measure Pass Effectiveness in Professional Soccer Matches

Floris R. Goes^{1,*}, Matthias Kempe¹, Laurentius A. Meerhoff², and Koen A.P.M. Lemmink¹

Differentiate Passes & Players



Issues with D-Def

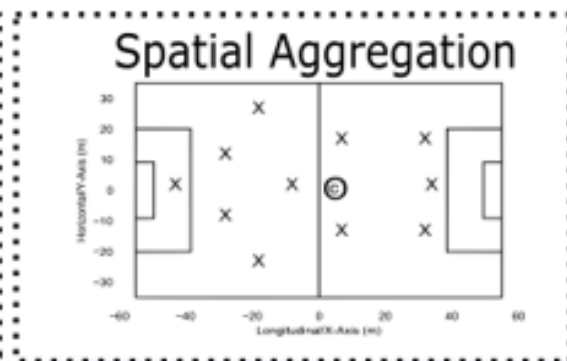
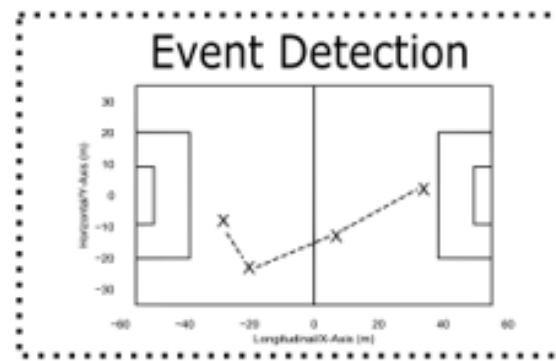
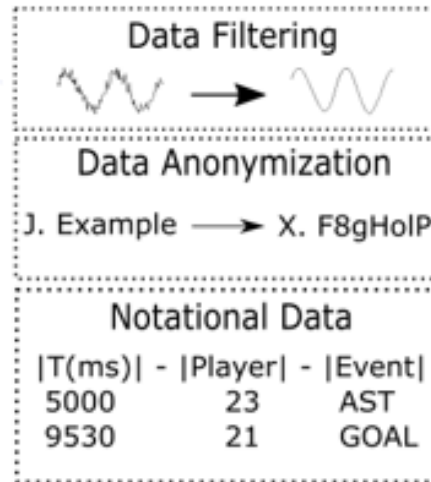
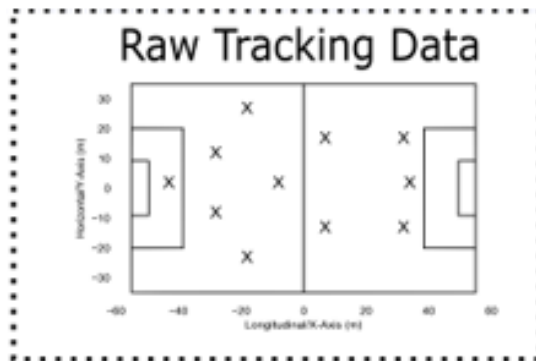
- › Use of arbitrary 3 second window
- › Use of starting formations for subunit calculation



New Study – fixing Issues + explore relation to team success

1. Issue: 3s window → normalize in change (m) per second
2. Issue: Arbitrary formations for subunit calculation
 - Spilt possession in attacking or defending
 - K-Means for 1.half of a game ($n_{\text{clusters}} = 3$) (Bialkowski et al, 2014)
 - Assign every player to one cluster for every timeframe of the game

Study design



→
Data Processing

Results

Table 1 - Descriptive statistics winning and losing teams (*: $p = .05$ **: $p < .05$, *: $p < .01$)**

	Wins (N = 89)	Losses (N = 89)	Mean Diff.	Effect Size (Cohen's d)
<i>Individual Movement (I-Mov)</i>				
I-Mov-X (Mean)	0.866m \pm 0.673m	0.515m \pm 0.675m	+68.1%	0.52***
I-Mov-Y (Mean)	0.772m \pm 0.600m	0.451m \pm 0.591m	+71.2%	0.54***
I-Mov (Mean)	1.638m \pm 1.268m	0.966m \pm 1.265m	+69.6%	0.53***
<i>Defensive Disruptiveness (D-Def)</i>				
PC1 (Mean)	0.018 \pm 0.015	0.013 \pm 0.022	+34.1%	0.24*
PC2 (Mean)	0.010 \pm 0.013	0.014 \pm 0.033	-23.6%	-0.13
PC3 (Mean)	-0.026 \pm 0.022	-0.021 \pm 0.022	-25.5%	-0.25*
D-Def (Mean)	0.474 \pm 0.048	0.484 \pm 0.072	-2.0%	-0.16

Results

- › 5-fold cross-validated logistic Regression

$$\text{Outcome} = -0.146 + 0.689 \text{ I-Mov}_{\text{Mean}} + 0.172 \text{ PC1}_{\text{Mean}} - 0.592 \text{ PC3}_{\text{Mean}}$$

- › predicts 69.4 % match outcomes correctly



Discussion

- › Solve the previous issues in our model
- › Reconsider the lateral component of D-Def
- › Spatial-temporal variables can predict match outcome
 - So far good predictors for match outcome were goals & shots on goal's (Lago-Penas et al., 2010)
 - Passing parameters were poor game by game predictors (Collet, 2013)

Conclusion

- › Key Performance Indicators build on spatial- temporal variables are good predictors for match outcome
- › Spatial- temporal variables have the opportunity to model team & individual interactions

Stop using:

- purely goal related KPI's
- Event data

Thanks to:



Floris Goes



Dr. Rens Meerhoff



Koen Lemmink



@kempe_matthias

Contact: m.kempe@umcg.nl

For comparison of D-Def vs other performance indicators

Wednesday 12:10 Session Inplay Prediction

“Predicting Match outcome in professional Dutch football using tactical performance metrics computed from position tracking data”



Floris Goes