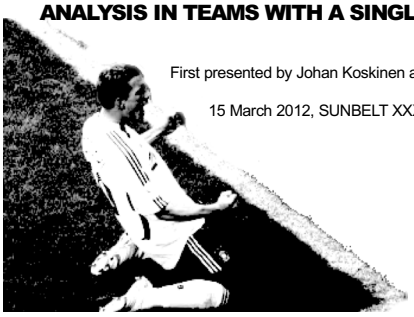
PASSING THE BALL AND TALKING TO YOUR ENEMY:
A CONVERSATIONAL ANALYSIS IN TEAMS WITH A SINGLE TOPIC



First presented by Johan Koskinen and Thomas Grund:

15 March 2012, SUNBELT XXXII Redondo Beach

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OUTLINE

- **Aspects of REM that needs attention**
- **The ball is one topic**
- **The importance of the single topic**
- **Dynamics**
  - Short-range
  - Spatial embedding
  - Long-range
- **Settings**
- **Model**
- **Results**
- **Conclusion**

2

ANTECEDENTS

- **Relational events models (Butts and co)**
- **Time-stamped SAOM (Brandes, Lerner and Snijders)**
- **Conversation analysis (Gibson; McFarland)**
- **Multilevel relational events (Pierski, et al)**
- **Taxonomy (Kovanen, et al)**

3

DATA

- Detailed narratives of 760 Premier League football matches based on video footage.
- 1,050,411 in-match events (including referee decisions and player behaviours).
- 283,259 passes between professional football players.
- All matches in the seasons 2006/07 and 2007/2008.
- 76 matches for 17 teams, 38 matches for 6 teams.

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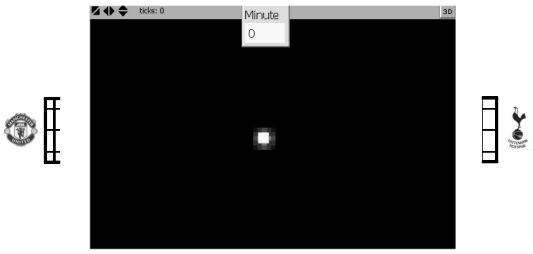
MANCHESTER UTD – TOTTENHAM HOTSPUR

9/9/2006, Old Trafford

5

MANCHESTER UTD – TOTTENHAM HOTSPUR

9/9/2006, Old Trafford



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MANCHESTER UTD – TOTTENHAM HOTSPUR

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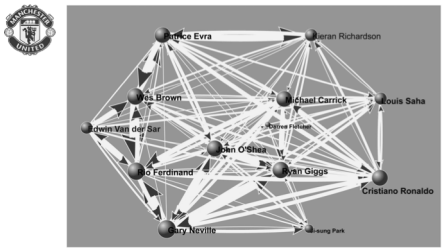

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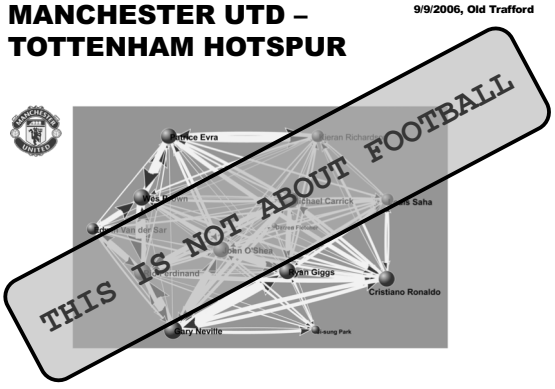

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CONVERSATION AS METAPHOR – ONE TOPIC

9

CONVERSATION AS METAPHOR – ONE TOPIC

Turn receiving AB-BA

So, how about it?

10

CONVERSATION AS METAPHOR – ONE TOPIC

Turn receiving AB-BA

I really don't know

11

CONVERSATION AS METAPHOR – ONE TOPIC

Turn receiving AB-BA

Oh, I'm sure we can talk about it…

12

CONVERSATION AS METAPHOR – ONE TOPIC

Turn receiving AB-BA

… hmm, I really don't know…

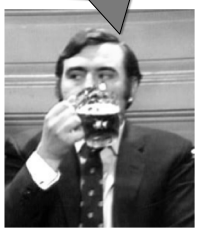
13

CONVERSATION AS METAPHOR – ONE TOPIC

Turn receiving AB-BA

no…?

hmph…



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CONVERSATION AS METAPHOR – ONE TOPIC

Turn receiving AB-BA

Well, I would…

15

CONVERSATION AS METAPHOR – ONE TOPIC

Turn usurping AB-XA

ANYONE FOR TENNIS?!

16

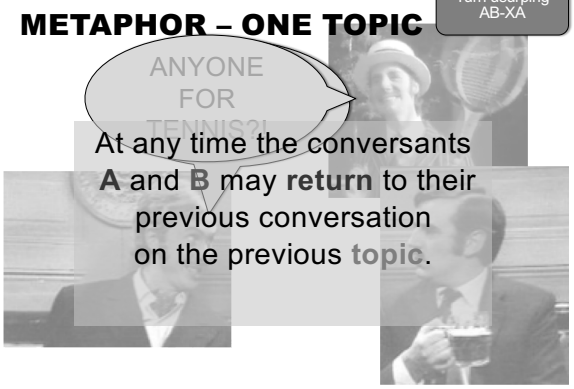
CONVERSATION AS METAPHOR – ONE TOPIC

Turn usurping AB-XA

17

CONVERSATION AS METAPHOR – ONE TOPIC

Turn usurping AB-XA



At any time the conversants **A** and **B** may **return** to their previous conversation on the previous **topic**.

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CONVERSATION AS METAPHOR – ONE TOPIC

Turn usurping AB-XA

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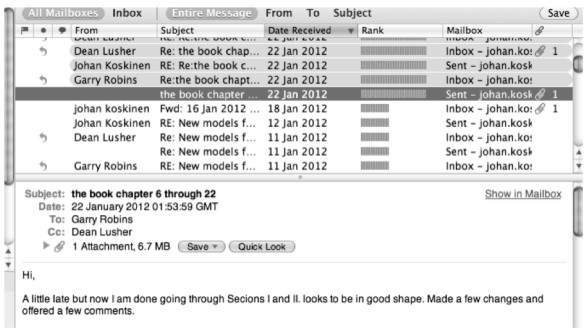
CONVERSATION AS METAPHOR – ONE TOPIC

Labeled events?



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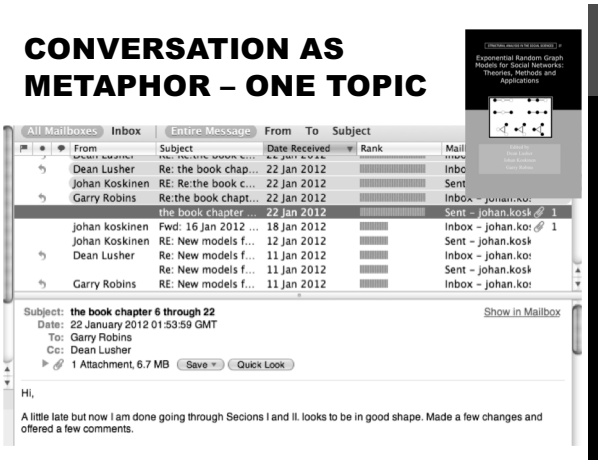
CONVERSATION AS METAPHOR – ONE TOPIC



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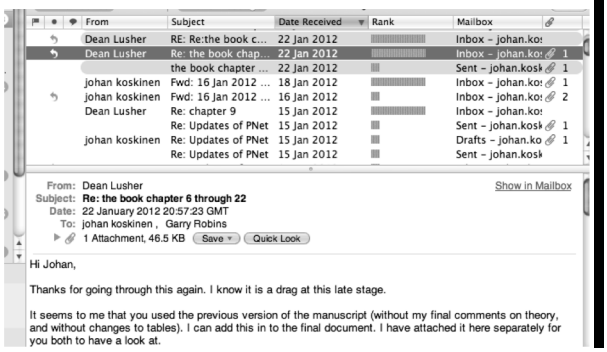
CONVERSATION AS METAPHOR – ONE TOPIC



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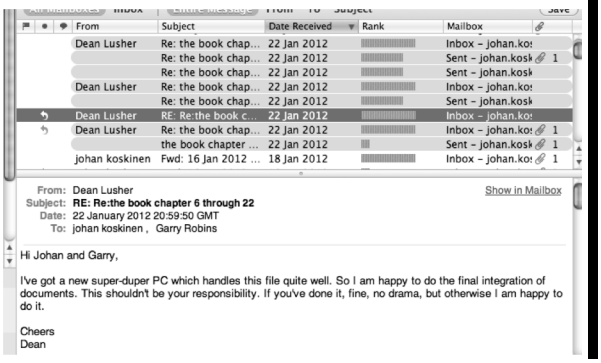

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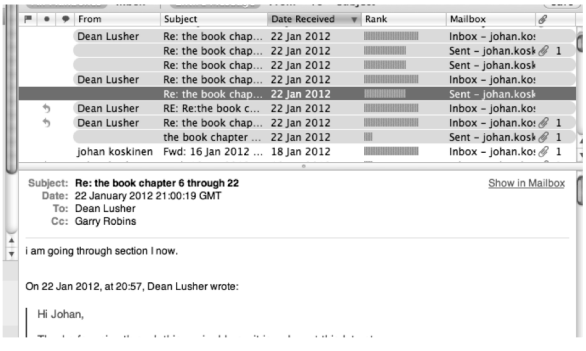

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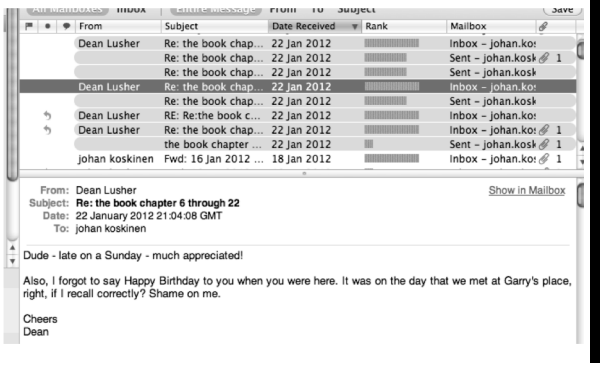

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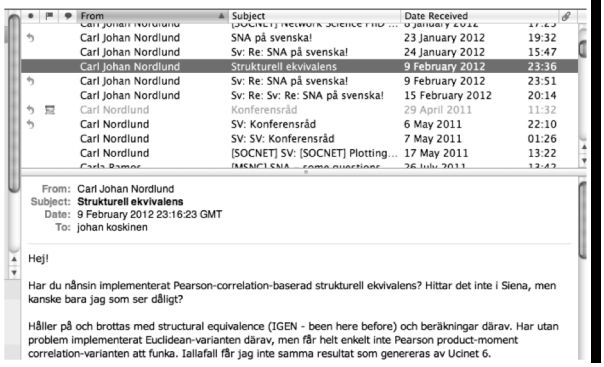
CONVERSATION AS METAPHOR – ONE TOPIC



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CONVERSATION AS METAPHOR – ONE TOPIC

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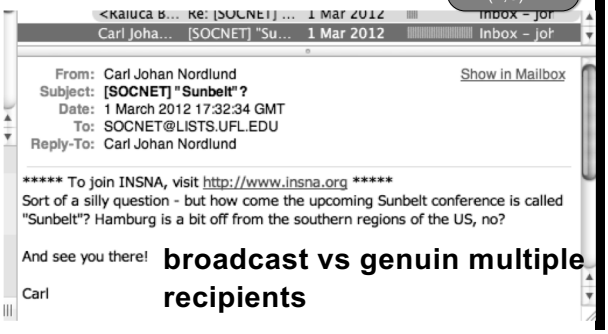
CONVERSATION AS METAPHOR – ONE TOPIC

Turn claiming
A0-X0
Accumulated
turn receiving
A(B,C)-BA



broadcast vs genuin multiple recipients

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CONVERSATION AS METAPHOR – ONE TOPIC

Chain of command
(c.p. Varese's mafiosos)

29

CONVERSATION AS METAPHOR – ONE TOPIC

Chain of command
(c.p. Varese's mafiosos)

30

CONVERSATION AS METAPHOR – ONE TOPIC

Chain of command
(c.p. Varese's mafiosos)

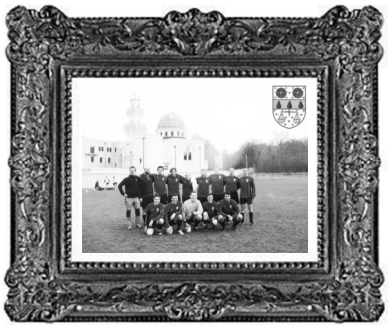
31

CONVERSATION AS METAPHOR – ONE TOPIC

Negotiations?

32

WHAT MAKES A GOOD TEAM?



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WHAT MAKES A GOOD TEAM?

The team is a nicely **bounded** organisation confining the action set

C.p., I could send an **email to anyone** with an email account

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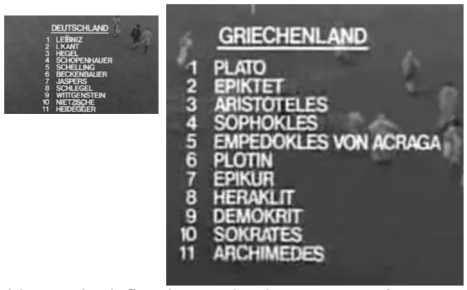
SETTING – COMPETING ORGANISATIONS



Two unambiguously defined organisations **competing** for the **same scarce resources**

35

KICK-OFF: THE CURSE OF INITIAL CONDITIONS

Where and **when** did the conversation get started?

36

THE ACTION SET AND "MOTIFS"/P-SHIFTS/N-GRAMS

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THE ACTION SET AND "MOTIFS"/P-SHIFTS/N-GRAMS

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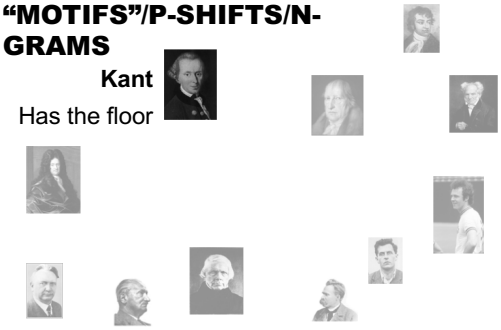
THE ACTION SET AND "MOTIFS"/P-SHIFTS/N-GRAMS

Kant

Has the floor



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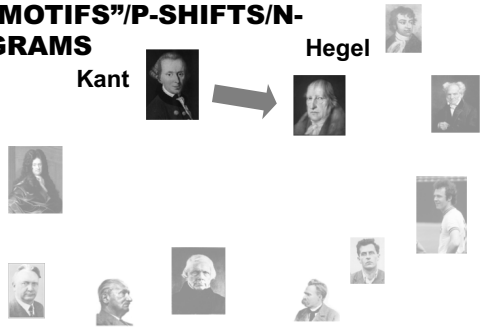
THE ACTION SET AND "MOTIFS"/P-SHIFTS/N-GRAMS

Kant → Hegel



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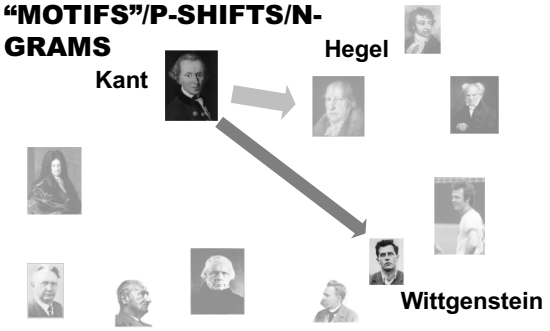
THE ACTION SET AND "MOTIFS"/P-SHIFTS/N-GRAMS



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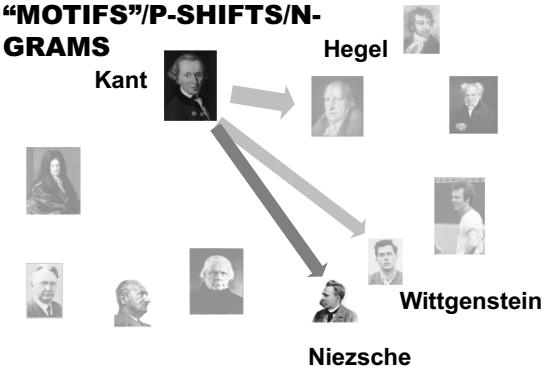

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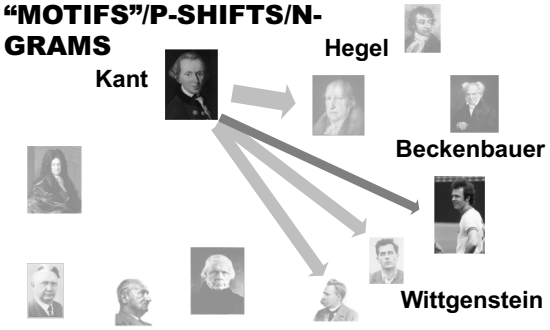

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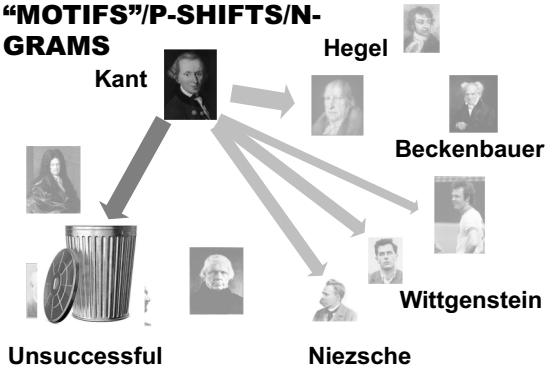

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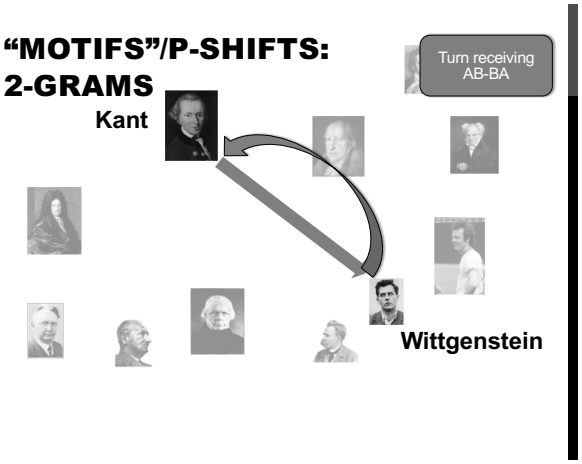
"MOTIFS"/P-SHIFTS:
2-GRAMS
Kant
Turn receiving AB-BA
Wittgenstein

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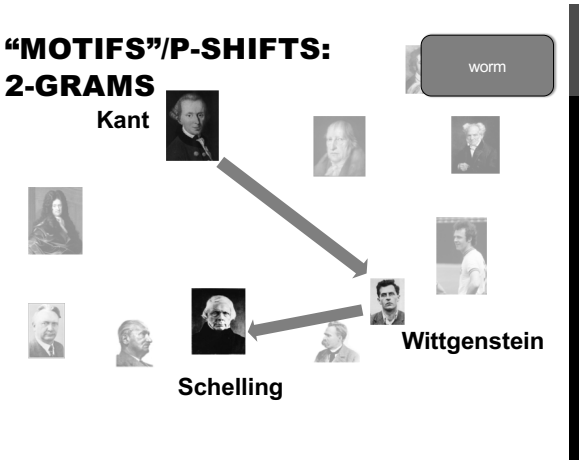
"MOTIFS"/P-SHIFTS:
2-GRAMS
Kant
worm
Wittgenstein
Schelling

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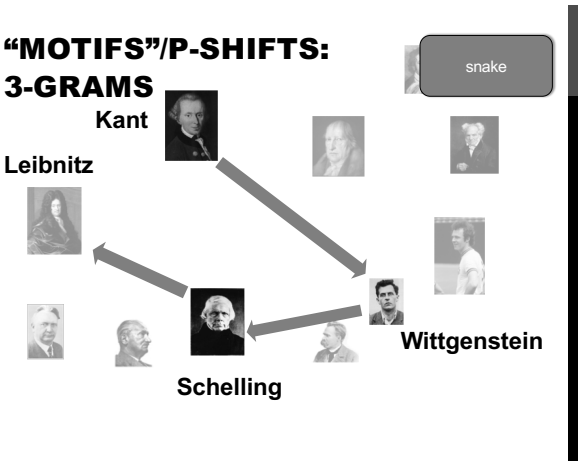
"MOTIFS"/P-SHIFTS:
3-GRAMS
Kant
snake
Leibnitz
Wittgenstein
Schelling

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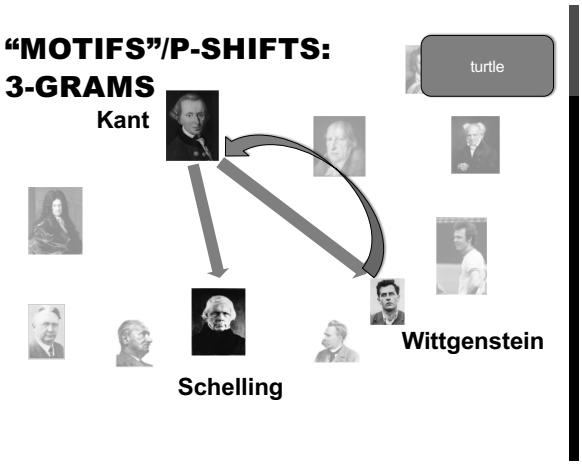
"MOTIFS"/P-SHIFTS:
3-GRAMS
Kant
turtle
Wittgenstein
Schelling

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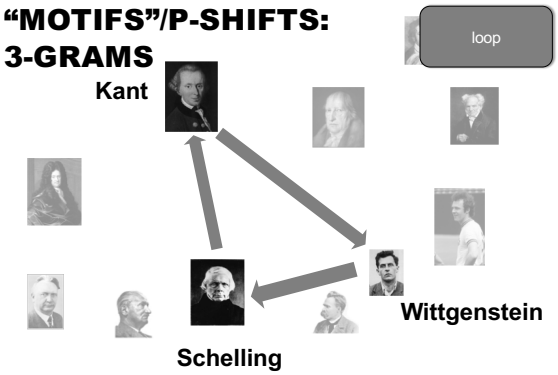
"MOTIFS"/P-SHIFTS: 3-GRAMS



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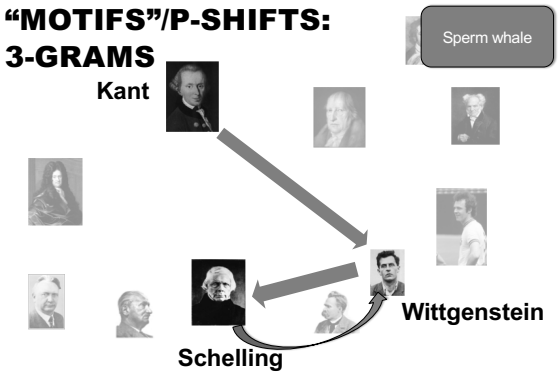
"MOTIFS"/P-SHIFTS: 3-GRAMS



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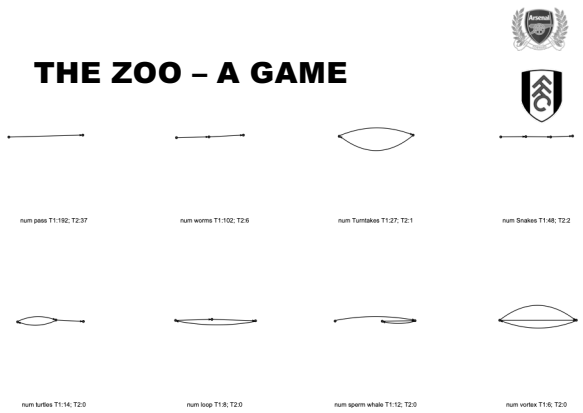
THE ZOO – A GAME



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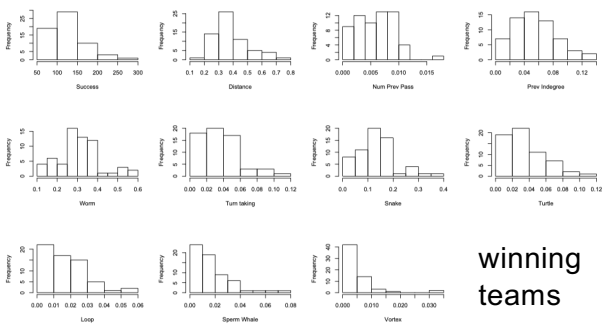
THE ACTION SET AND "MOTIFS"/P-SHIFTS/N-GRAMS



winning teams

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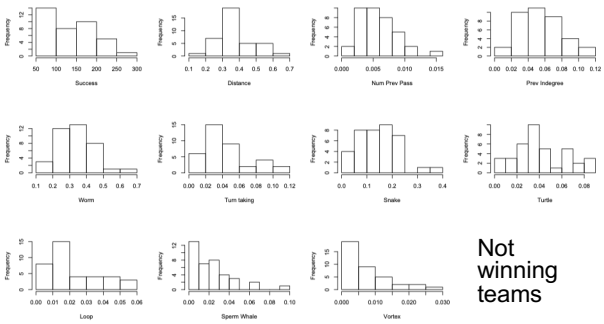
THE ACTION SET AND "MOTIFS"/P-SHIFTS/N-GRAMS



Not winning teams

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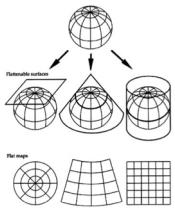
THE ACTION SET SPATIAL EMBEDDING



Social interaction is embedded in space

Spatial embedding as mechanism difficult

Many constraints combine to make relational events towards proximate others more likely than distant others

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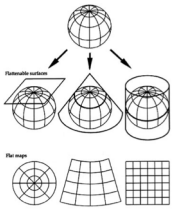
THE ACTION SET SPATIAL EMBEDDING



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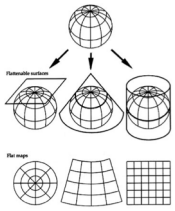

Social interaction is embedded in space

Spatial embedding as mechanism difficult

Many constraints combine to make relational events towards proximate others more likely than distant others

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THE ACTION SET SPATIAL EMBEDDING

For football:
space **bounded**
Mechanism is clear

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THE ACTION SET SPATIAL EMBEDDING – DATA CONSIDERATIONS

We only **know** position of **passer** and **passee**
Not out of play players - A lot or **unknown** positions

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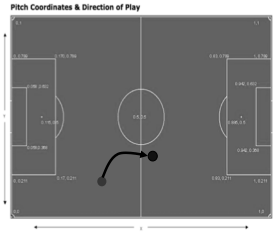
THE ACTION SET SPATIAL EMBEDDING – DATA CONSIDERATIONS



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THE ACTION SET SPATIAL EMBEDDING – DATA CONSIDERATIONS

Solution: assume players move randomly (Brownian motion)

62

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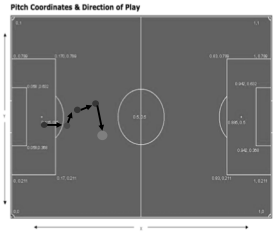

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65

THE ACTION SET SPATIAL EMBEDDING – DATA CONSIDERATIONS

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66

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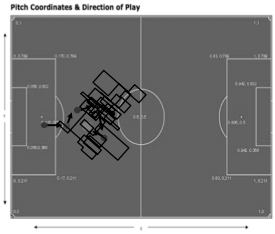

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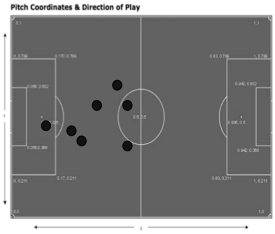

Conditional on Observed positions:

Intermediate Position given by a Brownian bridge

Solution: assume players move randomly (Brownian motion)

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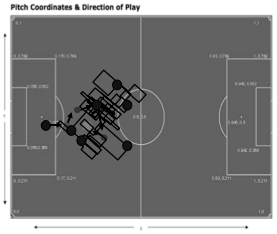
THE ACTION SET SPATIAL EMBEDDING – DATA CONSIDERATIONS



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THE ACTION SET SPATIAL EMBEDDING

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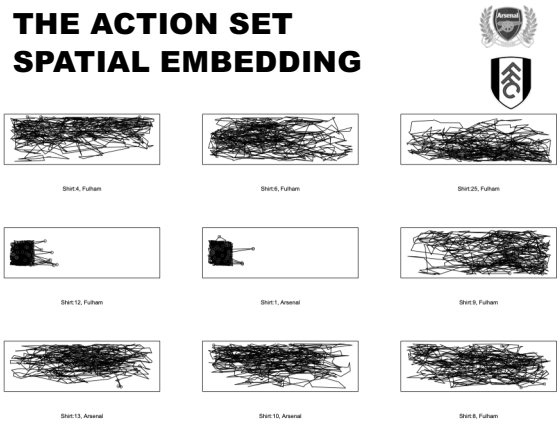
THE ACTION SET SPATIAL EMBEDDING



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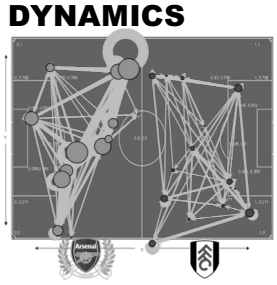
LONG RANGE DYNAMICS



Bernard, Killworth and Sailor:

dualism between **stable social ties** and **interactional behavior**

Giving precedence to either form tenuous.

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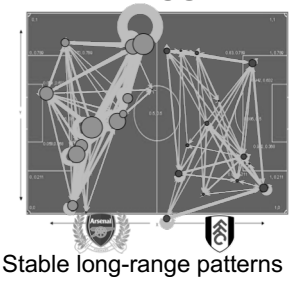
LONG RANGE DYNAMICS



Stable long-range patterns reflecting real **social structure**

Bernard, Killworth and Sailor:

dualism between **stable social ties** and **interactional behavior**

Giving precedence to either form tenuous.

Email, phone calls, and notice boards - direct **observations** on the interactional behavior.

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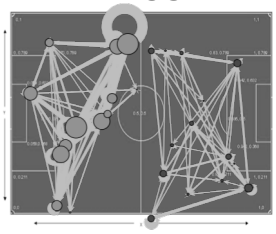
LONG RANGE DYNAMICS



In REM:

(i) Frequency previous passes to passee by passer

(ii) Frequency previous passes to passee by anyone

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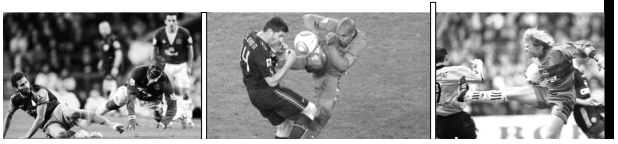
SOCIAL SETTING - CROSSED DATA

"In football everything is complicated by the presence of the opposite team."

Jean-Paul Sartre



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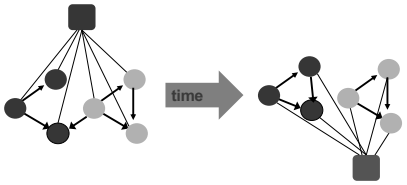
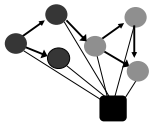
SOCIAL SETTING - CROSSED DATA



The opponents and occasion constitute the (social) setting for the team

– teams are affiliated with matches



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NON-PASSING EVENTS?

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NON-PASSING EVENTS?

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THE MODEL

Actors: $i \in V = \{1,2,\ldots,n\}$

Person with the topic at time t: $\{i \in V : z_i(t) = 1\}, \sum_{i \in V} z_i(t) = 1, \forall t \in [t_0, T$

Relational event At time t of type a: $e(i,j,a,t)$

Set of events up to time t: $E_t = \{e(i,j,a,s) : s < t\}$

Time until $e(i,j,a,t)$: $Exp(\lambda(E_t))$ for i if $z_i(t) = 1$

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THE MODEL

Conditional Action set: $A(E_t)$

Conditional change probability

$$\Pr\{e(i,j,a,t) \mid E_t\}$$

$$= \begin{cases} \dfrac{\exp\{g(e(i,j,a,t);E_t)\}}{\sum_{h \in V \setminus \{i\}, a' \in A(E_t)} \exp\{g(e(i,h,a',t);E_t)\}} & \text{if } z_i(t) = 1 \\ 0 & \text{if } z_i(t) = 0 \end{cases}$$

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THE MODEL

The objective function:

$$g(e(i,j,a,t);E_t) = \sum_{r=1}^{p} \theta_p f(e(i,j,a,t) \otimes E_t)$$

where:

$$f(e(i,j,a,t) \otimes E_t)$$

Are counts of temporal motifs, the distance between *i* and *j*, etc

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HYPOTHESES

Stable patters v short-range dynamics v setting

Given that a relational event occurs it is directed towards

Stable patters:

- **Previous interaction**
- **Emergent "leadership"**
- **Someone proximate in relevant space**

Short-range dynamics

- **Responding**
- **Referral**
- **Delegating**

Setting

- **Effects moderated by context of competitor**

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THE MODEL – TEAM SETTING

To take dependence on team into account

We assume Hierarchy on parameters

$$\theta_{\text{TEAM}_i} = \mu + \eta_{\text{TEAM}_i}$$

Where

$$\eta_{\text{TEAM}_i} \sim N_p(0, \Sigma)$$

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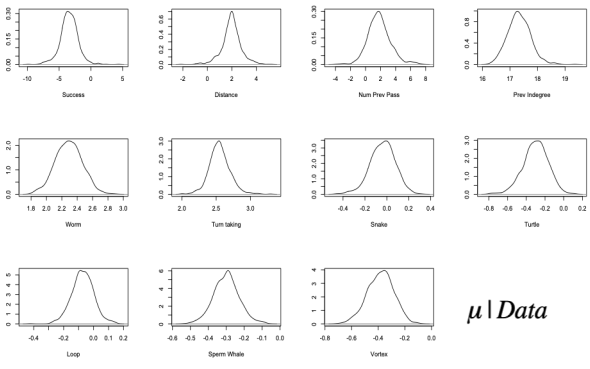
POSTERIOR MEANS



$\mu \mid Data$

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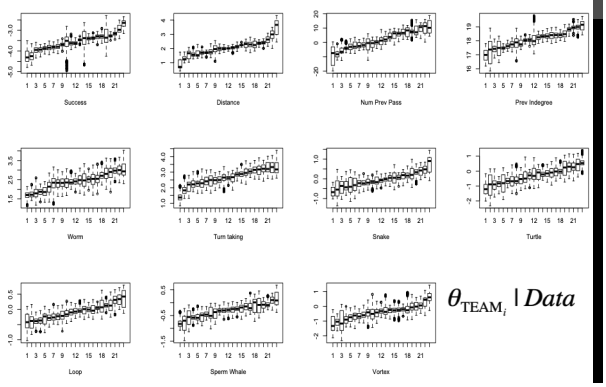
RANDOM EFFECTS



$\theta_{\text{TEAM}_i} \mid Data$

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CONCLUSION

- We have looked at central aspects of REMs
  - "Proper" Short-range dynamics
  - "Emergent" long-range dynamics
  - Spatial embedding
  - … the role of the social setting
- Using
  - Topic following
  - Bounded action
    - ✓ Space
    - ✓ Action
    - ✓ Time

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FURTHER RESEARCH

- Model selection
- Crossed effects

$\theta_{\text{TEAM A, GAME}}$ $\theta_{\text{TEAM B, GAME}}$

- The ability to act is constrained by competing team

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PASSING THE BALL AND TALKING TO YOUR ENEMY:

A CONVERSATIONAL ANALYSIS IN TEAMS WITH A SINGLE TOPIC

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Mitchell Centre for Network Analysis

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