Spatio-temporal metrics that distinguish plays in field hockey: a pilot study

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Spatio-temporal metrics that distinguish plays in field hockey: A pilot study

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Introduction

Direction of play

$(x, y, t)$

$\theta$

$=$ offence

$=$ defence
Introduction

Positions

Distances

Angles

Spread

Area

Duration

Speed

Context

(x, y, t)

\[ \Delta t = t_2 - t_1 \]

\[ \Delta t = \frac{d}{t_2 - t_1} \]

No. of players
How many variables actually relate strongly to the output?
Introduction

Aim

To estimate the distribution of strong marginal effects of spatio-temporal metrics in field hockey plays.
Method

Data collection

HD cam’, pan-tilt-zoom

4K cam’, 0.3x fisheye lens, fixed
Method

Data processing

- **Positions**: Variables $(x, y, t)$
- **Distances**: $\Delta t = t_2 - t_1$
- **Angles**: $\theta$
- **Spread**: Equation $\Delta t = \frac{d}{t_2 - t_1}$

- **Area**: Diagram showing area calculation
- **Duration**: Diagram showing time difference $t_2 - t_1$
- **Speed**: Diagram showing speed calculation
- **Context**: Diagram showing number of players and context
### Method

#### Data analysis

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Measure of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cramér’s $V$</td>
<td>Association</td>
</tr>
<tr>
<td>Mutual Information</td>
<td>Mutual dependency</td>
</tr>
<tr>
<td>I-score</td>
<td>Influence / association</td>
</tr>
</tbody>
</table>
# Method

## Data analysis

<table>
<thead>
<tr>
<th>Metric</th>
<th>Good vs. Bad</th>
<th>Good vs. OK</th>
<th>Ok vs. Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>metric₁</td>
<td>{V, M, I}</td>
<td>{V, M, I}</td>
<td>{V, M, I}</td>
</tr>
<tr>
<td>metric₂</td>
<td>{V, M, I}</td>
<td>{V, M, I}</td>
<td>{V, M, I}</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>metric₁₈₃₇</td>
<td>{V, M, I}</td>
<td>{V, M, I}</td>
<td>{V, M, I}</td>
</tr>
</tbody>
</table>

\[ V = \text{Cramér's } V \] \hspace{1cm} \[ M = \text{Mutual Information} \] \hspace{1cm} \[ I = \text{l-score} \]
Results

Good vs. Bad

- Large effect
- Moderate effect
- Small effect
Conclusions

*Reminder*

**Aim:** To estimate the distribution of strong marginal effects of spatio-temporal metrics in field hockey plays.

1. Small subset of large effect metrics.
   
   => use univariate variable-selection methods.

2. Agreement between statistics.

   => confidence in apparent distribution.


   => same methods can be applied for all comparisons.
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