Spatio-temporal metrics that distinguish outcomes of field hockey plays

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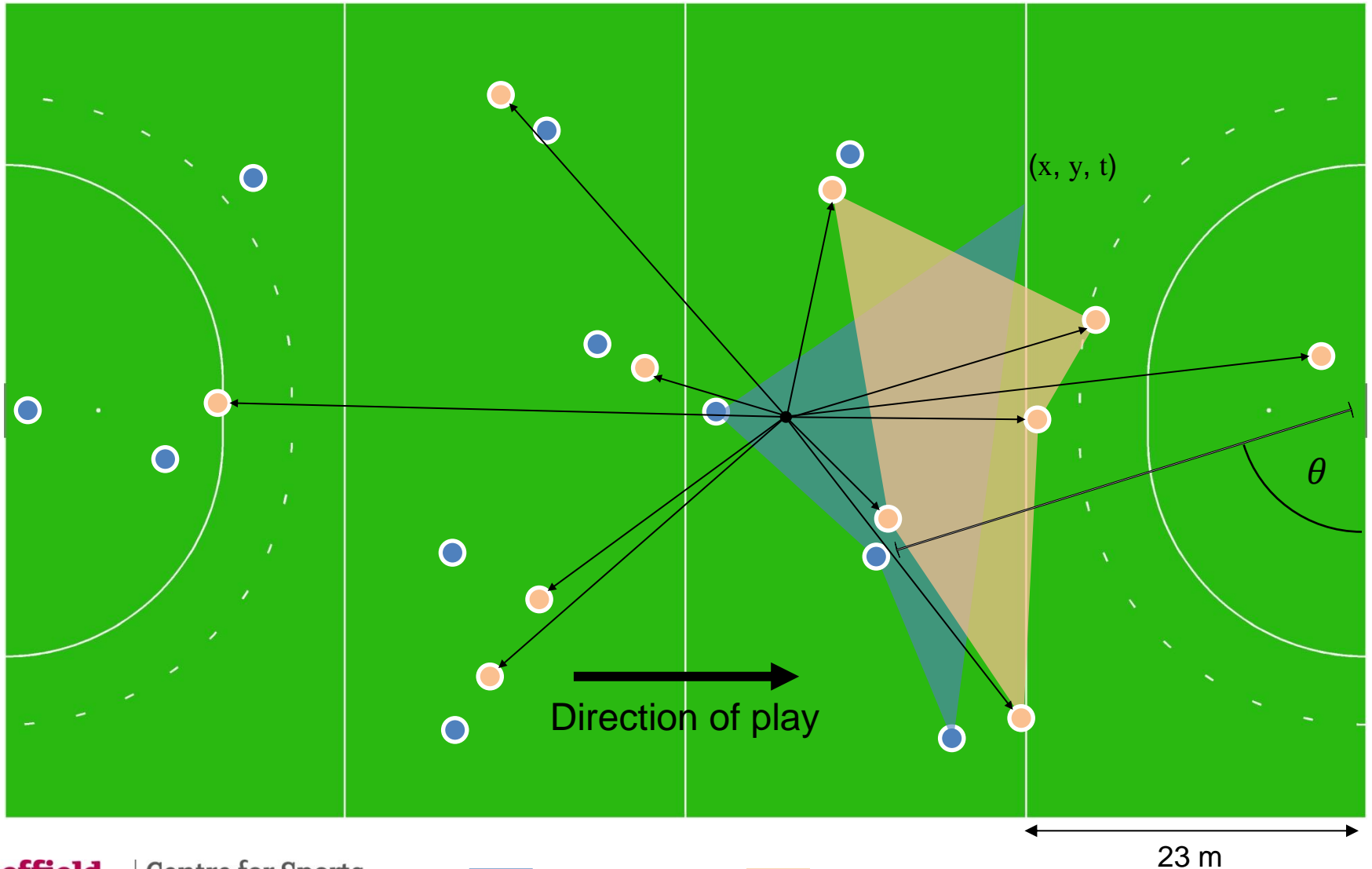[1]*Centre for Sports Engineering Research, Sheffield Hallam University*
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Introduction

= offence = defence

Introduction

Positions

(x, y, t)

Distances

Angles

θ

Spread

Area

Duration

$\Delta t = t_2 - t_1$

Speed

$\Delta t = \dfrac{d}{t_2 - t_1}$

Context

No. of players
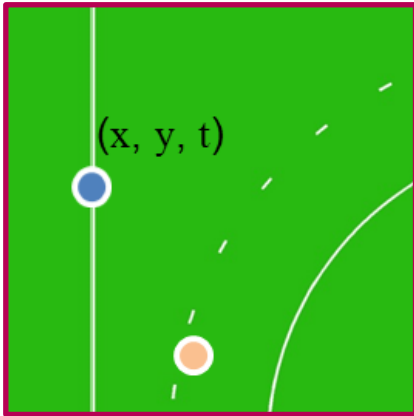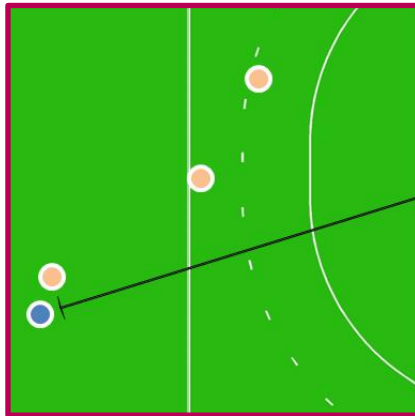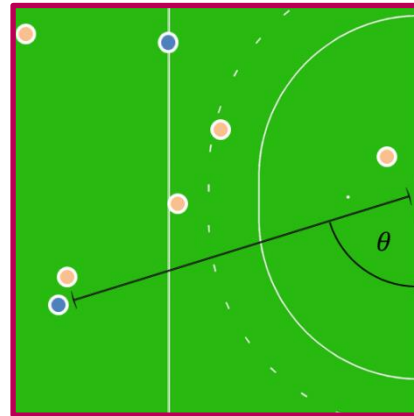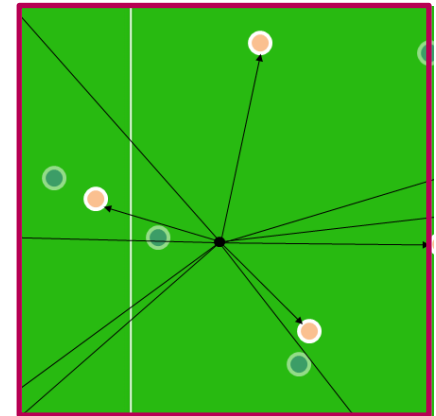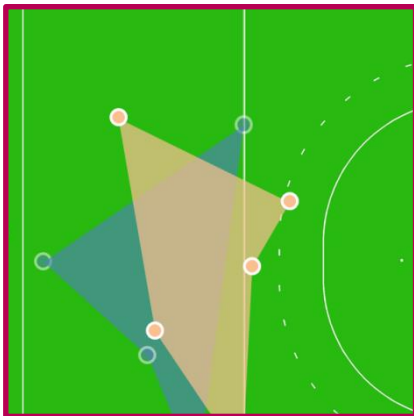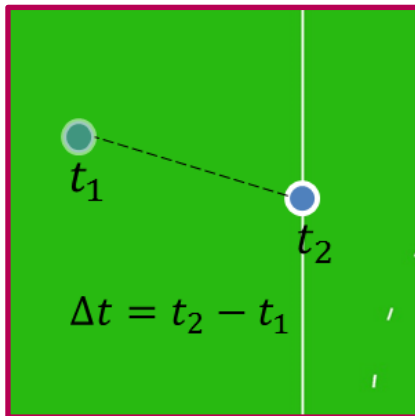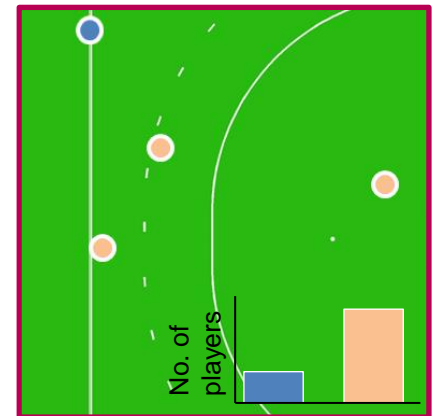
Introduction

Question:

What combinations of spatio-temporal metrics

distinguish play outcomes?

Method

Data collection

HD cam',
pan-tilt-zoom

4K cam', 0.3x fisheye lens, fixed

Method

Data processing

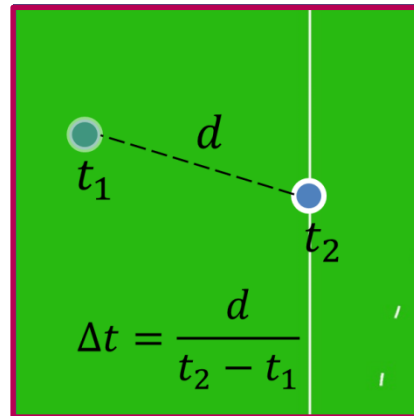### Positions

(x, y, t)

Distances

Angles

θ

Spread

Area

Duration

t_1

t_2

$\Delta t = t_2 - t_1$

Speed

t_1

d

t_2

$\Delta t = \dfrac{d}{t_2 - t_1}$

Context

No. of players
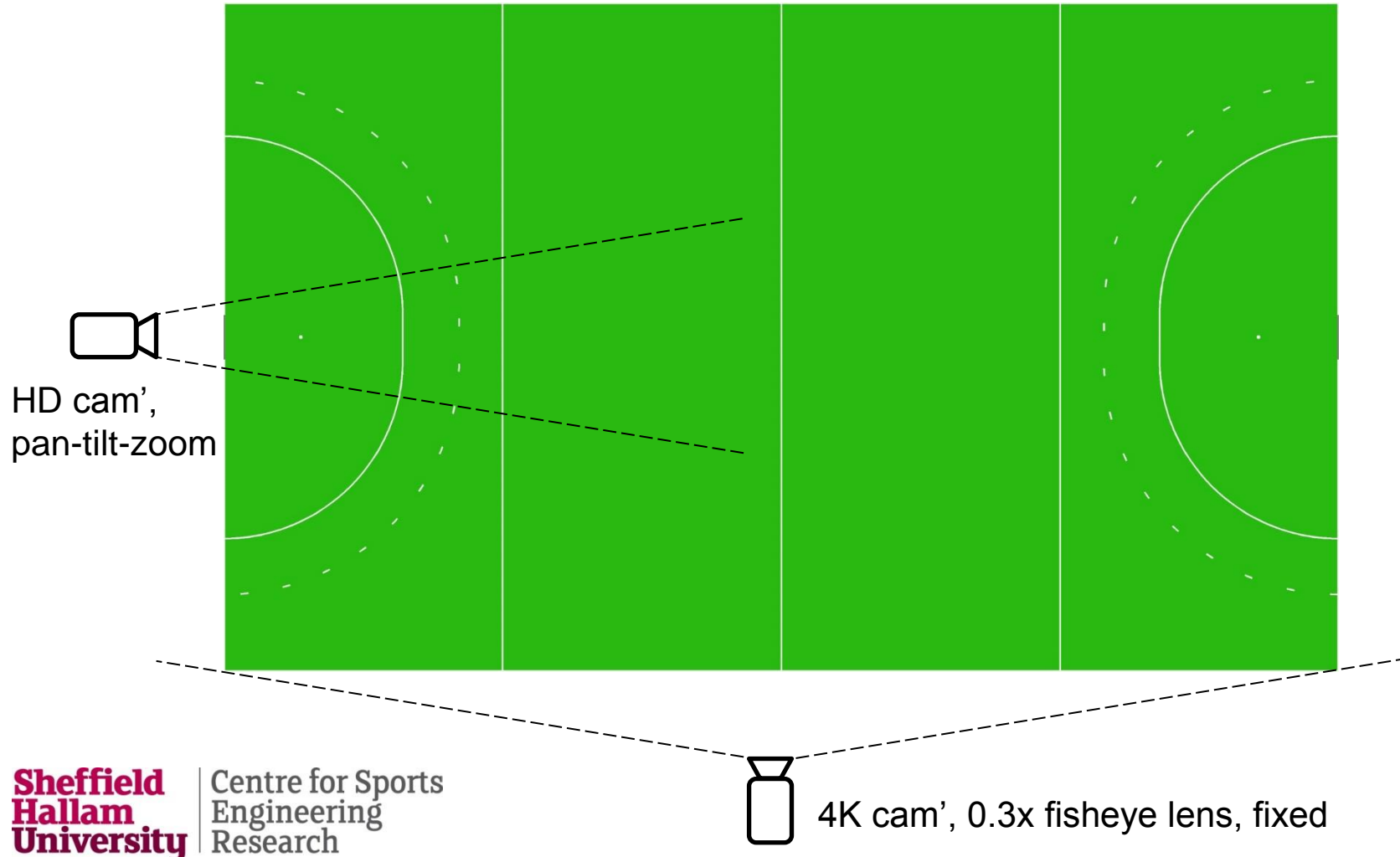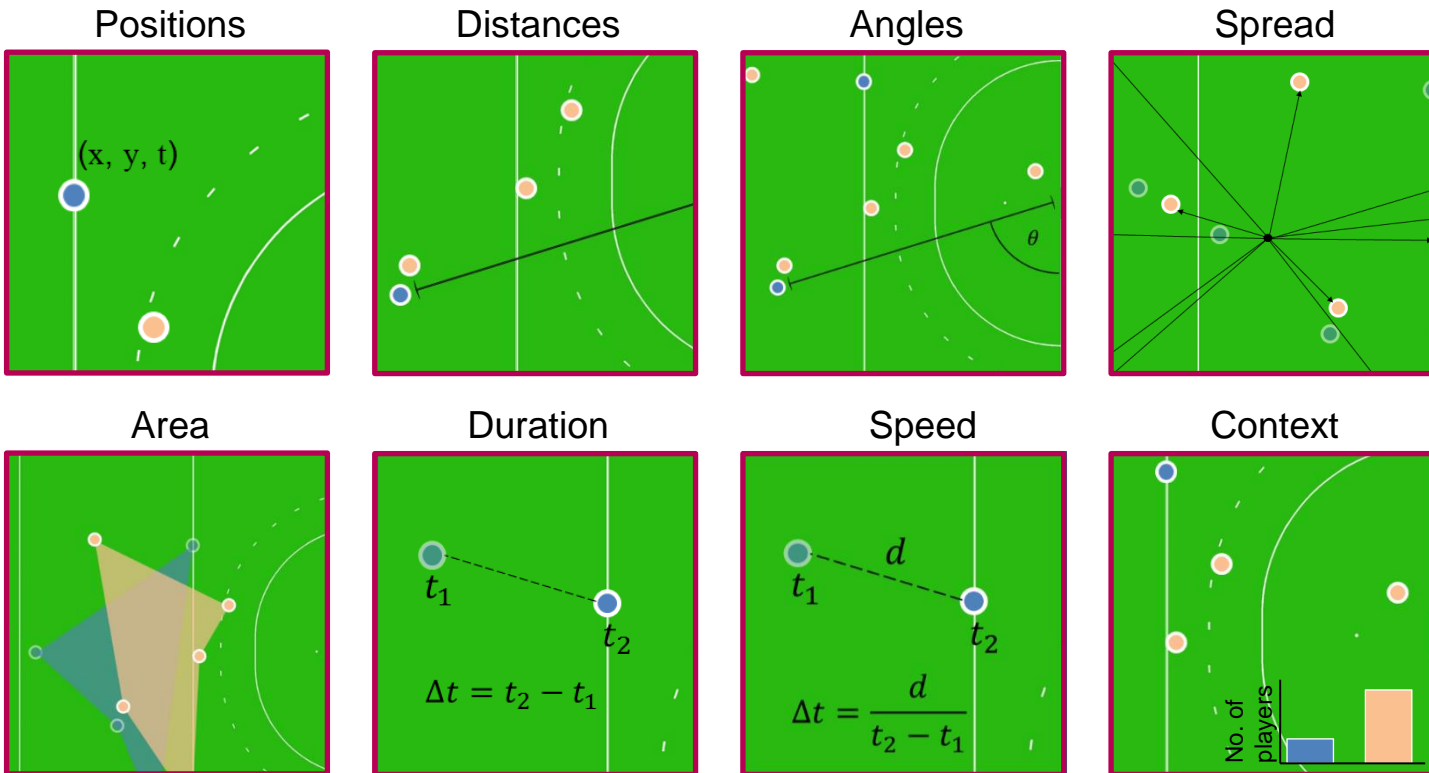
Method

Problem:

- Many metrics ($n_{metrics}$ = 3,641)

- Few observations ($n_{observations}$ = 660)

$$I-\text{score} = \sum n_j^2 \left(\bar{Y}_j - \bar{Y} \right)^2$$
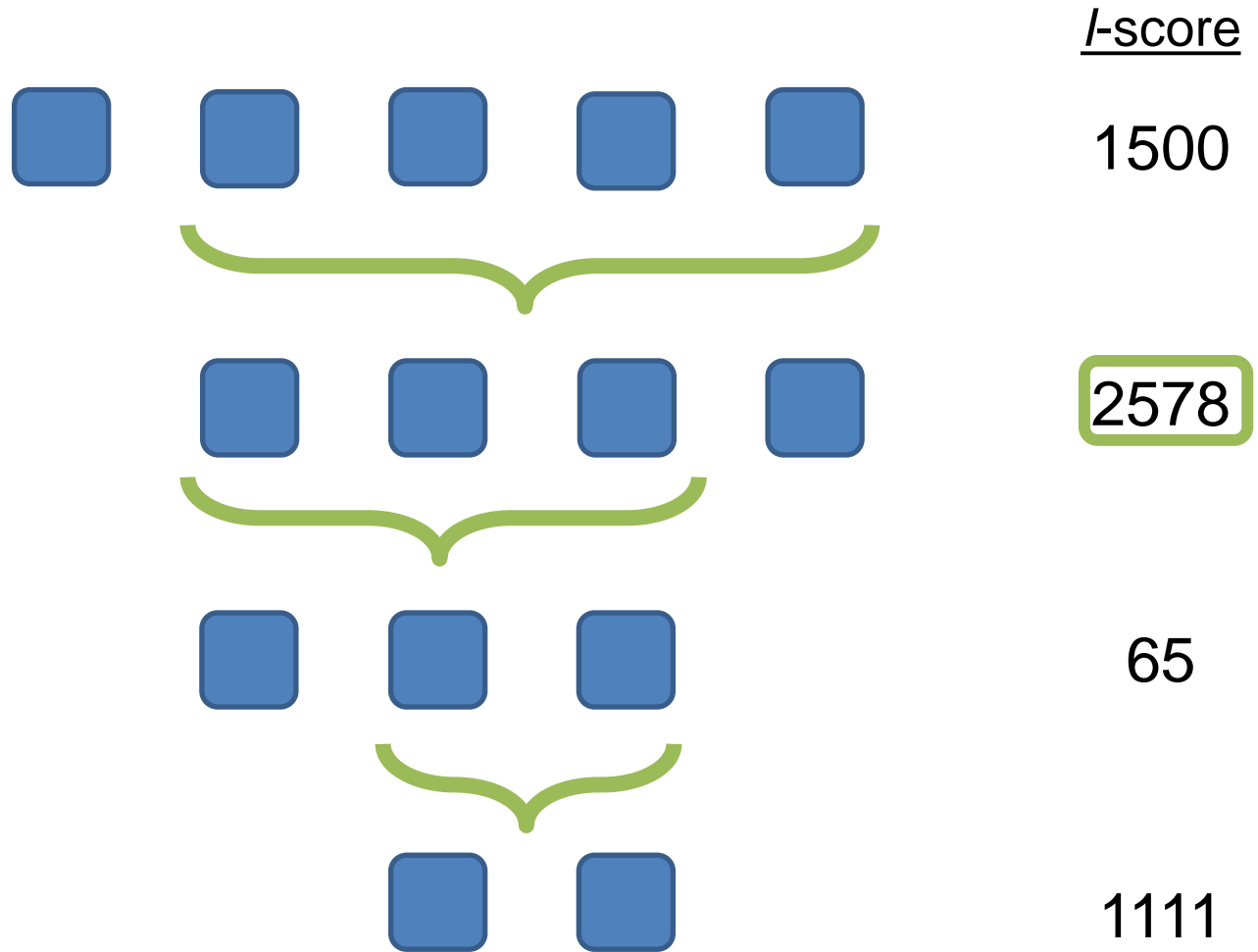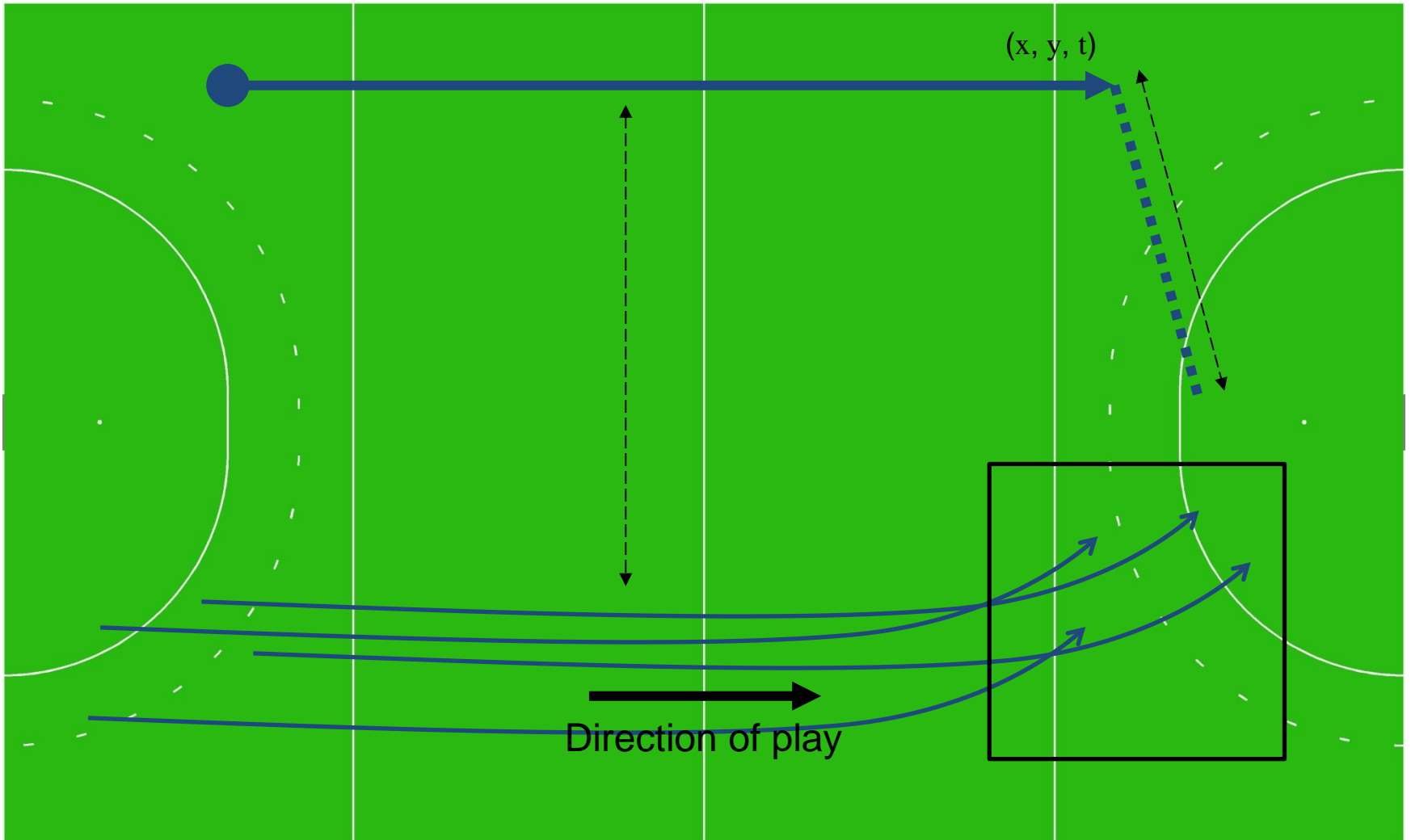
Backward Dropping Algorithm (Wang et al. 2012)

Method

I-score

1500

2578

65

1111

Results

Rank	Metric Combination	*I*-score
1	[23,26]	2702.772
2	[3,11]	2702.772
3	[4,5,7,8,31]	2681.984
4	[4,7,8,31]	2681.984
5	[5,7,8,31]	2681.984
6	[3,21]	2677.408
7	[4,5,8,31]	2646.662
8	[4,8,31]	2646.662
9	[5,8,31]	2646.662
10	[4,5,7,31]	2643.416

Discussion

(x, y, t)

Direction of play

Discussion

(x, y, t)

(x, y, t)

Direction of play
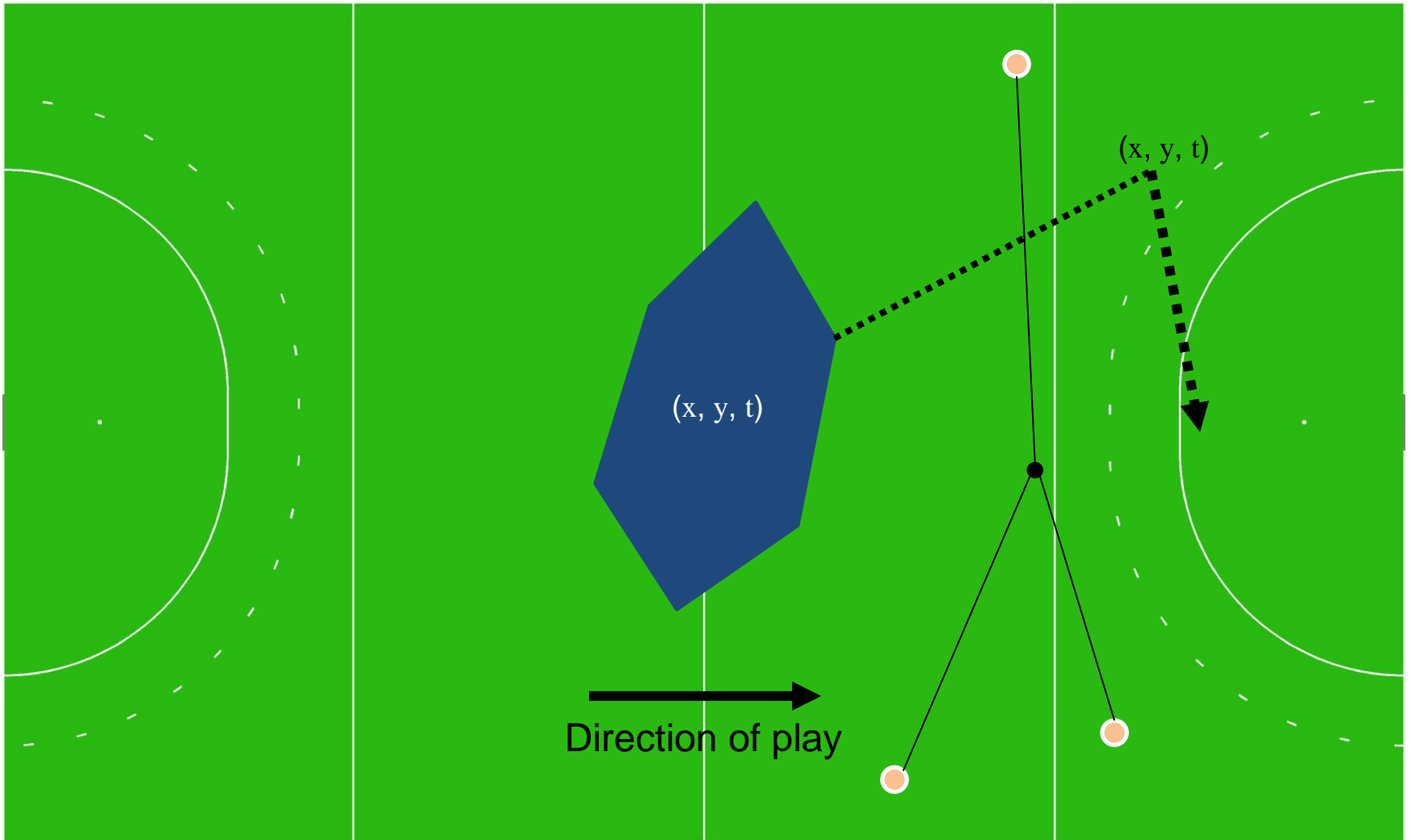
Conclusion

Problem:

- Too many metrics.

- Too few observations.

Solution:

- Ask someone who knows – genetic analysts.

- Backward Dropping Algorithm

Results

- Metrics associated with outcomes.

- Metric combinations associated with outcomes.

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