Sports Video Visualization

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Swansea University
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Introduction

* Collaborative project between Sports Science, Computer Science and Engineering.

* Three Research Associates:
  * Phil Legg, Matthew Parry, David Chung.
* Sports Science: Dr. Iwan Griffiths
* Computer Science: Prof. Min Chen
* Commercial Manager: Adrian Morris

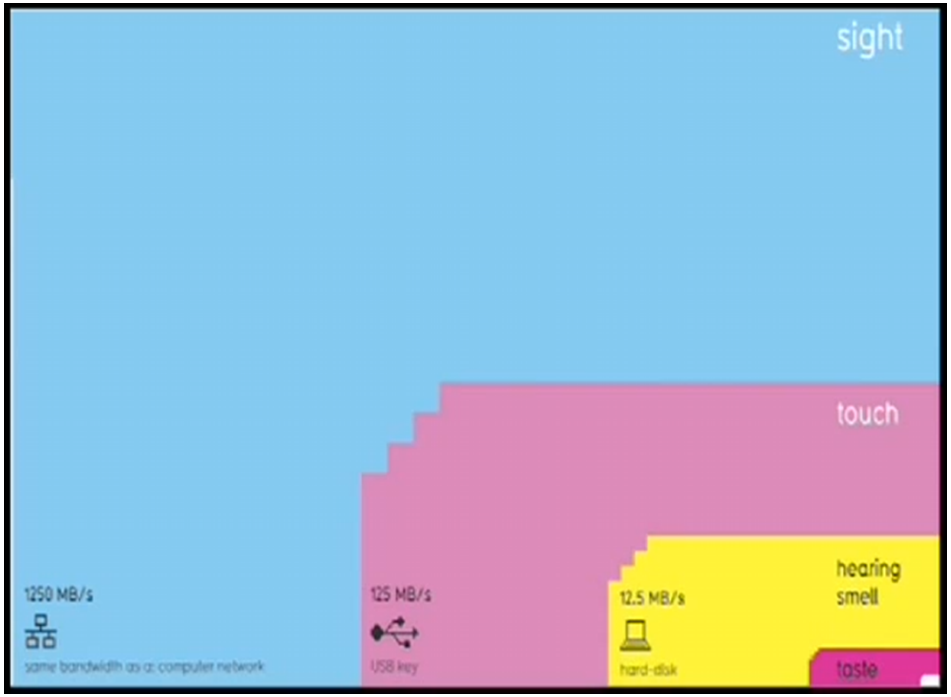
* Funded by Welsh Assembly Government (A4B).

Visualization…
What is it?

Visualization

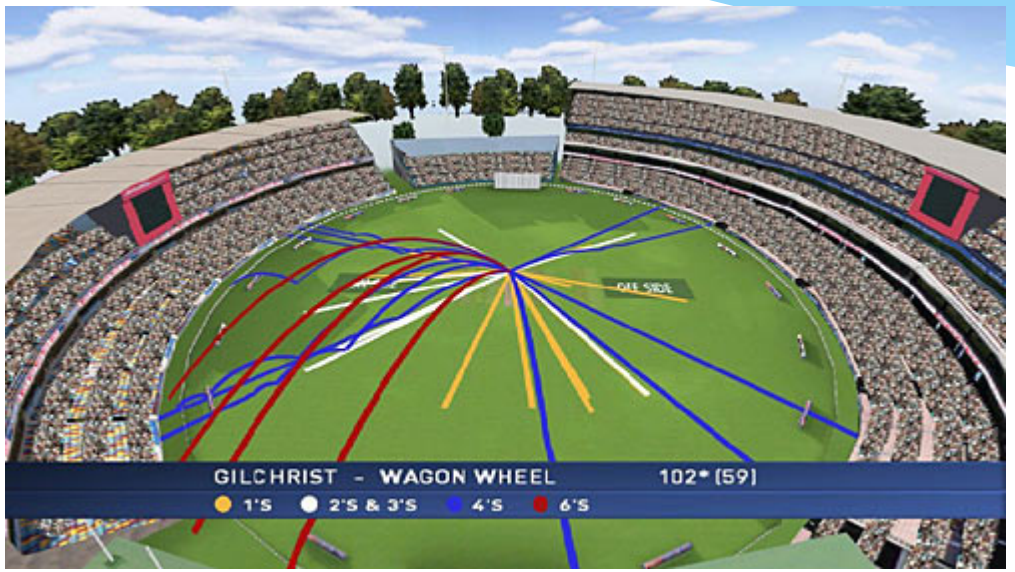
* Data to Information in a visual form.

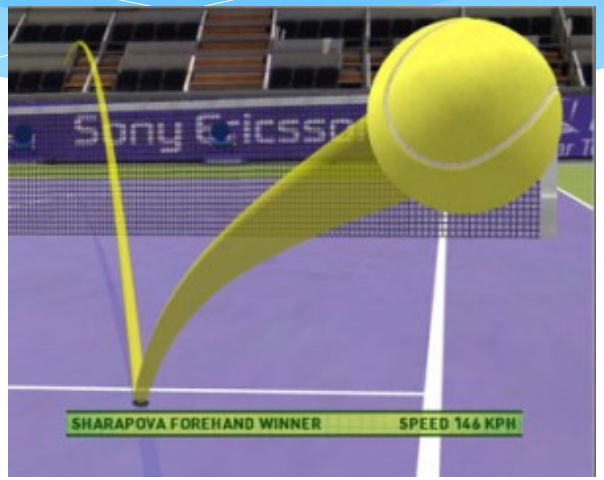
* Should be:
  * Accurate
  * Informative
  * Relative
  * Memorable
  * … Maybe even exciting!

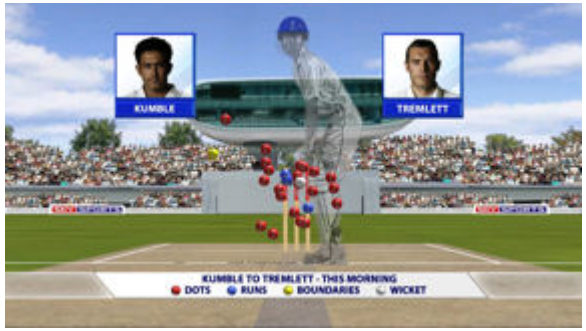


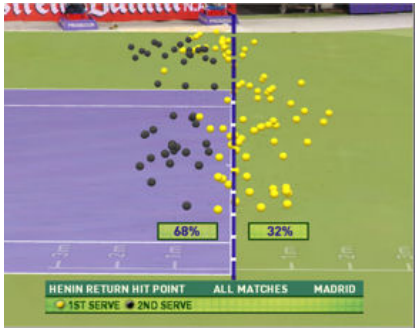
Danish physicist **Tor Nørretranders**

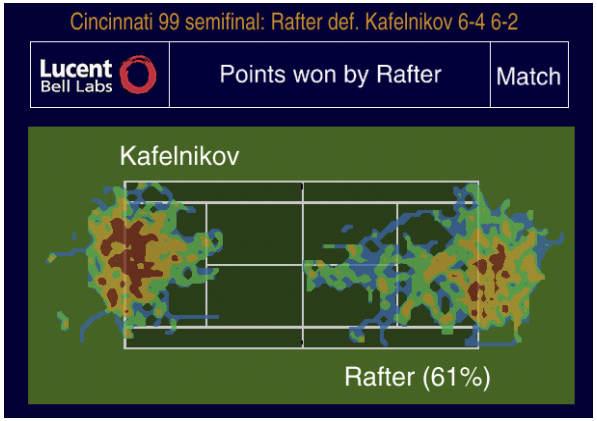
Visualizations in Sport



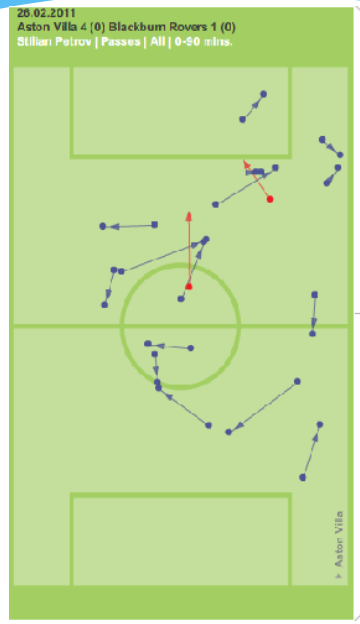


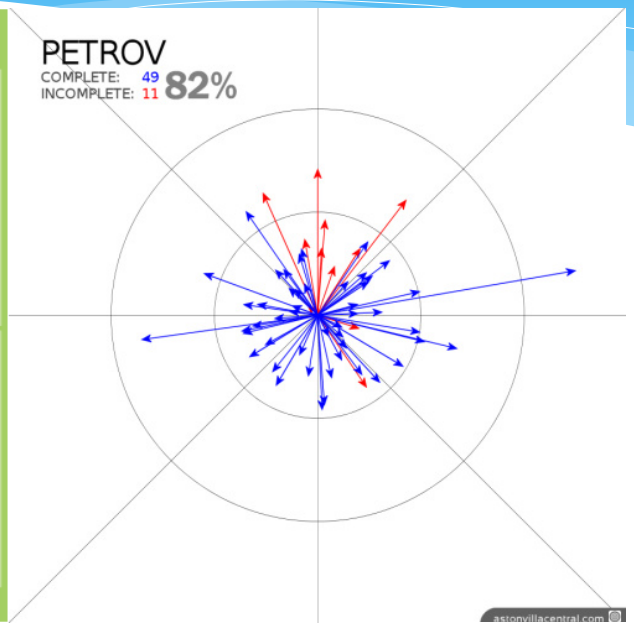


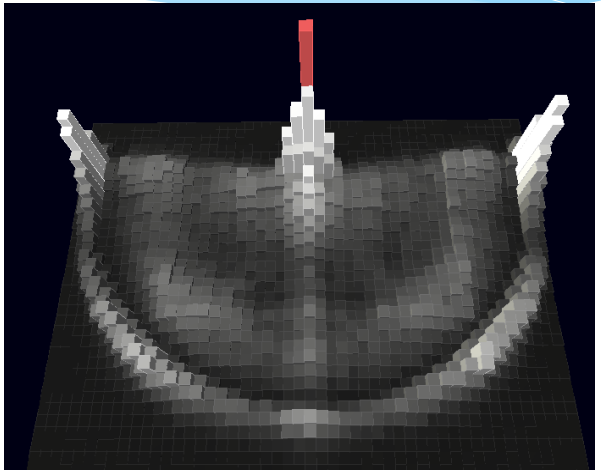


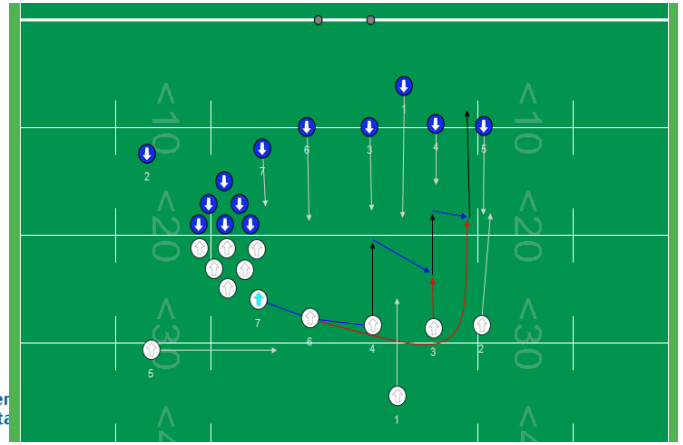


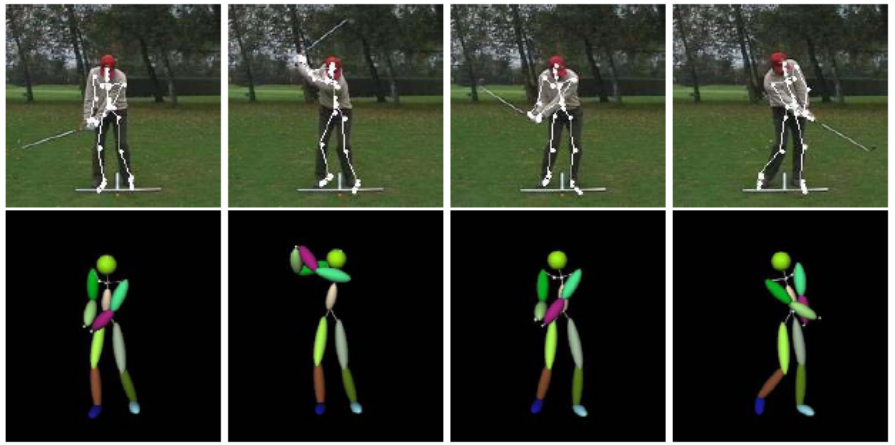
Visualizations in Sport







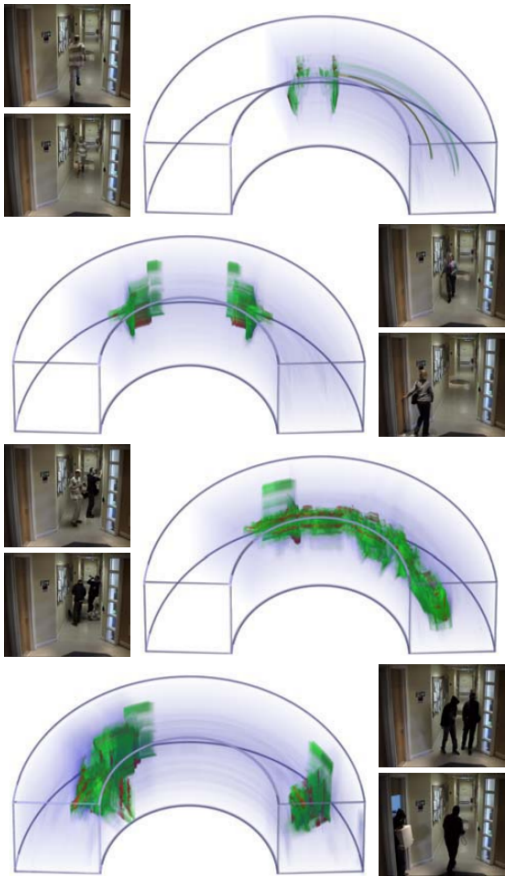


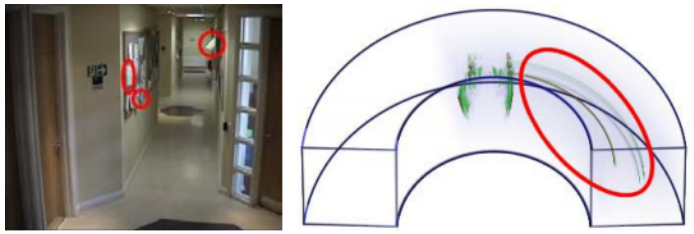


What is Video Visualization?

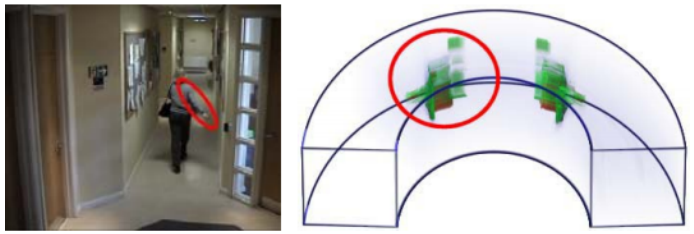
* A process to:
  * Depict key information from a video by means of visual representation.
  * Reduce viewing time of video content by means of visual representation.
  * Enhance analysis by identifying trends or characteristics.

Surveillance Video Visualization (1)

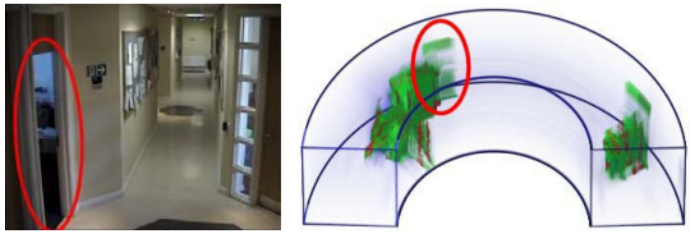




(a) changes that remain for a period.

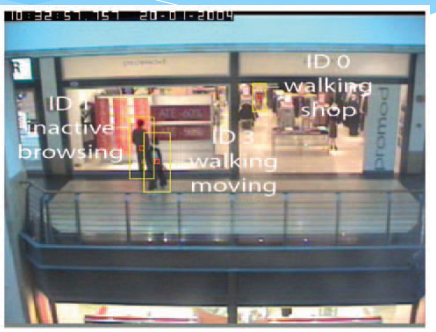


(b) walking with moving arms



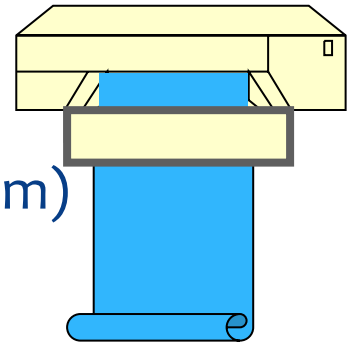
(c) door opening

Surveillance (2)



* Record motion similar to Electrocardiogram (ECG) and Seismographs.

* VPG (VideoPerpetuoGram)



Sports Video Visualization

* Sports relies heavily on video capture
  * TV broadcast
  * Coaching practice

* Reduce video viewing time for coaches and players.
* Could provide greater insight to their game.

Case Study: Snooker

Snooker

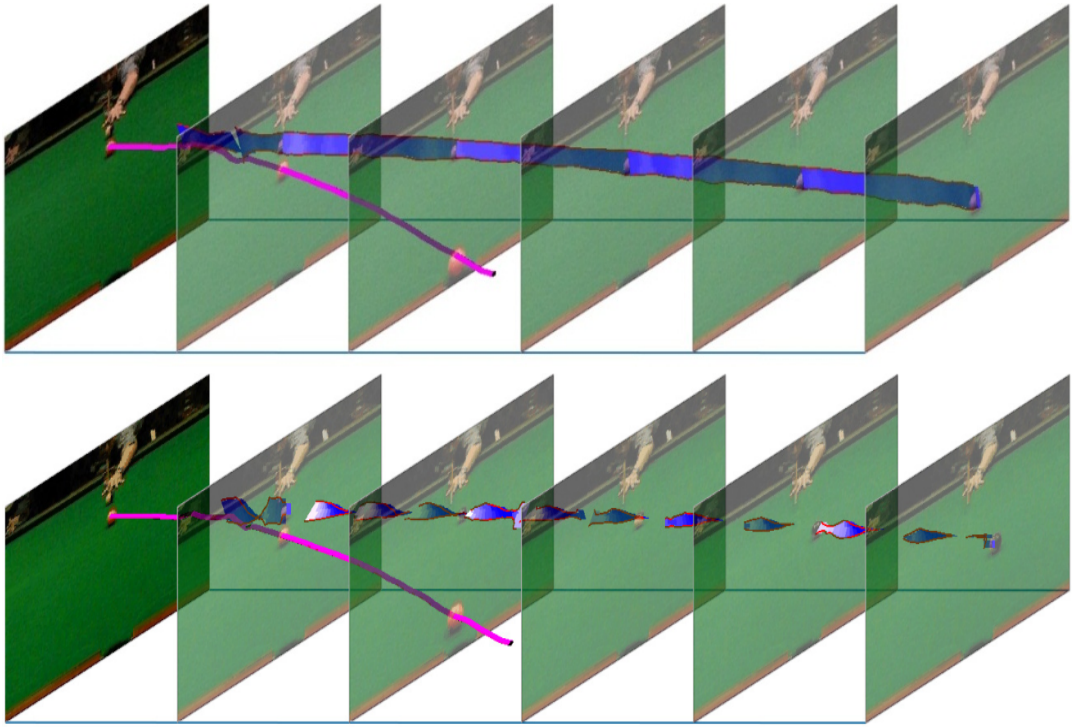
* Collaboration with Terry Griffiths Matchroom, Llaneilli.

* Aim to deliver both academic and commercial solutions that would benefit the sport.

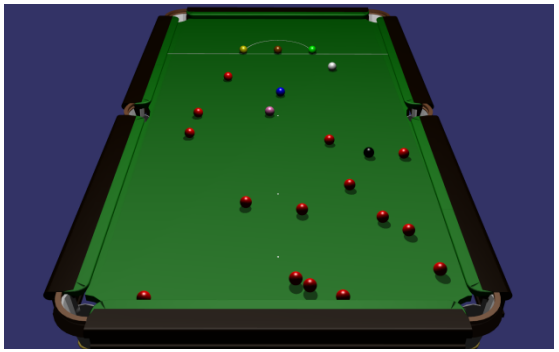
  * Well-defined set of rules.
  * Constrained play region (relives video capture issues).
  * Potential to expand research ideas to other sports.

Video Visualization in Snooker

* Video frames from a Snooker shot
  * Shows ball trajectory.
  * Can also introduce additional data
    * E.g., cueball spin.

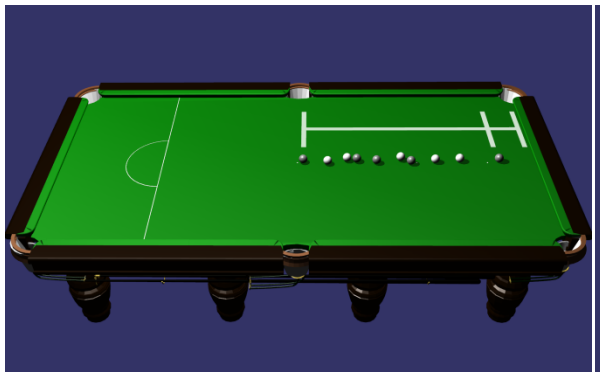


Animated 3D Reconstruction



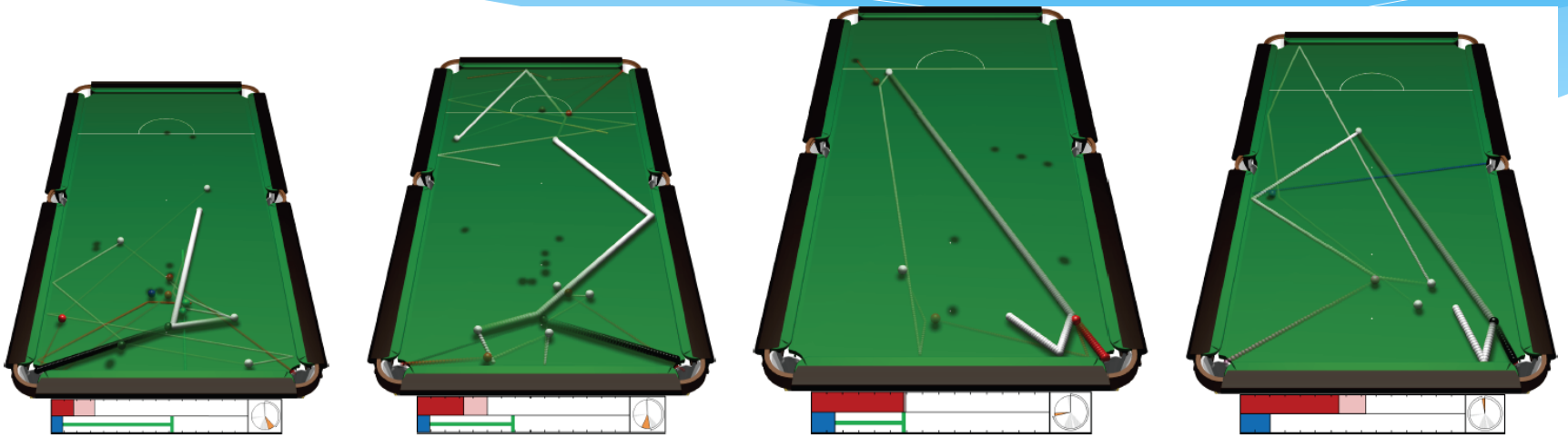
* 3D Reconstruction from Video
  * Single camera setup for video capture.
  * Reconstruction based on table measurements.
  * Automated ball/table detection and ball tracking.

Visualization for Sports Training



* Used for set-piece analysis
  * Combine multiple shots onto same visualization for comparison.
  * Can introduce scoring and assessment to measure performance.

Event Visualization

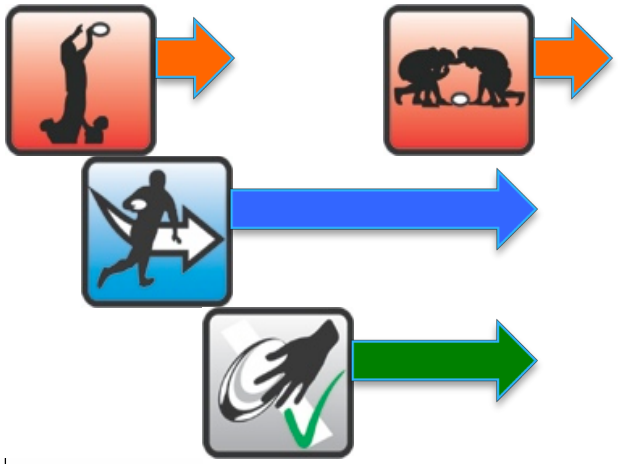


* Video Storyboard
  * Each illustration shows a sequence taken from the video.
  * Highlights the key action based on event importance.
  * Provides a quick summary rather than watching the full match video.

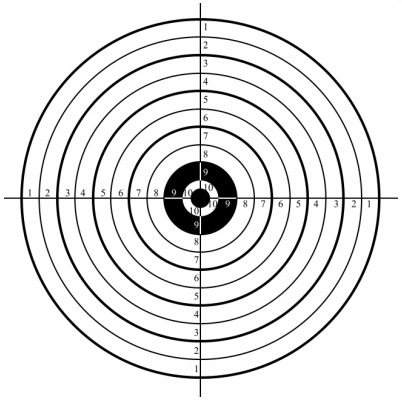
Future Works

Future Works

* Rugby data visualization
  * Player and match visualizations.
  * Summary and analysis tool.
  * Generated based on analyst input.
  * Collaboration with WRU.



* Shooting sports
  * Automated target system.
  * Based on video analysis.



Conclusion

* Visualization in Sport is rapidly increasing.
* Video Visualization highlights key data from video content, whilst reducing viewing time.
* Additional data sources (e.g. GPS, accelerometers) could also be combined to enhance visualization.

* We have explored Snooker and are now moving into other sports, including Rugby and Shooting.

Thank you for listening.

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