Sports Video Visualization

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vLunch (Cardiff University)

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College of Engineering

Introduction

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

- Team consists of:
    - 3 RA's: Phil Legg, Matthew Parry, David Chung.
    - Dr. Iwan Griffiths (P.I. / Sports Science / Engineering)
    - Professor Min Chen (Computer Science)
    - Dave Marshall (Computer Science)
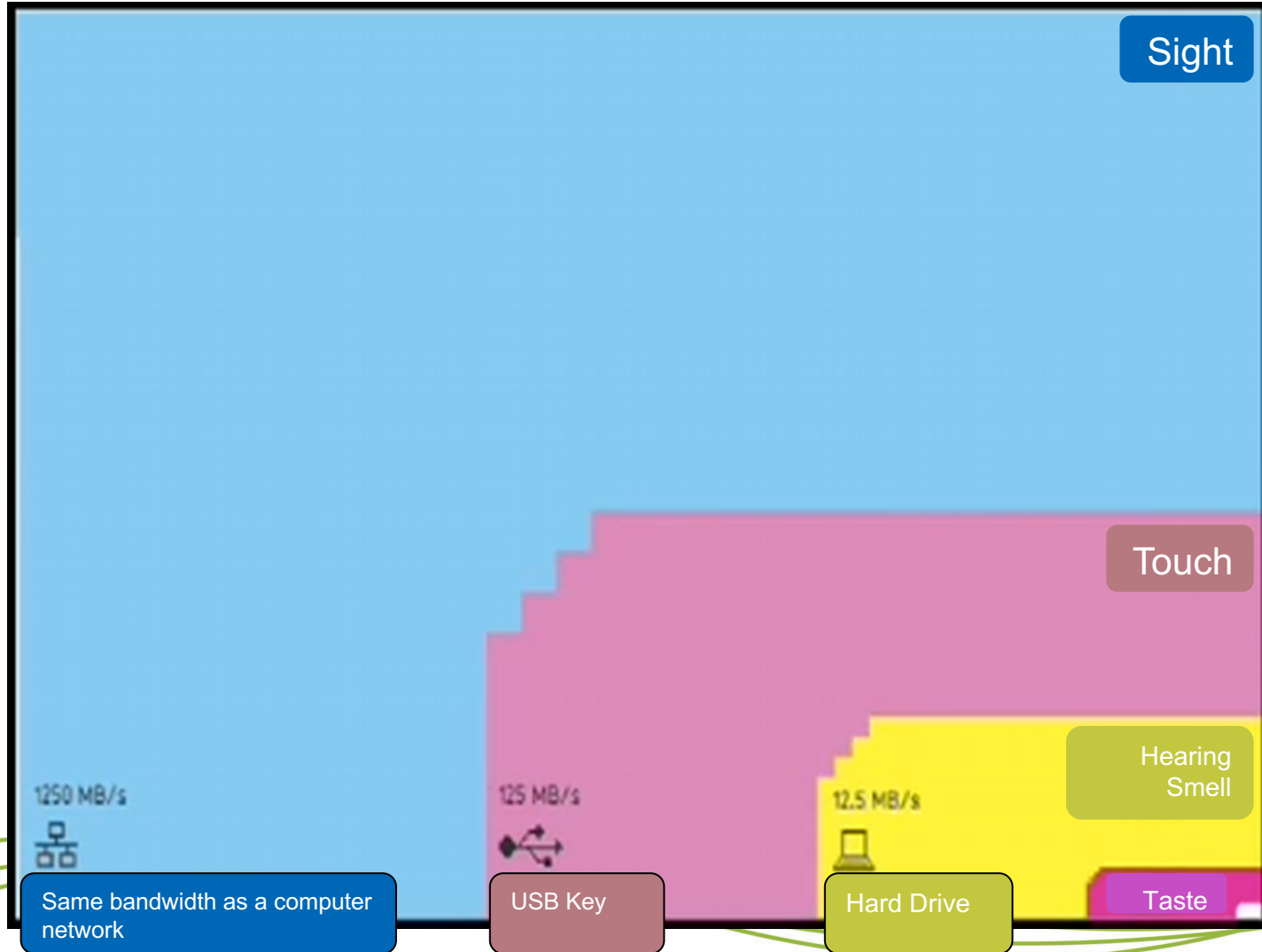   - Adrian Morris (Commercial Director)

Introduction

- Partnerships between Universities and Industry.

  - Swansea, Cardiff and Oxford University.

  - Terry Griffiths Snooker Matchroom.

  - Absolute Sports Group.

  - Welsh Rugby Union.

  - Quintic Consultancy.

- Funded by Welsh Government (A4B / CIRP).

What is Visualization?

Visualizing Human Senses

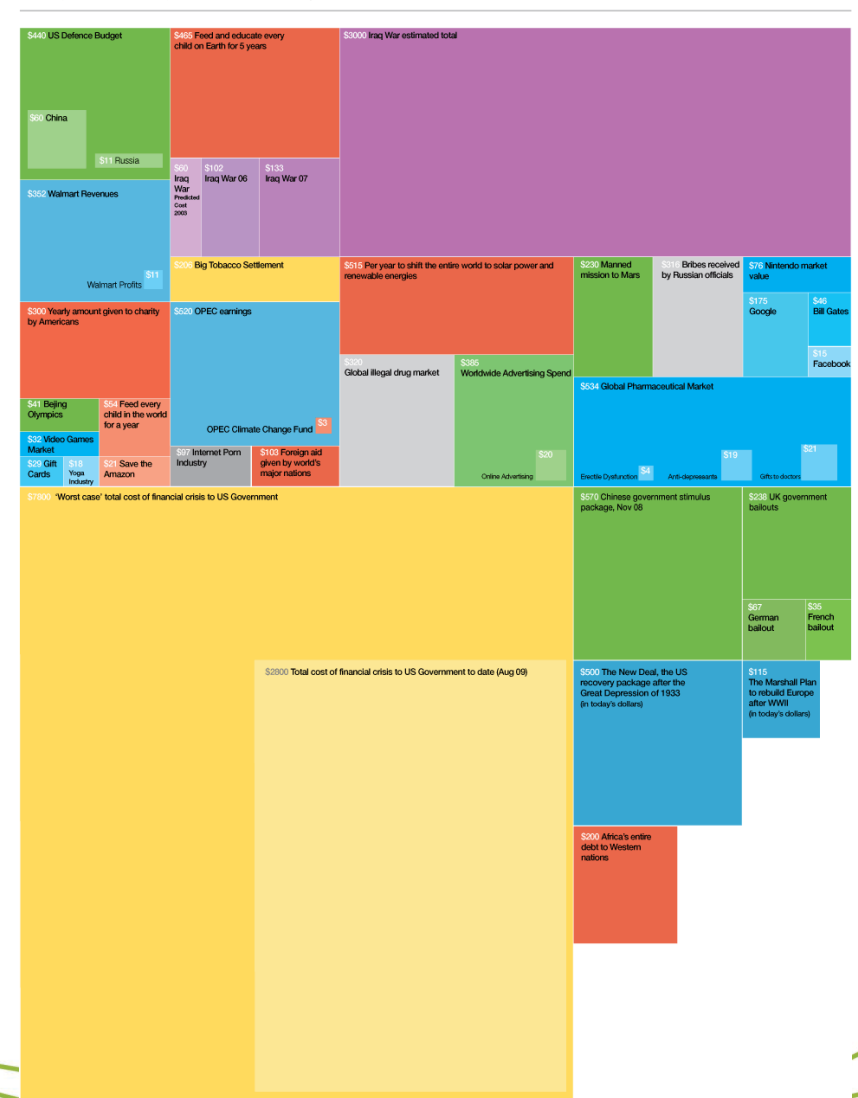*Visualization of Human Senses created by Danish physicist **Tor Nørretranders***
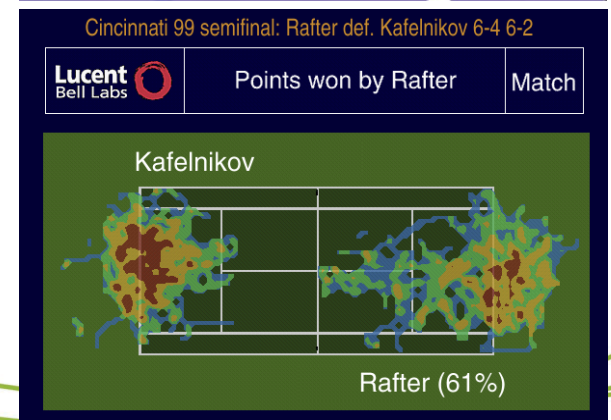
What is Visualization?
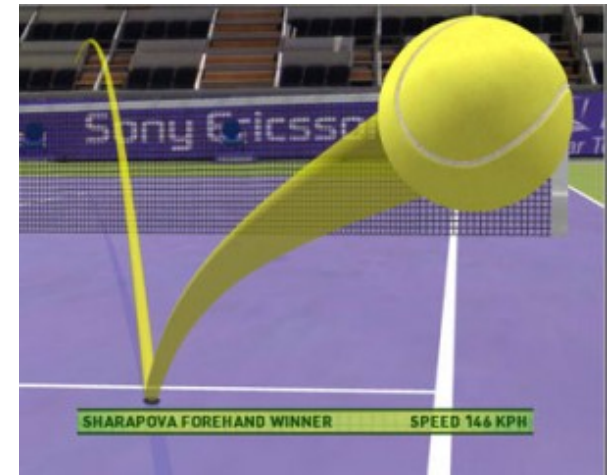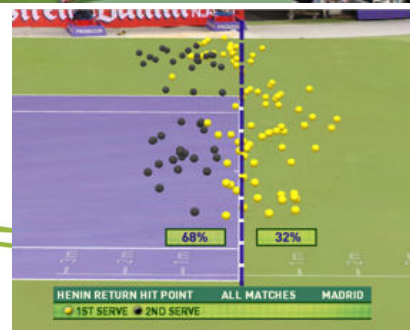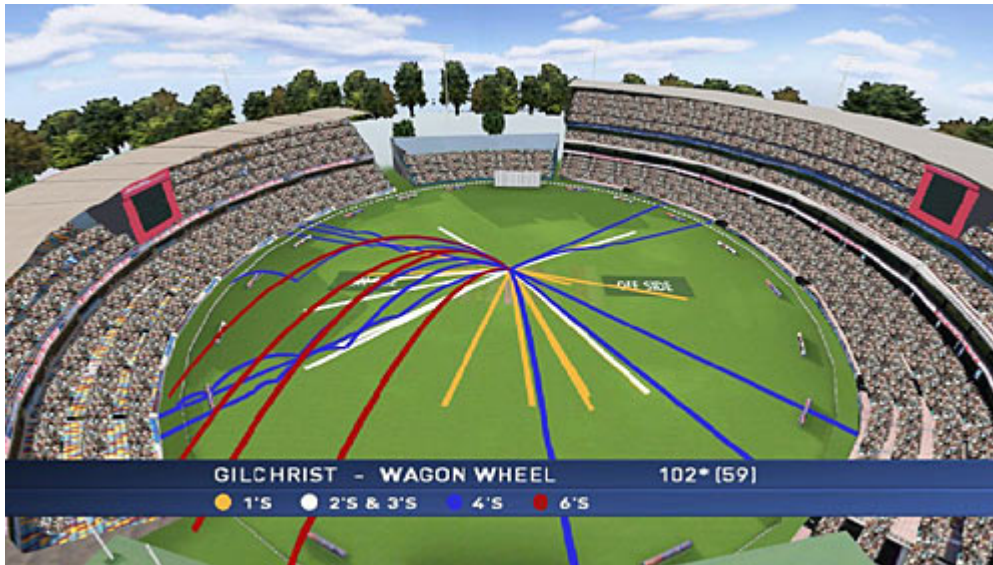
- Enhancing human perception of data.

- Mechanism to aid data exploration and understanding.

- Data in visual form for simple user interpretation.
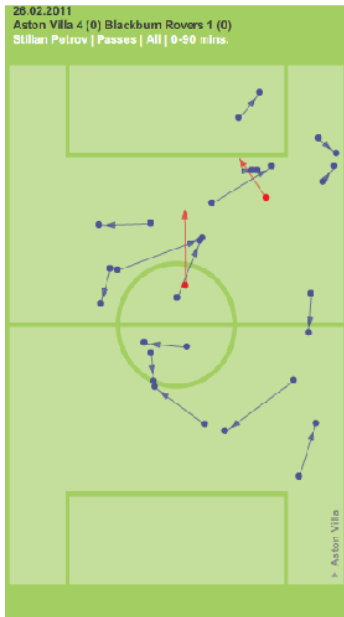
- "Don't try to tell them what the data means, present it and let them decide"

Visualizations in Sport

Visualizations in Sport

What is Video Visualization?

- Depict key information from video by visual representation.

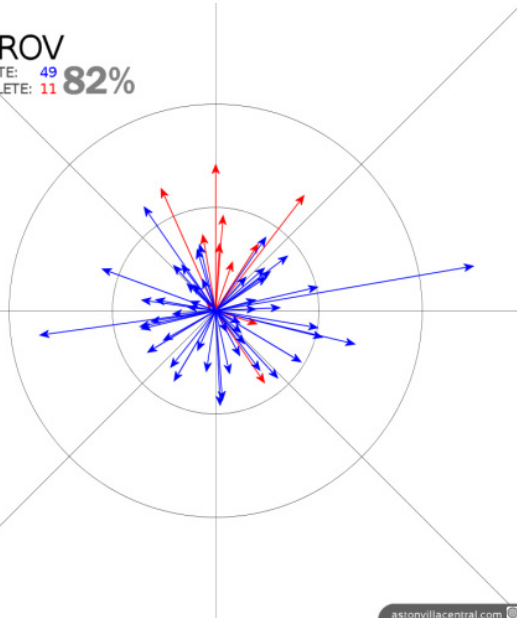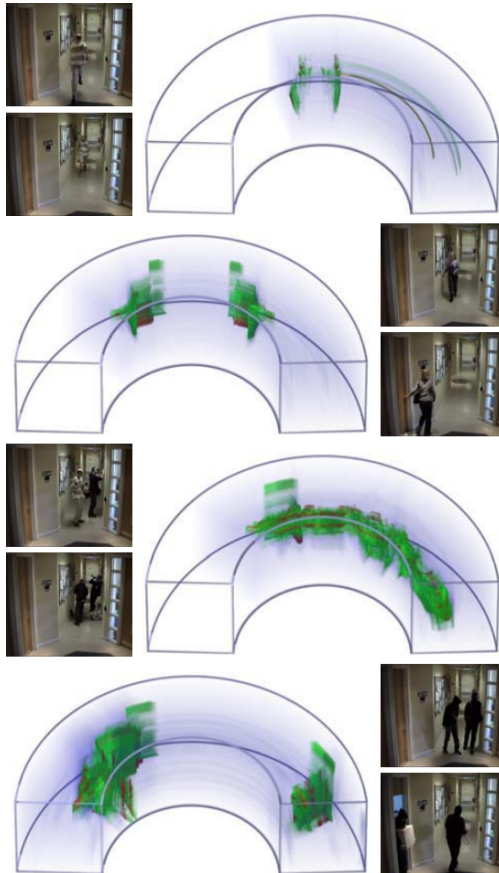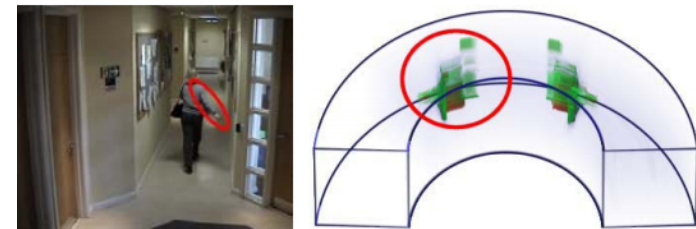- Enhance analysis by identifying trends or characteristics.

- Reduce time required to interpret video data.
    - Especially important for sports coaches.
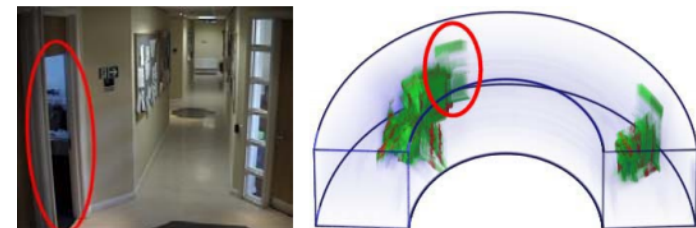
Surveillance Video Visualization (1)

(a) changes that remain for a period.

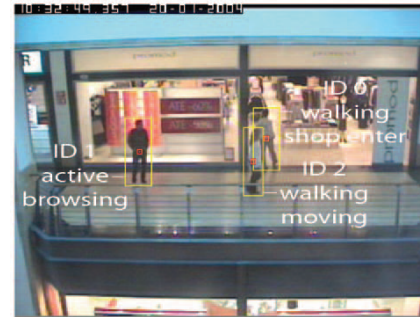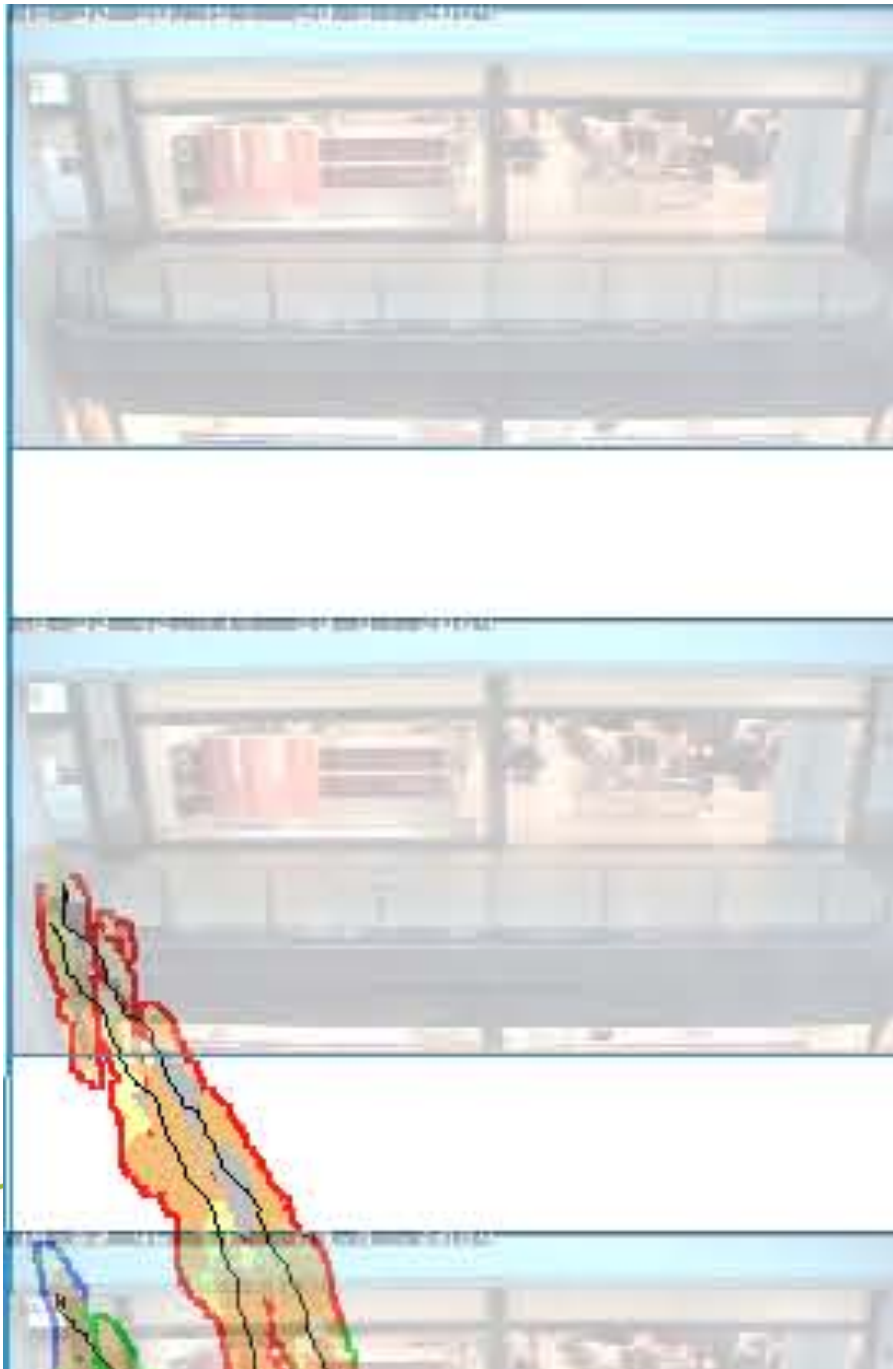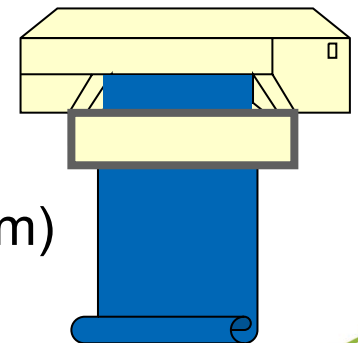(b) walking with moving arms

(c) door opening

Surveillance (2)

Record motion similar to
  Electrocardiogram (ECG)
  and Seismographs.

VPG
  (VideoPerpetuoGram)

Sports Video Visualization

Video is an important aspect in sport

- TV broadcast

- Training / Coaching

Sports Video Visualization can be used for:

- Performance analysis

- Relieving coaching time

- Additional insight into game factors.

Sports Video Visualization

So far we have focused on **Snooker** and **Rugby**.

Could be applied to other sports.

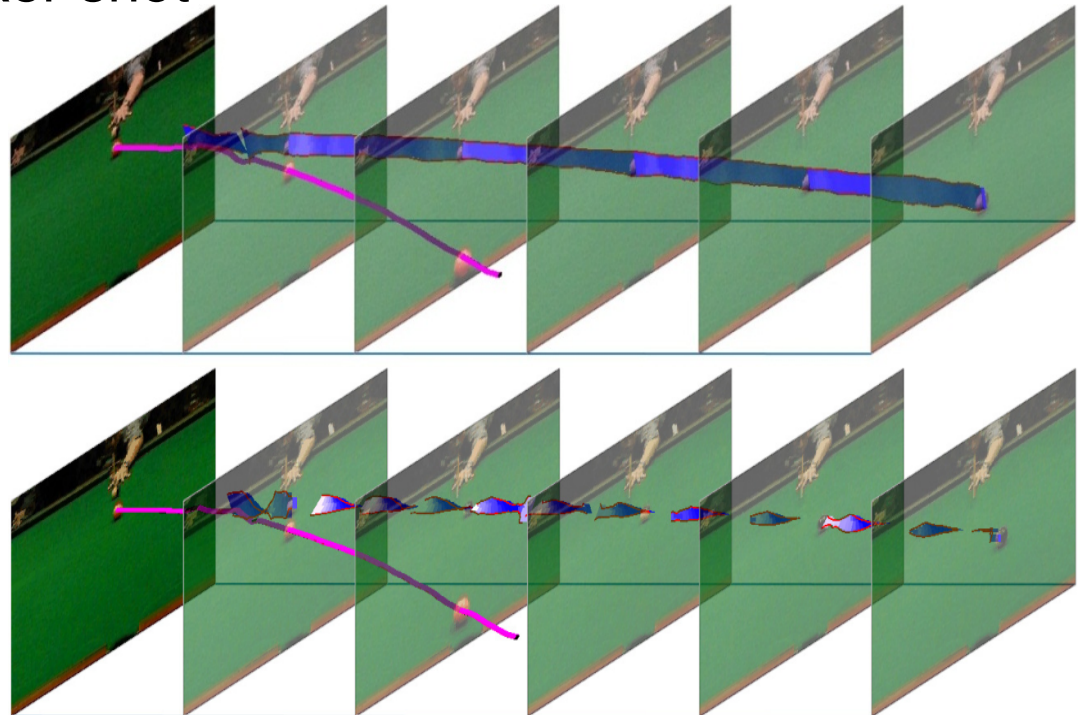Future work includes expanding on current sports, and investigating Football and Shooting.

Snooker

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.

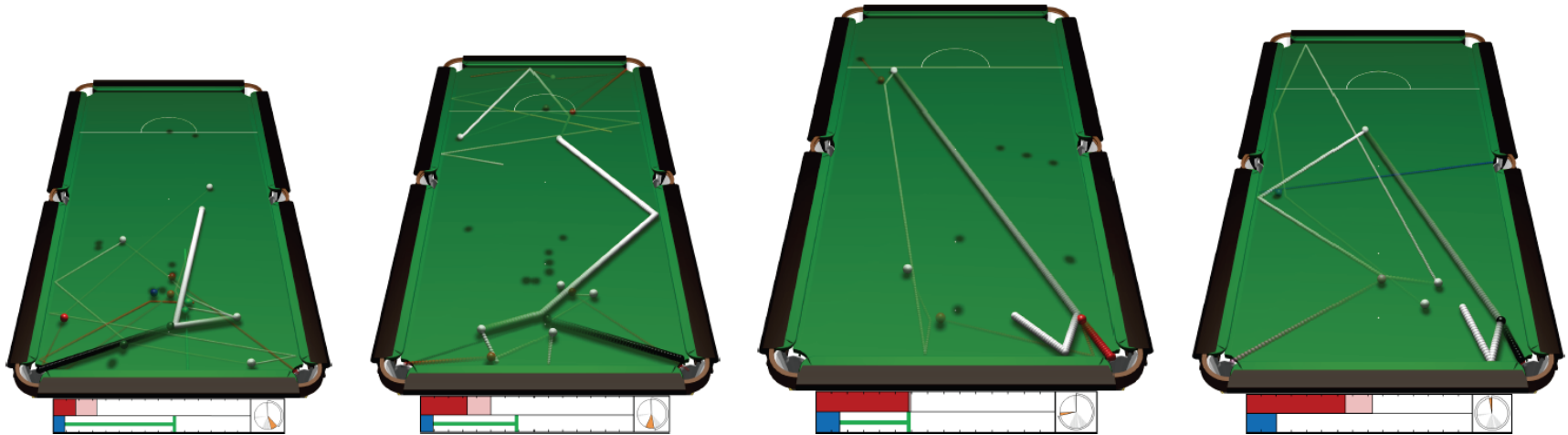# Visualization for Sports Training

Used for set-piece analysis

- Combine multiple shots onto same visualization for comparison.

- Can introduce scoring and assessment to measure performance.
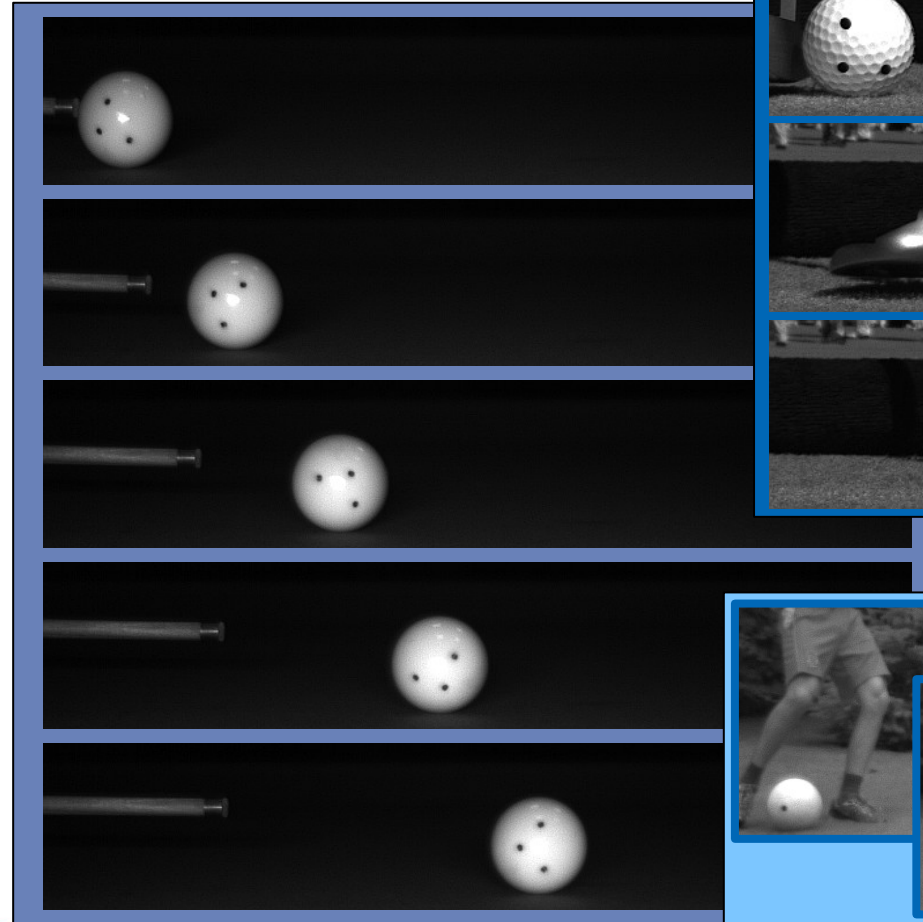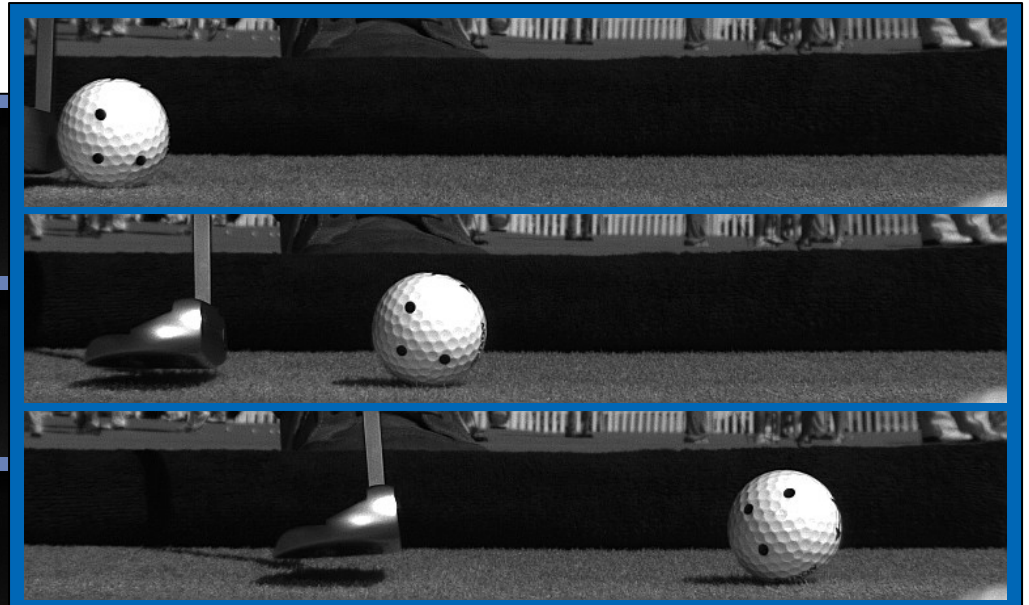
Event Visualization

Video Storyboard

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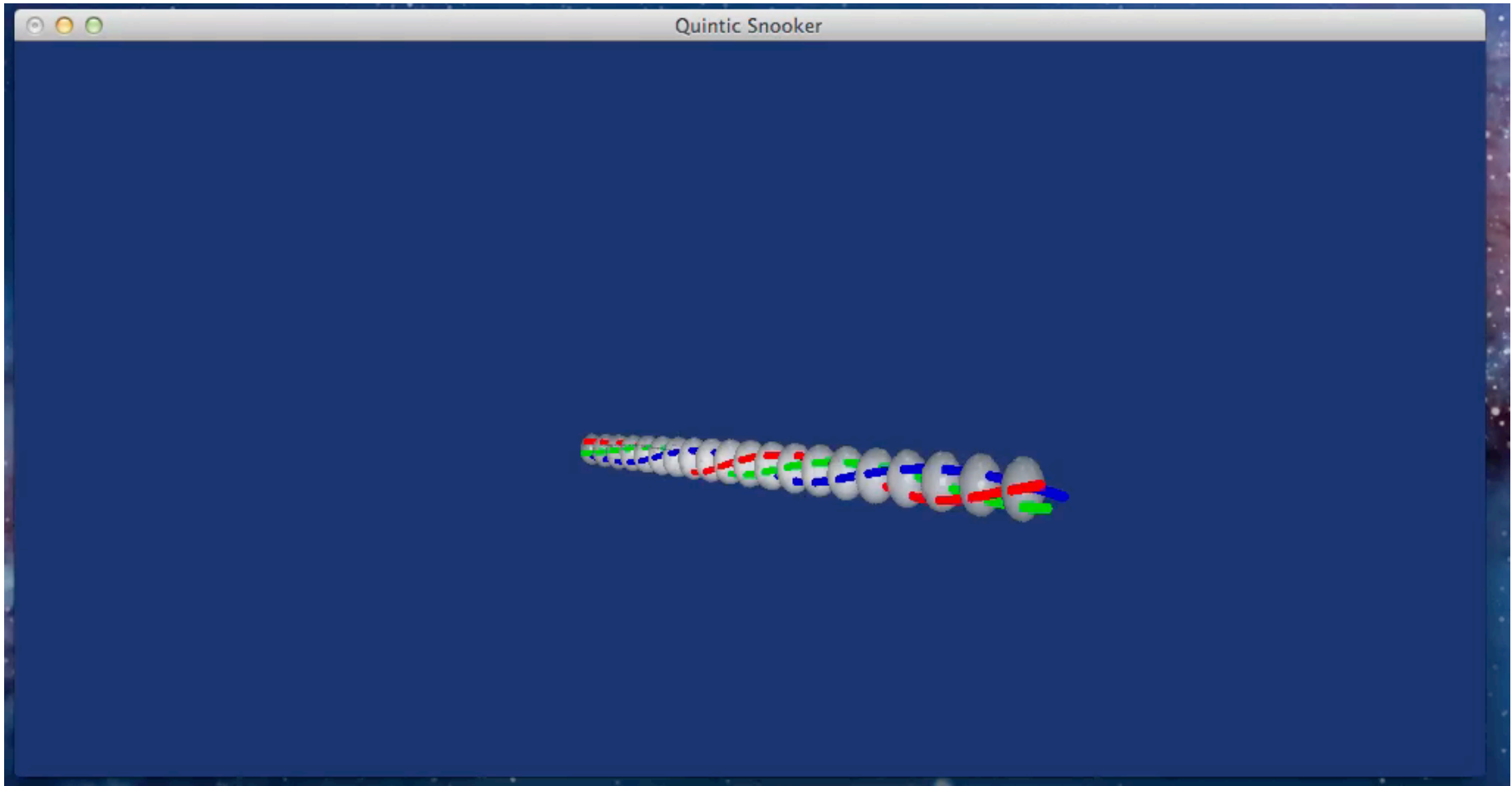- Provides a quick summary rather than watching the full match video.

Interactive Snooker Training System

- Interactive Snooker training table.

  - Camera and projector mounted above the table.

  - Action recorded by camera and processed.

    - Detect ball objects and tracked positions.

  - Action is projected back onto the table after shot.

    - Can review multiple shots together.

  - For use with a training scheme that provides a measure of player performance.

  - Player could interact using detected hand gestures.

Ball Spin Visualization (Quintic)
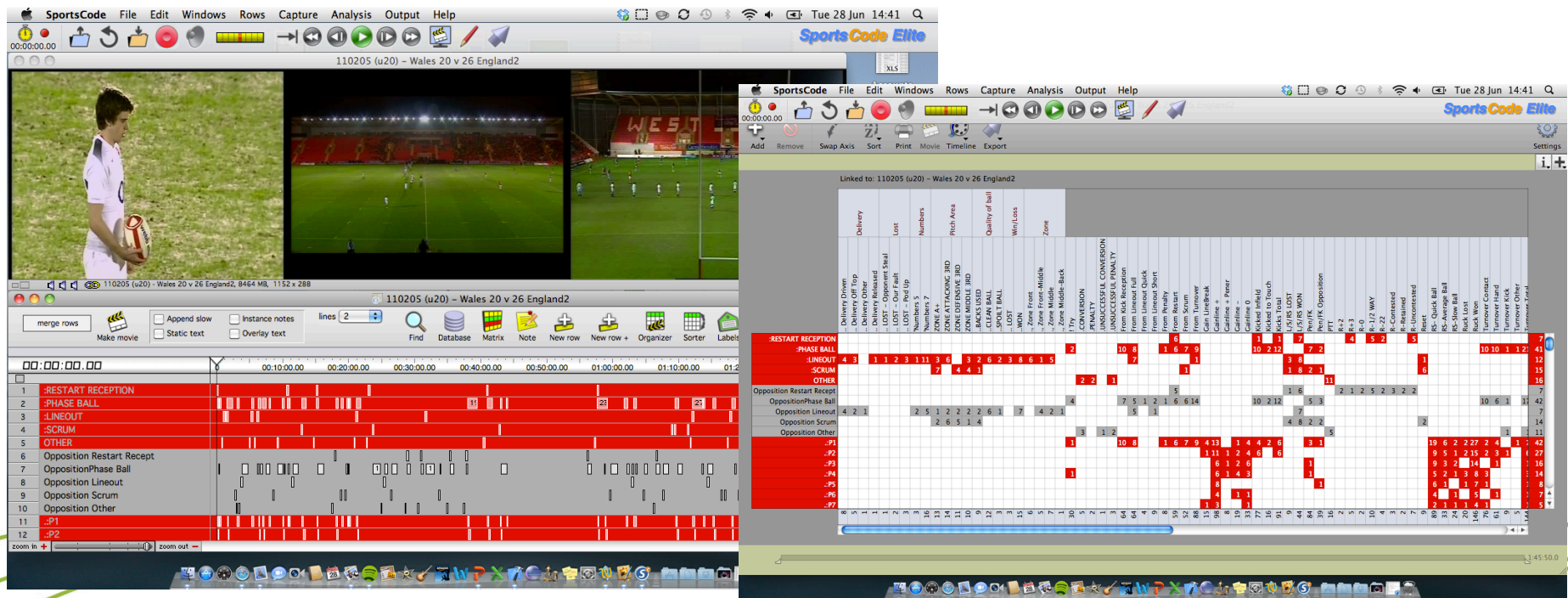
Ball Spin Visualization

Rugby

Rugby
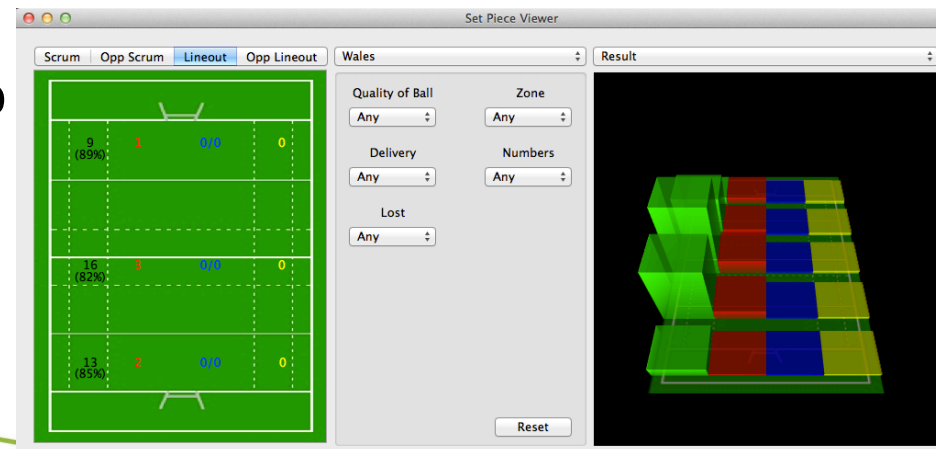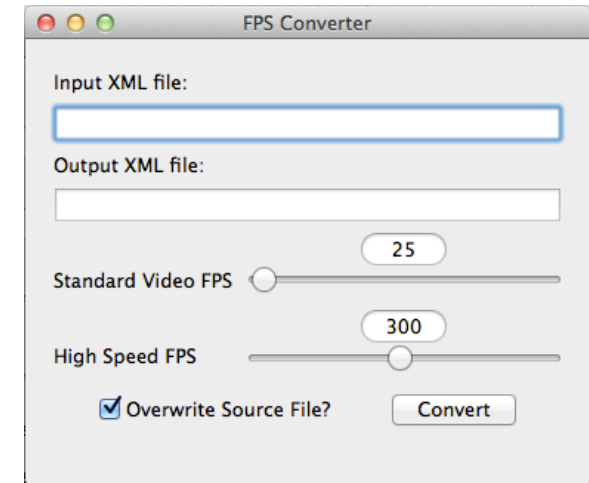
- Collaborative project with Welsh Rugby Union.

- Working with Chief Analyst (Rhys Long).

- Data Visualization of SportsCode software.

Analysis Tools

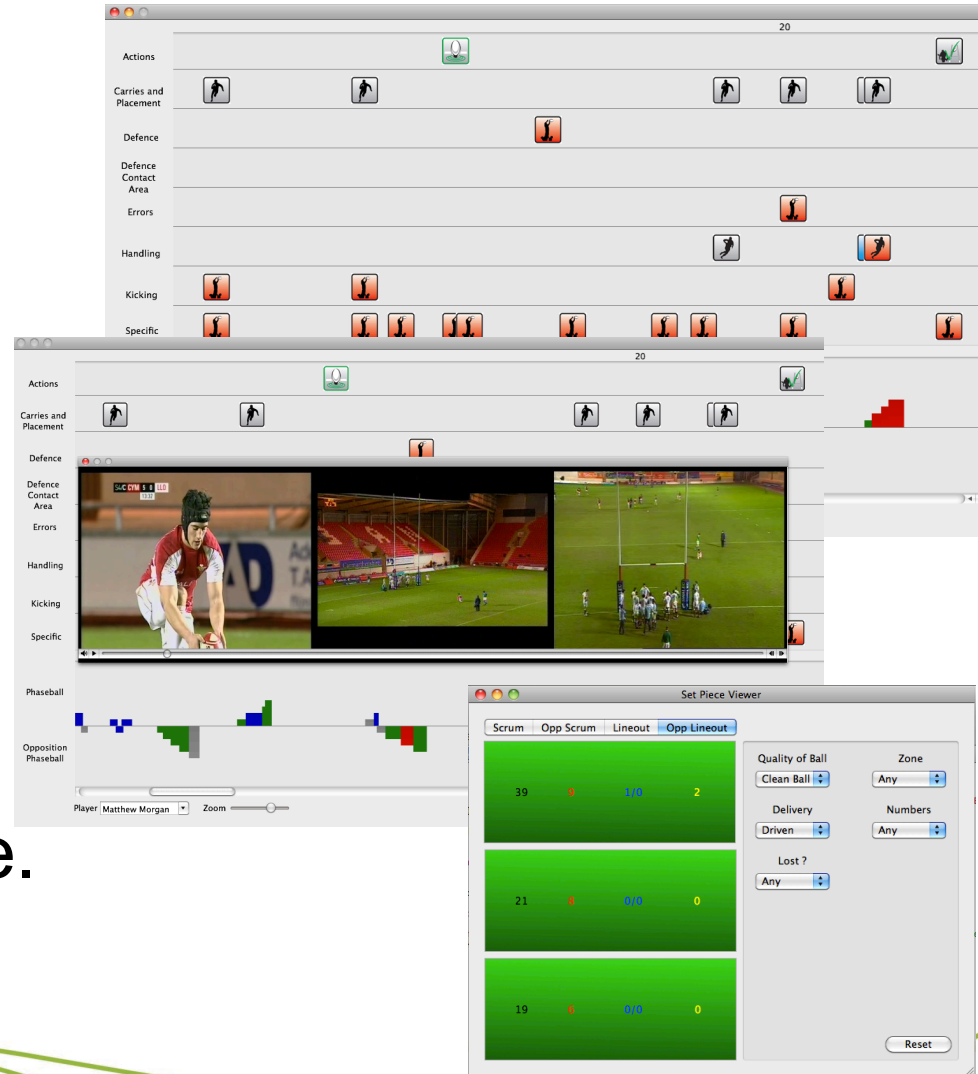Swansea University
Prifysgol Abertawe

- We have developed analysis tools for the Welsh Rugby Union to improve data understanding:

  - Frames per Second convertor – for the conversion of high speed video coding.

  - Set Piece Analyser – to analyse sets of previous match data
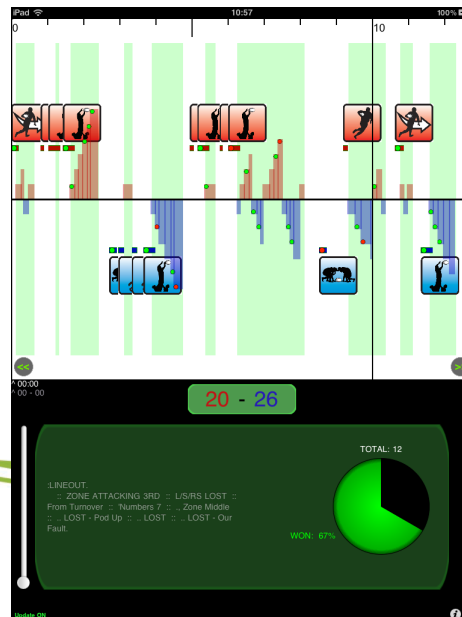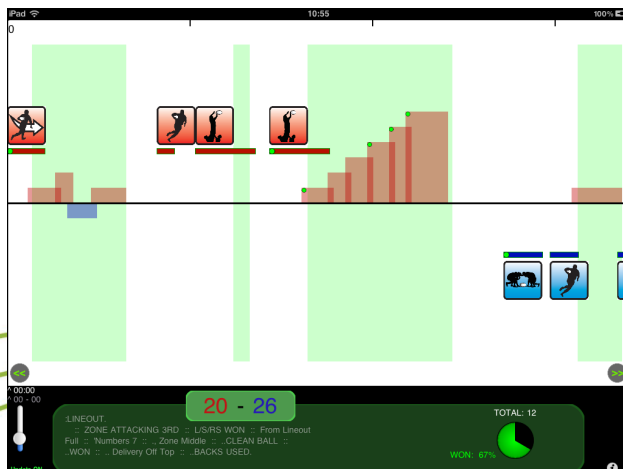
Rugby Data Visualization

We bring visualization to rugby to help analyse player and match events.

This can be used to identify trends and analyse performance.

iPad Application

We have extended this to a real-time iPad application.

WRU are using this at the Rugby World Cup 2011.

Conclusions

- Visualization helps humans to quickly interpret meaning from data.

- Visualization of Sports data can dramatically help to:

  - Analyse player performance.

  - Identify trends and characteristics.

  - Reduce time spent reviewing video data.

Thank you!