Ball Tracking and Prediction

Capstone Advisor - Dr Masoud Makrehchi

The Group

Kunj Patel - Software

Parth Suthar - Software

Jehro Celemin - Software

Shreyans Rishi - Software

Goal

- Automate a camera for broadcasting and reduce the number of personnel needed.

- 3 steps
  - Identify and track ball in footage
  - Predict the ball movement
  - Have camera follow the ball

Our Choices

- Basketball
- Python
- Multi camera system
    - Stationary detection camera(s)
    - Rotating broadcast camera

Existing Software

- Second Spectrum and SportsVU
- Human Broadcasting
- Hudl Focus
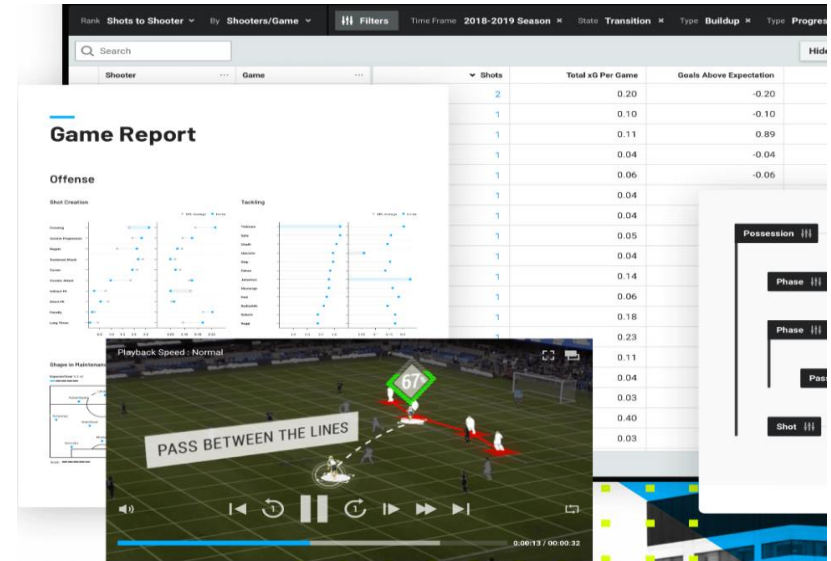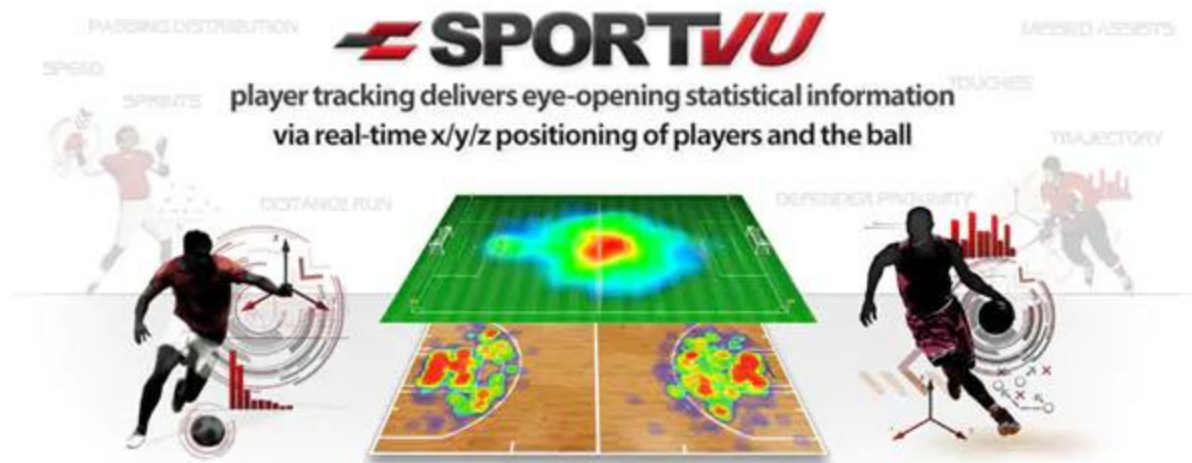
Other Factors

- Ethics
  - Privacy
- Safety Considerations
  - Hardware
- Security
- Usability
- Cost

Progress Timeline

- Started with ML
- Youtube Footage
- Used Moving Video
- NBA 2K Footage
- Full Court Ridgeback Video

Difficulties

Tried using youtube footage

- Low quality
- Not stationary

Hard to set parameters

- Ball, court, and players similar in color
- Ball is a blur in most frames

Real Footage has variable lighting

Our Solution

- Video from full court camera
- Processed by software
- Virtual camera for highlights
- Real camera for broadcast

Software Implementation

- Ball Detection
  - Frame limit
  - Image subtraction
  - Color filtering
  - Erosion and dilation
  - Proximity detection
  - Frequency verification

- Digital Camera Movement
  - Movement and Zoom
  - Pseudo-acceleration

Hardware Implementation

- Custom 3D Printed Parts
- Stepper Motor Control
- Small Camera

Demo

Future Steps

- Testing of NBA Scenarios
- Predict Movement
- Player Tracking
- Identification of Key Events
- Testing Outside NBA Scenarios
    - Baseball
    - Football
    - Soccer

Goal