Automatically Scout Sports Video

Who We Are

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- Team led by University of Illinois Electrical & Computer Engineering (top 3 in nation) faculty

- $1.7 million for August 2011 – August 2014

Research Advances

- In the last 2 years, we have:
  - 9 conference papers in top peer-reviewed conferences
  - 1 paper in top tier journals

Outcomes: Publications

- Jagannadan Varadarajan, Indriyati Atmosukarto, Shaunak Ahuja, Bernard Ghanem, Narendra Ahuja, "A Topic Model Approach to Represent and Classify American Football Plays," BMVC 2013

- Tianzhu Zhang, Bernard Ghanem, Changsheng Xu, Narendra Ahuja, "Object Tracking by Occlusion Detection via Structured Sparse Learning," CVPRW 2013 (CVsports)

- Indriyati Atmosukarto, Bernard Ghanem, Shaunak Ahuja, Karthik Muthuswamy, Narendra Ahuja , "Automatic Recognition of Offensive Team Formation in American Football Plays," CVPRW 2013 (CVsports) [best paper]

- Tianzhu Zhang, Bernard Ghanem, Narendra Ahuja , "Low-Rank Sparse Learning for Robust Visual Tracking," ECCV 2012

- Indriyati Atmosukarto, Bernard Ghanem, Narendra Ahuja , "Trajectory-based Fisher Kernel Representation for Action Recognition in Videos," ICPR 2012

- Bernard Ghanem, Maya Kreidieh, Marc Farra, Tianzhu Zhang , "Context-Aware Learning for Automatic Sports Highlight Recognition," ICPR 2012

- Tianzhu Zhang, Bernard Ghanem, Si Liu, Narendra Ahuja , "Robust Visual Tracking via Multi-Task Sparse Learning," CVPR 2012 [oral, 2.5%]

- Bernard Ghanem, Tianzhu Zhang, Narendra Ahuja, "Robust Video Registration Applied to Field-Sports Video Analysis," ICASSP 2012

- Tianzhu Zhang, Bernard Ghanem, Narendra Ahuja, "Robust Multi-Object Tracking via Cross-Domain Contextual Information for Sports Video Analysis," ICASSP 2012

Real World Applications

Patents

- Bernard Ghanem, Shaunak Ahuja, Tianzhu Zhang, and Indriyati Atmosukarto, "Video Analysis Based on Sparse Registration and Multiple Domain Tracking" (US Provisional Patent Application: Serial No. 61/614,146, filed 3/22/2012)

Licenses

- Singapore Sports Council (SSC) licensed a customized tablet app for table tennis analysis
- Negotiating License for Rights to American Football in United States

Industrial Outreach Targets

- XOS Digital Inc. = leading sports software provider for American Football in the US
  - 70% of college football teams + 60% of NFL pro teams
- ESPN = global leader in sports broadcasting and news
- Singapore Sports Council (SSC)
  - first adopters for ADSC's table tennis package
- Football Association of Singapore

In the news …

SPORTS ANALYSIS PROGRAM

SOFTWARE HELPS S'PORE ATHLETES WATCH THE BALL

ALYWIN CHEW
Assistant Sports Editor
alywin@mediacorp.com.sg

SINGAPORE – The national women's table tennis players may have shed many years of blood, sweat and tears preparing for last August's London Olympics.

But they also had some help from a state-of-the-art object-tracking and computerised sporting analysis software program called Auto-Scout to help them reach their peak before leaving for London.

According to the Singapore Sports Institute (SSI), AutoScout was used by the national table tennis coaches to generate video footage and statistical information about their paddlers' playing styles.

Developed by the Advanced Dig-ital Sciences Centre (ADSC) least

what you're seeing now are very basic 3D images – We want the graphics to look as good as those seen on the FIFA games!

Shaunak Ahuja
SPORTS APPLICATION
ANALYST AT THE
ADVANCED DIGITAL
SCIENCES CENTRE

backhand and forehand shots made by a player, detecting the type of spin on the ball and the points scored by players using different techniques, and even identifying whether a player concedes more points on his forehand or backhand.

The SSI had nothing but praise for the software.

"Our scientists, led by our Exec-utive Director, Associate Professor Fabian Lim, designed the platform architecture, and ADSC delivered very well with their enabling tech-nology and know-how in sports vis-ualisation and analytics," said SSI Assistant Director of Research and Development Su Chun Wei.

Su said the program stream-lined the analysis process for coach-es — only one coach was needed to perform the task as compared to before when an entire team of each

Video Analytics

Real World Impact

- Utility Patent Conversion
- License
- Outreach

XOS Technologies

ESRN

Disney Research

3D Visualization

Register

Track

Review

AUTOSCOUT

AutoScout :: Home   Help
Sports Directory

Choose Action

Video
Choose Game
OSU_Iowa_1
Choose Play
play_12.avi

Video Registration

Research

- 9 top conference papers
  - 2 video registration
  - 3 object tracking
  - 2 sports-related understanding
  - 1 action recognition
  - 1 highlight detection
- 1 top journal paper
  - 1 object tracking

Player Tracking

7

KICKOFF PLAY

Iowa @ Ohio State, Nov. 14, 2009

Opening Kickoff

Coaches want to know:
- Personnel Package
- Time of Kick
- Time of Catch
- Hang Time
- Spot of Kick
- Spot of Catch
- Kick Distance
- Kick Direction
- etc.

Video Registration

The process of mapping the video clip to the blue-print of the field (field model)
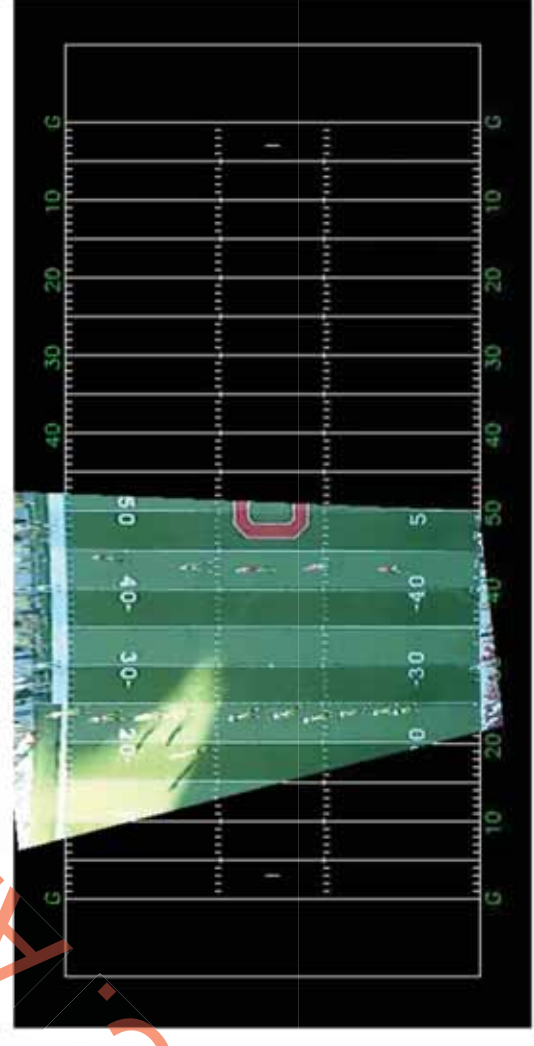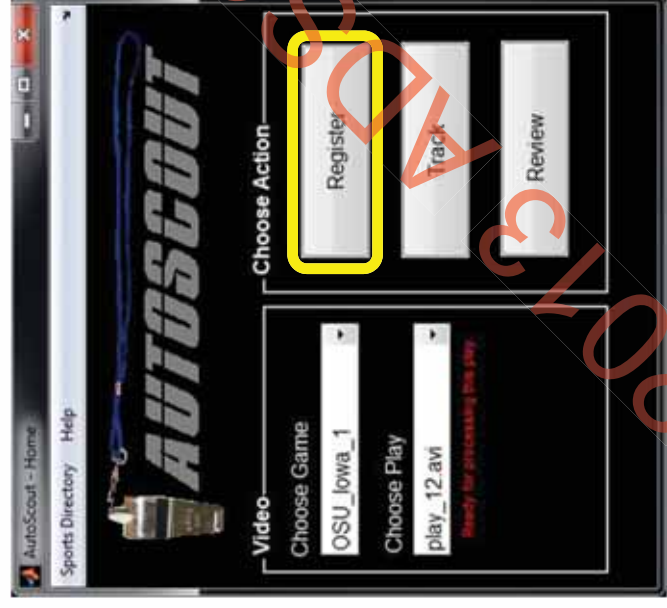
Player Tracking
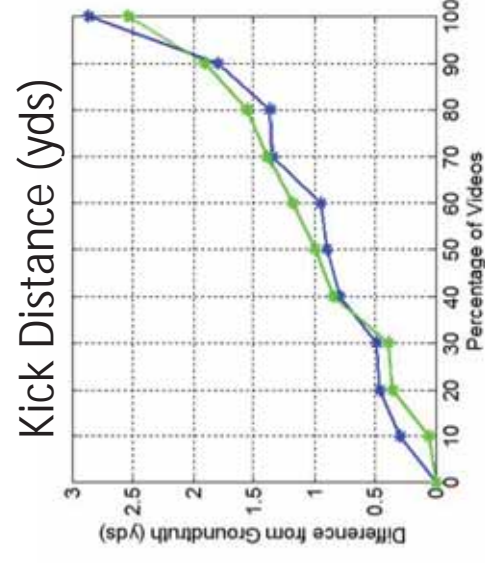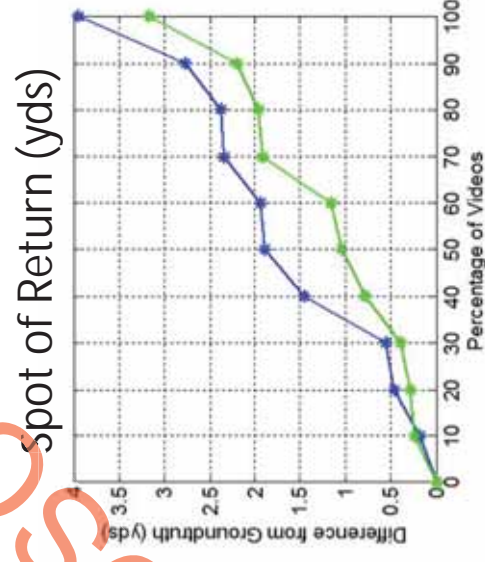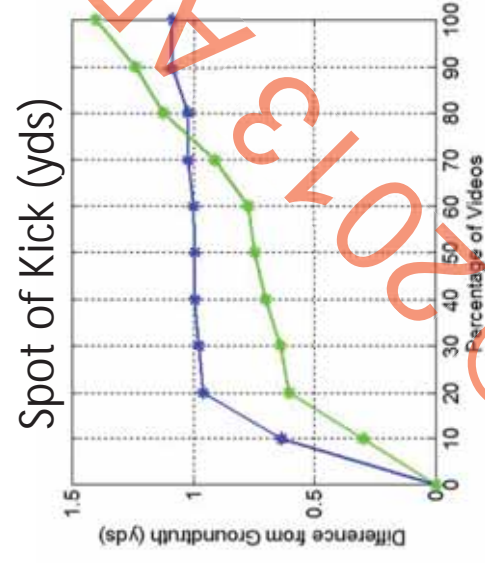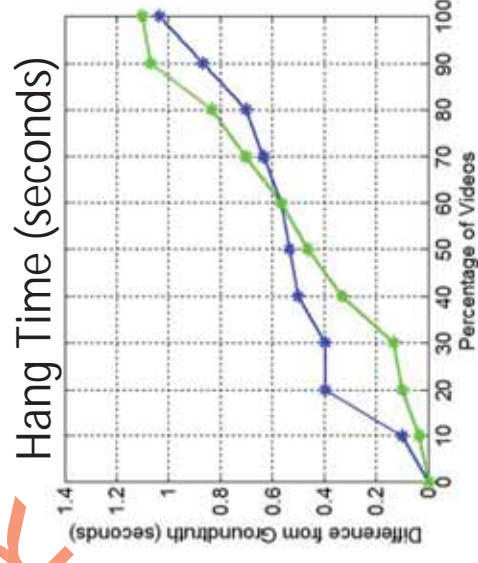
The process of locating a moving player in video over time
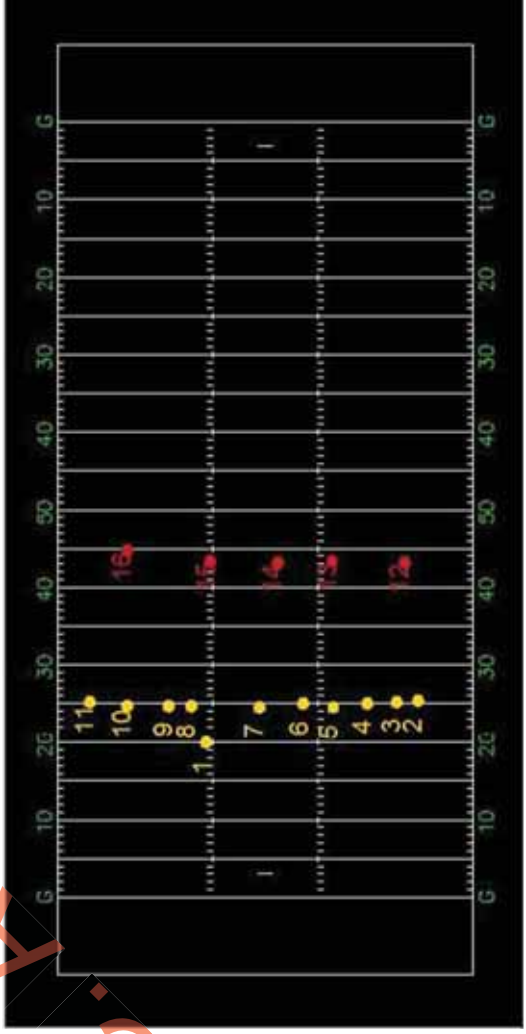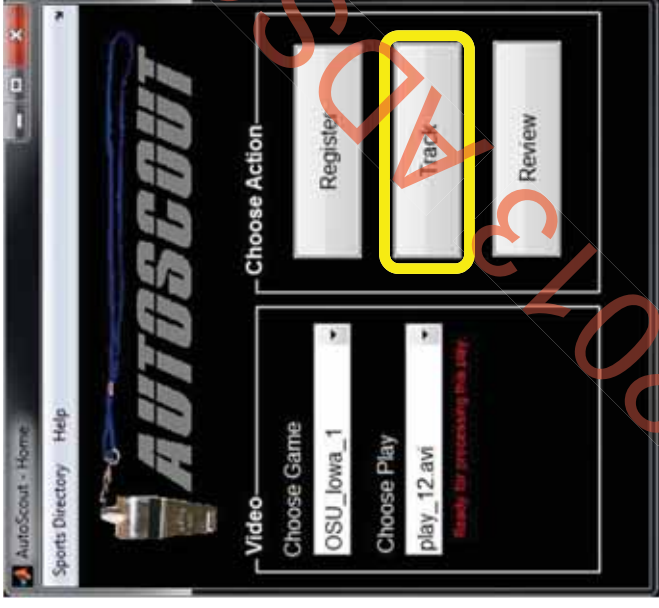
Statistics Extraction
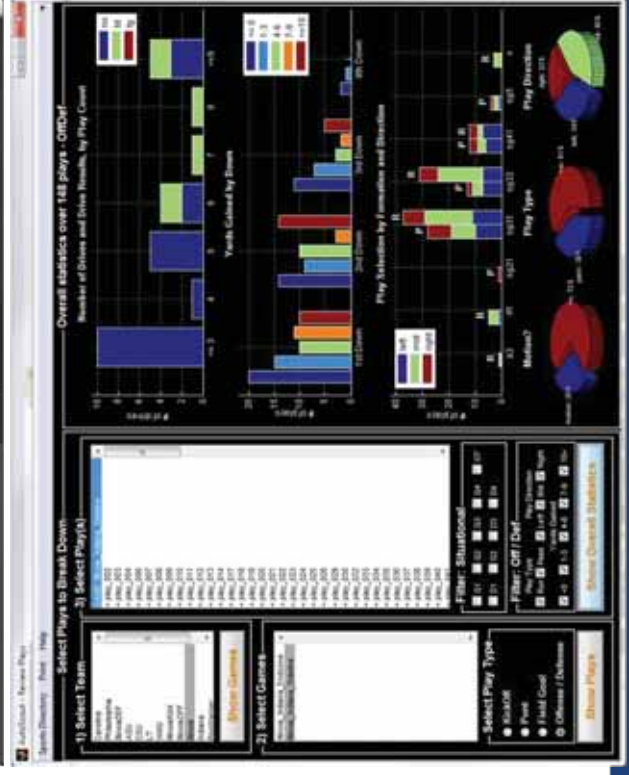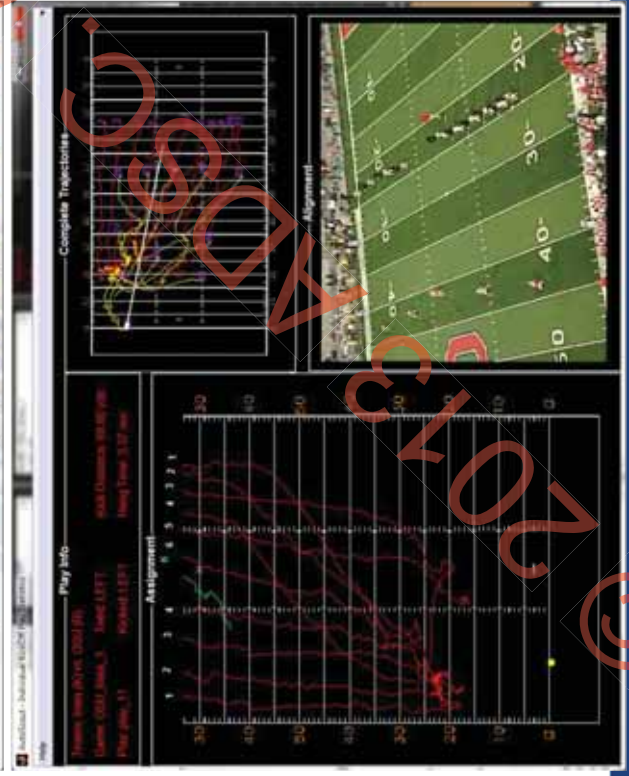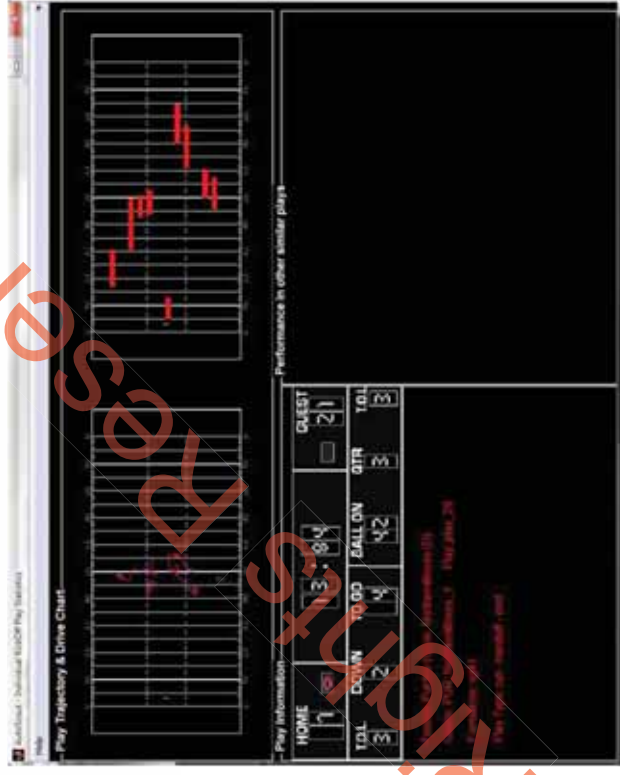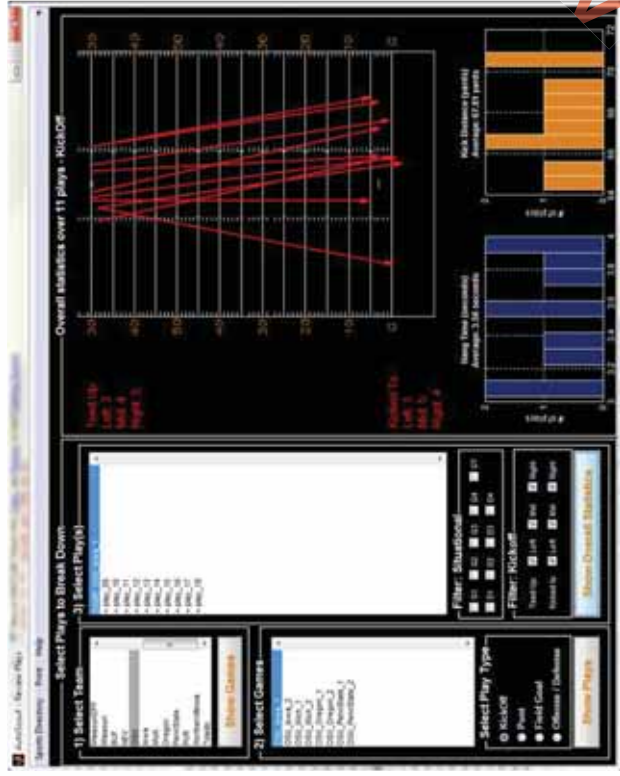
Stress Test Comparison

Standard Definition High Definition

Time of Kick (seconds)

Time of Return (seconds)

Hang Time (seconds)

Spot of Kick (yds)

Spot of Return (yds)

Kick Distance (yds)
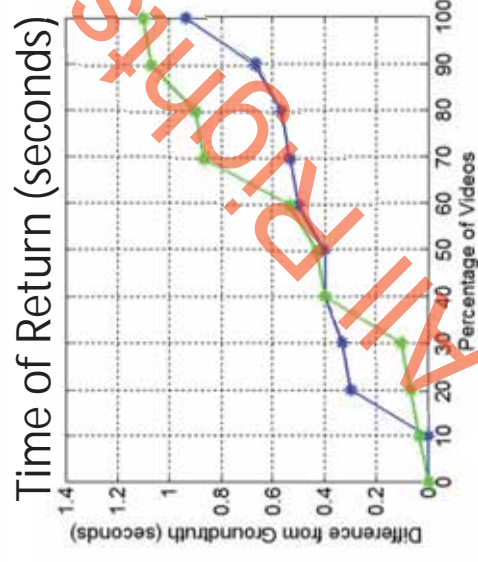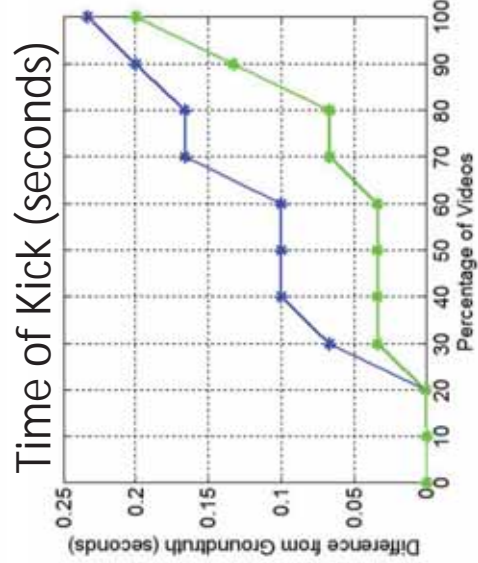
3D Visualization
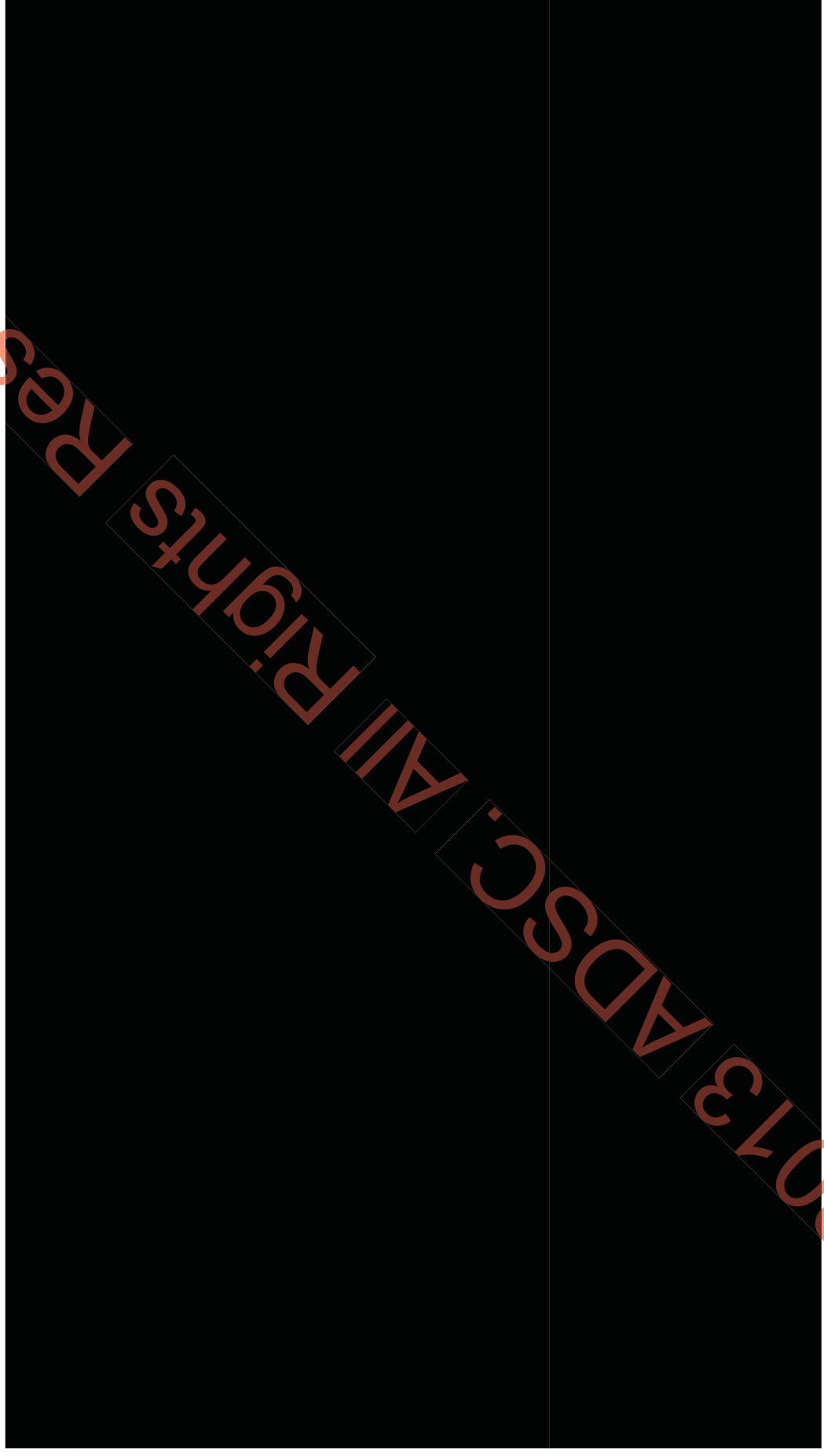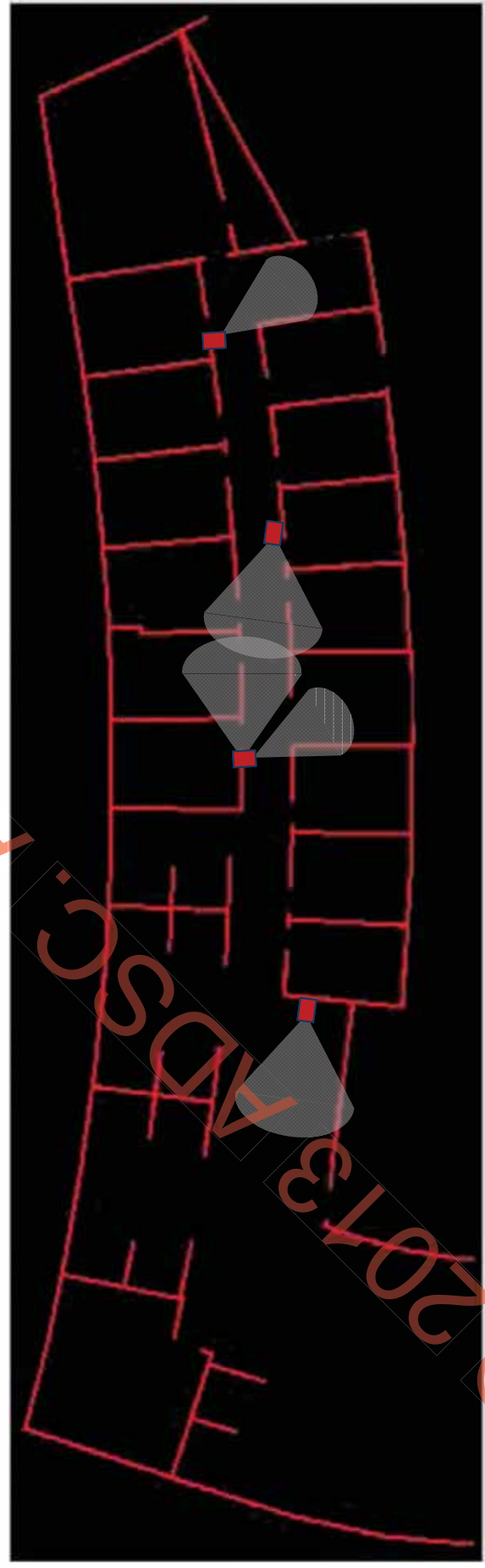
Security & Surveillance

Retail

Bank

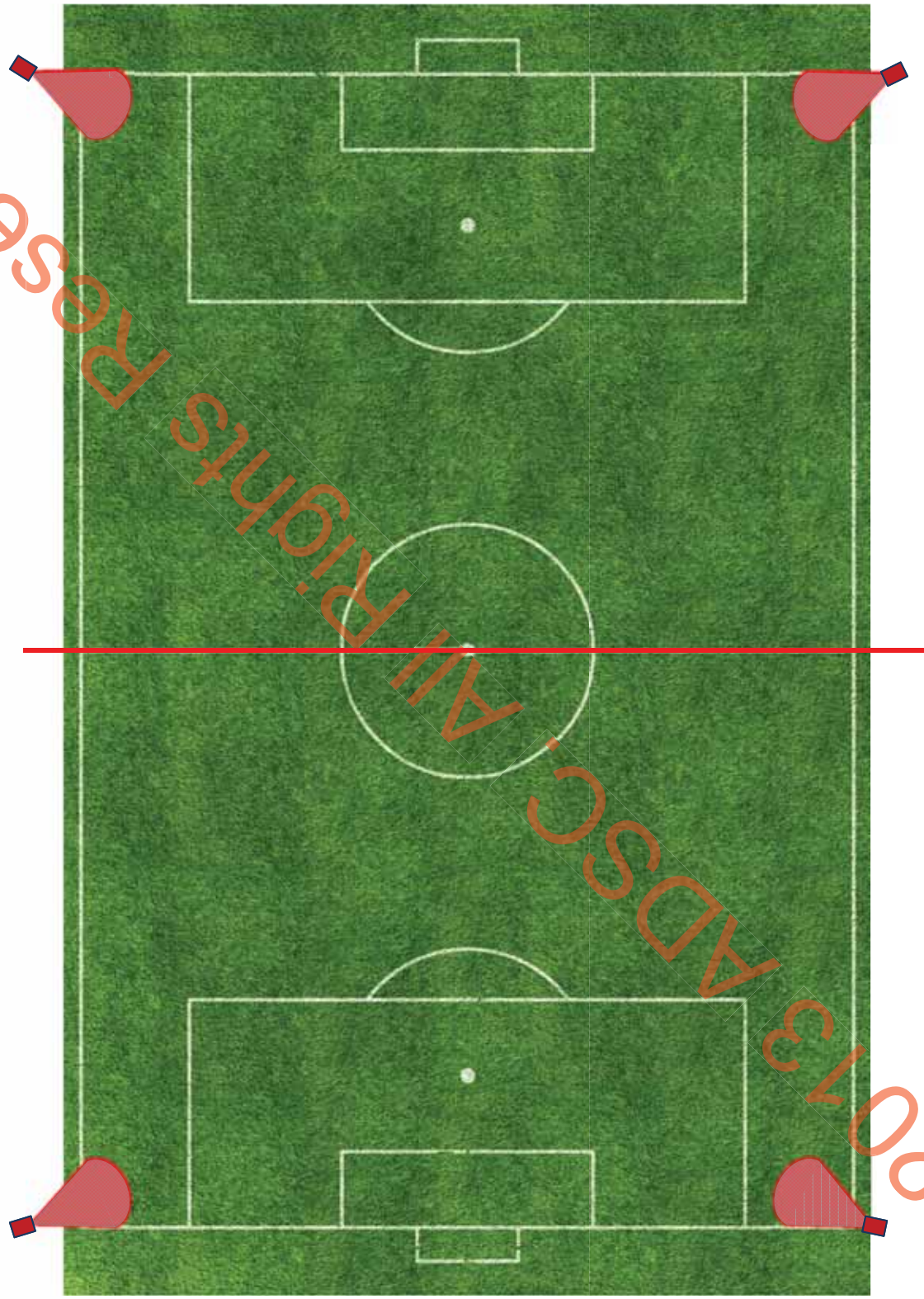Office

ILLINOIS

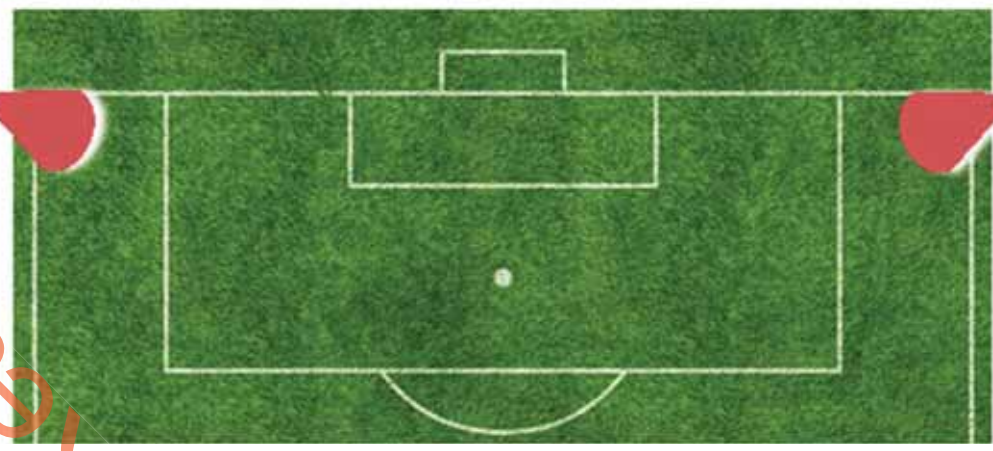# Ultimate Goal: Football

Football Video Analysis

Proposed System

-

Proposed System

Initial Results

Market Needs?

Technical Elements

Passing accuracy, to whom?

Shooting accuracy?

Crossing?

Etc.

Manual

Fitness Elements

Energy expended

Distance covered

Automated

ILLINOIS

Market Leaders?

Which Market?

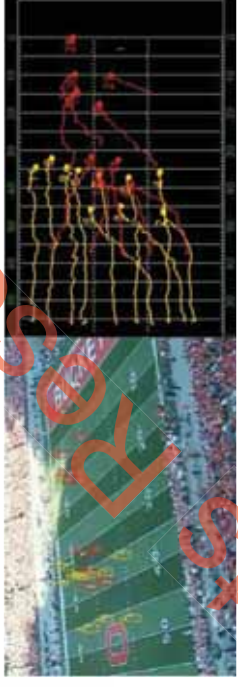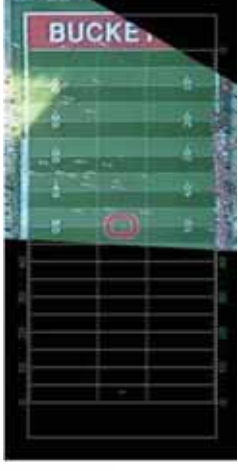Broadcasters

Existing Market

Clubs

Fans

In Summary

- ## Research

- ## American Football Near Commercialization

- ## Soccer

  - ## Exploring

Thank You!

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