IS&T International Symposium on
Electronic Imaging
SCIENCE AND TECHNOLOGY

29 January 2017 – 2 February 2017 • Burlingame, CA, USA

PROCEEDINGS

Computer Vision Applications in Sports

Editors: **Mustafa Jaber,** (United States),
Grigorios Tsagkatakis, Institute of Computer Science, FORTH (Greece)

These papers represent the program of Electronic Imaging 2017,
held January 29 – February 2, 2017, at the Hyatt Regency San Francisco Airport in Burlingame, CA.

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Computer Vision Applications in Sports

Introduction

The Chairs of Computer Vision Applications in Sports welcome you to this Session Series, which is part of the 2017 IS&T International Symposium on Electronic Imaging (EI 2017), held at the Hyatt Regency San Francisco Airport, Burlingame, California from 29 January to 2 February 2017.

The session series presented seven original research paper submissions organized into two sessions: Sports Imaging and Sports Analysis. The Sports Imaging session contains state-of-the-art methods in imaging of sports video sequences, while the Sports Analysis session includes papers presenting cutting-edge techniques for understanding and analyzing sports videos.

We are excited that Dr. Peter Carr, Senior Research Engineer at Disney Research in Pittsburgh, Pennsylvania, presented the keynote lecture on "Automated Sports Broadcasting" describing methods for automatically tracking players and driving robot cameras for recording of team sport games.

We would like to extend our gratitude to all people who helped putting this Session Series together, especially the contributing authors, Suzanne E. Grinnan (IS&T Executive Director), and Ann McCarthy (IS&T Special Projects Consultant).

We hope that you all have an excellent experience with Computer Vision Applications in Sports, and look forward to seeing you at the CVAS meeting next year.

Computer Vision Applications in Sports

Monday January 30, 2017

Sports Imaging

Session Chairs: Mustafa Jaber, NantVision Inc. (United States), and Grigorios Tsagkatakis, FORTH (Greece)

9:30 – 10:20 AM
Cypress B

9:30
Chair Opening Remarks

9:40 4
Virtual tracking shots for sports analysis, *Stuart Bennett[1], Joan Lasenby[1], and Tony Purnell[1,2]; [1]University of Cambridge and [2]British Cycling (United Kingdom)* [CVAS-342]

10:00 10
Aerodynamic analysis via foreground segmentation, *Peter Carey[1], Stuart Bennett[1], Joan Lasenby[1], and Tony Purnell[1,2]; [1]University of Cambridge and [2]British Cycling (United Kingdom)* [CVAS-343]

10:20 – 10:50 AM Coffee Break

Sports Analysis

Session Chairs: Mustafa Jaber, NantVision Inc. (United States), and Grigorios Tsagkatakis, FORTH (Greece)

10:50 AM – 12:10 PM
Cypress B

10:50 15
Goal! Event detection in sports video, *Grigorios Tsagkatakis[1], Mustafa Jaber[2], and Panagiotis Tsakalides[1,3]; [1]FORTH (Greece) [2]NantVision Inc. (United States), and [2]University of Crete (Greece)* [CVAS-344]

11:10 21
Pose estimation for deriving kinematic parameters of competitive swimmers, *Dan Zecha, Christian Eggert, and Rainer Lienhart, Augsburg University (Germany)* [CVAS-345]

11:30 30
Comparison of a virtual game-day experience on varying devices, *Jack Miller, Holly Baiotto, Anastacia MacAllister, Melynda Hoover, Gabriel Evans, Jonathan Schlueter, Vijay Kalivarapu, and Eliot Winer, Iowa State University (United States)* [CVAS-346]

11:50 38
Digital playbook – A teaching tool for American football, *Mario Vorstandlechner and Margrit Gelautz, Vienna University of Technology (Austria)* [CVAS-347]

12:10 – 2:00 PM Lunch Break

EI 2017 Opening Plenary and Symposium Awards
Session Chairs: Joyce E. Farrell, Stanford University, and Nitin Sampat, Rochester Institute of Technology (United States)

2:00 – 3:00 PM
Grand Peninsula Ballroom D

Laura Waller is the Ted Van Duzer Endowed Assistant Professor of Electrical Engineering and Computer Sciences (EECS) at UC Berkeley. She is a Senior Fellow at the Berkeley Institute of Data Science, and received her BS (2004), MEng (2005), and PhD (2010) in EECS from the Massachusetts Institute of Technology (MIT). Waller's talk is on computational imaging methods for fast capture of gigapixel-scale 3D intensity and phase images in a commercial microscope that employs illumination-side and detection-side coding of angle (Fourier) space with simple hardware and fast acquisition. The result is high-resolution reconstructions across a large field-of-view, achieving high space-bandwith-time product.

Giga-scale 3D computational microscopy, *Laura Waller, University of California, Berkeley (United States)*

3:00 – 3:30 PM Coffee Break

KEYNOTE: Computer Vision, Robotic Cameras, Sports Applications
Session Chairs: Mustafa Jaber, NantVision Inc. (United States), and Grigorios Tsagkatakis, FORTH (Greece)

3:30 – 4:30 PM
Cypress B

Peter Carr is a Senior Research Engineer at Disney Research, Pittsburgh. He received his PhD from the Australian National University (2010), under the supervision of Prof. Richard Hartley. His thesis, "Enhancing Surveillance Video Captured in Inclement Weather", explored single-view depth estimation using graph cuts, as well as real-time image processing on graphics hardware. As part of his earlier PhD work in sports analysis, Carr was a research intern at Mitsubishi Electric Research Labs. He received a Master's in physics from the Centre for Vision Research at York University in Toronto, Canada, and a Bachelor's of Applied Science (engineering physics) from Queen's University in Kingston, Canada.

Automated sports broadcasting, *Peter Carr, Disney Research (United States)* [CVAS-348]

5:00 – 6:00 PM All-Conference Welcome Reception, Atrium