Georgia Institute of Technology

Computational Photography

Dr. Irfan Essa
Professor
School of Interactive Computing

Study the basics of computation and its impact on the entire workflow of photography, from capturing, manipulating and collaborating on, and sharing photographs.

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What is Computational Photography? (Part 2)

Panorama: Another Example of Computational Photography

Lesson Objectives

Panorama, *a wide-angle view of space.*

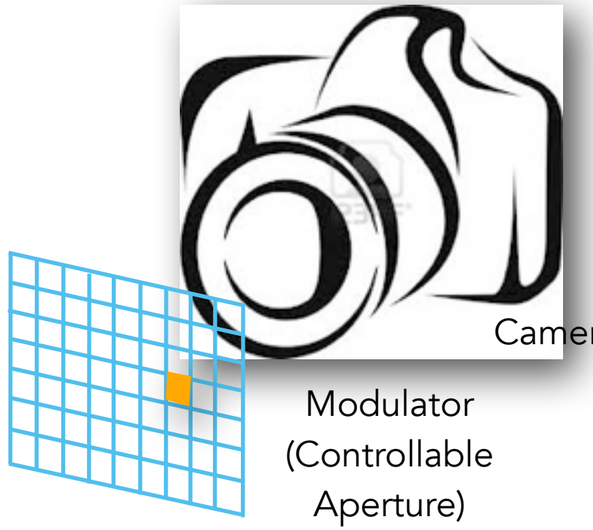
(Lords Cricket Ground, London, UK, by I. Essa)

- ★ Describe in your words, the steps required to make a panoramic image.
- ★ Identify the five elements of computational photography that are used in making a Panorama.

Dual Photography

Projector
(Controllable
Light Source)

Modulator
(Controllable
Aperture)



Camera

Modulator
(Controllable
Aperture)

3D Scene

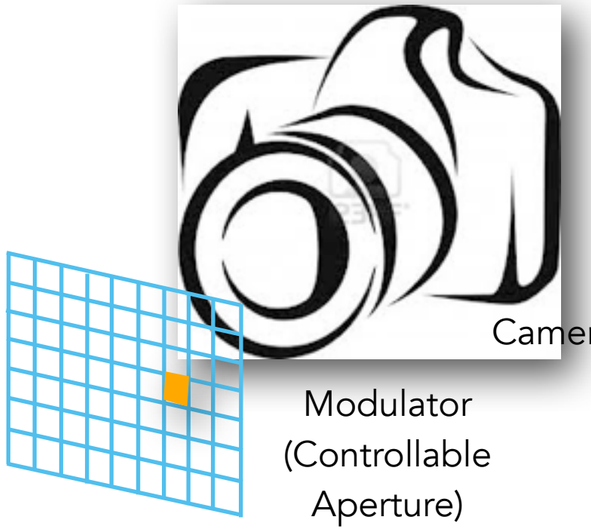
Dual Photography, Sen et al. SIGGRAPH 2005

Dual Photography

- 3D Scene
- Illumination
- Optics
- Sensor
- Processing
- Display
- User

Projector (Controllable Light Source)

Modulator (Controllable Aperture)



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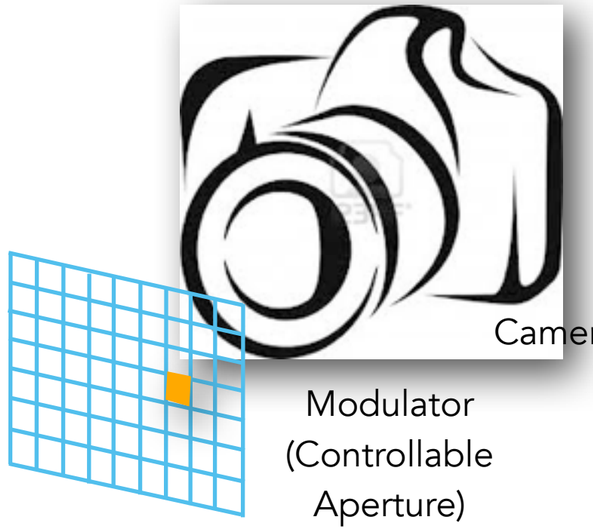

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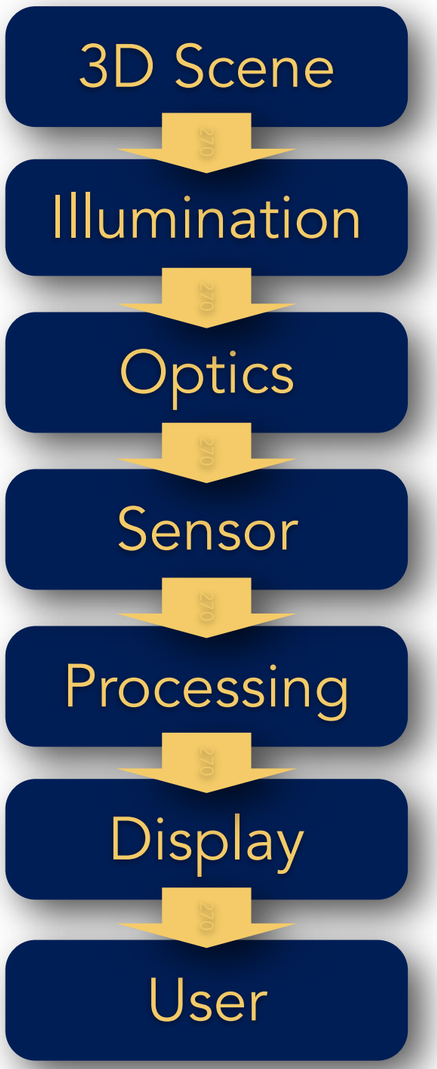
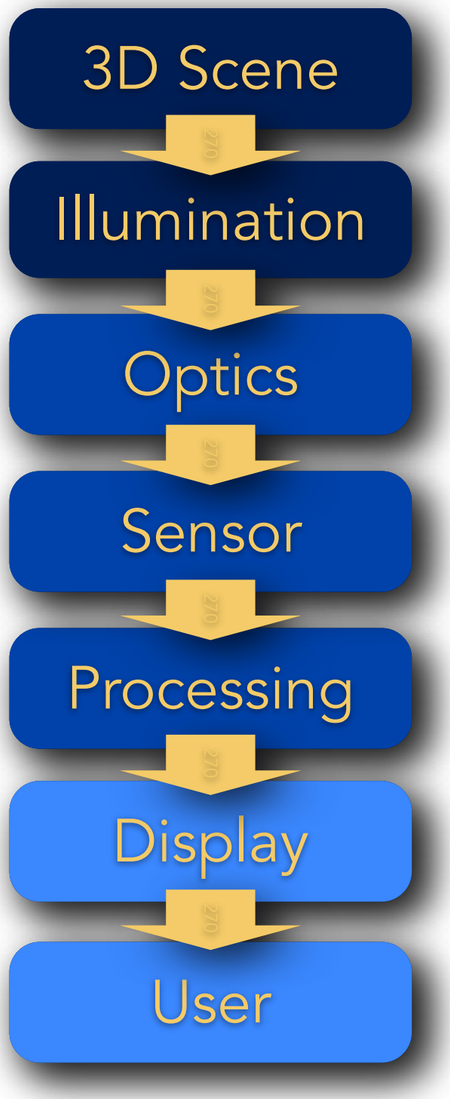
Panorama

Panorama



Panorama



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Panorama

3D Scene

Illumination

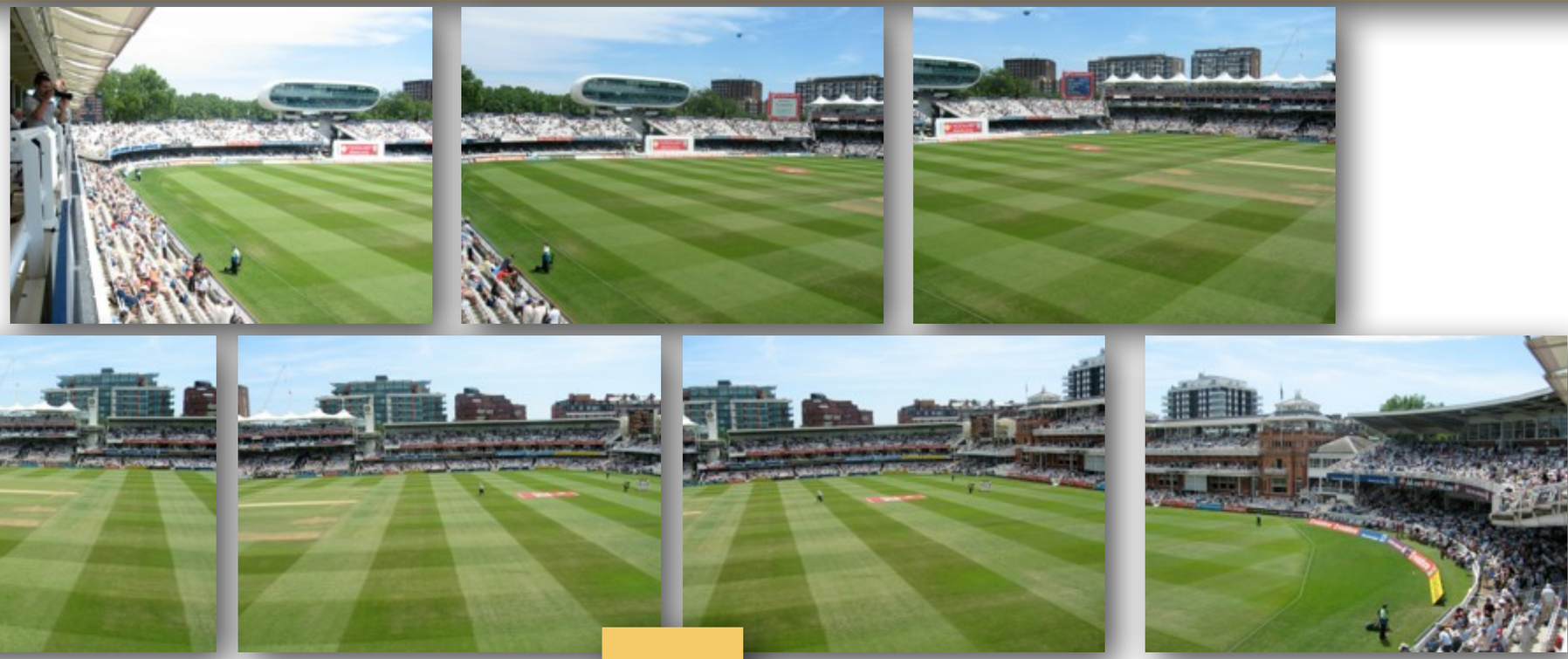
Optics

Sensor

Processing

Display

User



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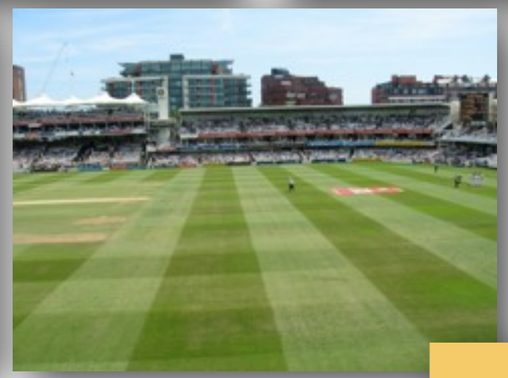
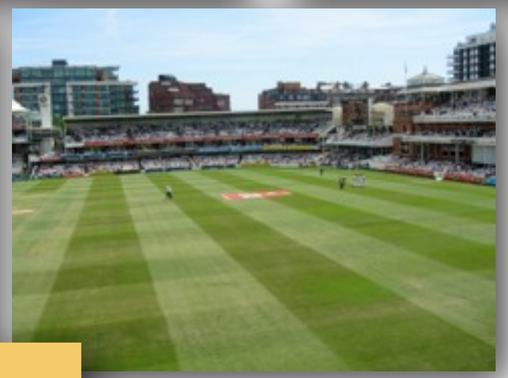

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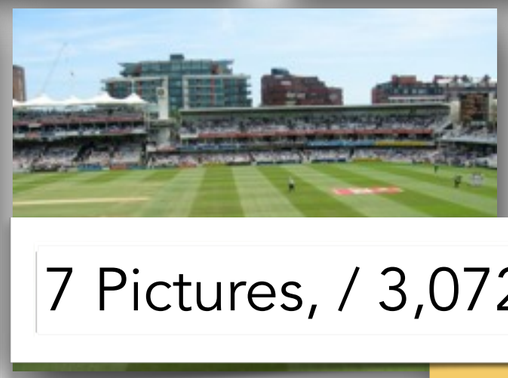
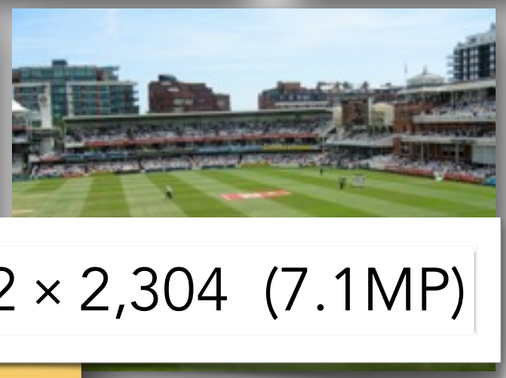


7 Pictures, / 3,072 × 2,304 (7.1MP)

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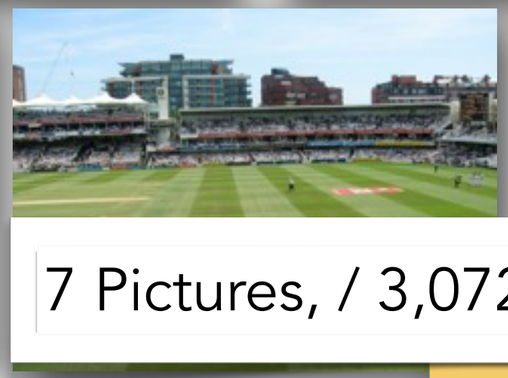
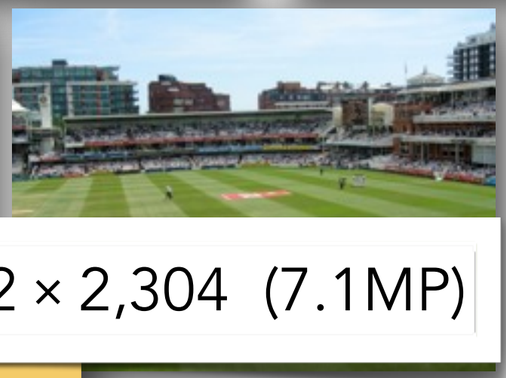


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11,262 x 2,691 / (31 MP) / FOV=151.72x24.46

Step 1: Taking Pictures

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gigapan.com

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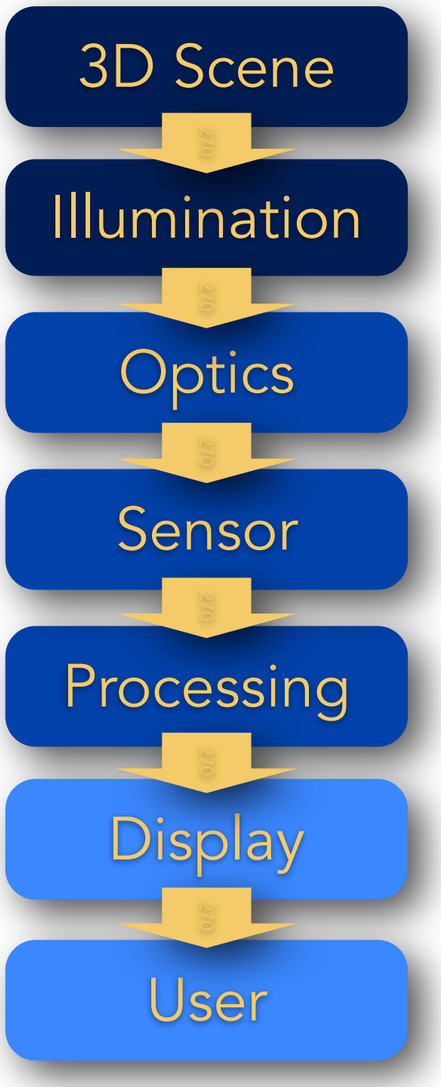

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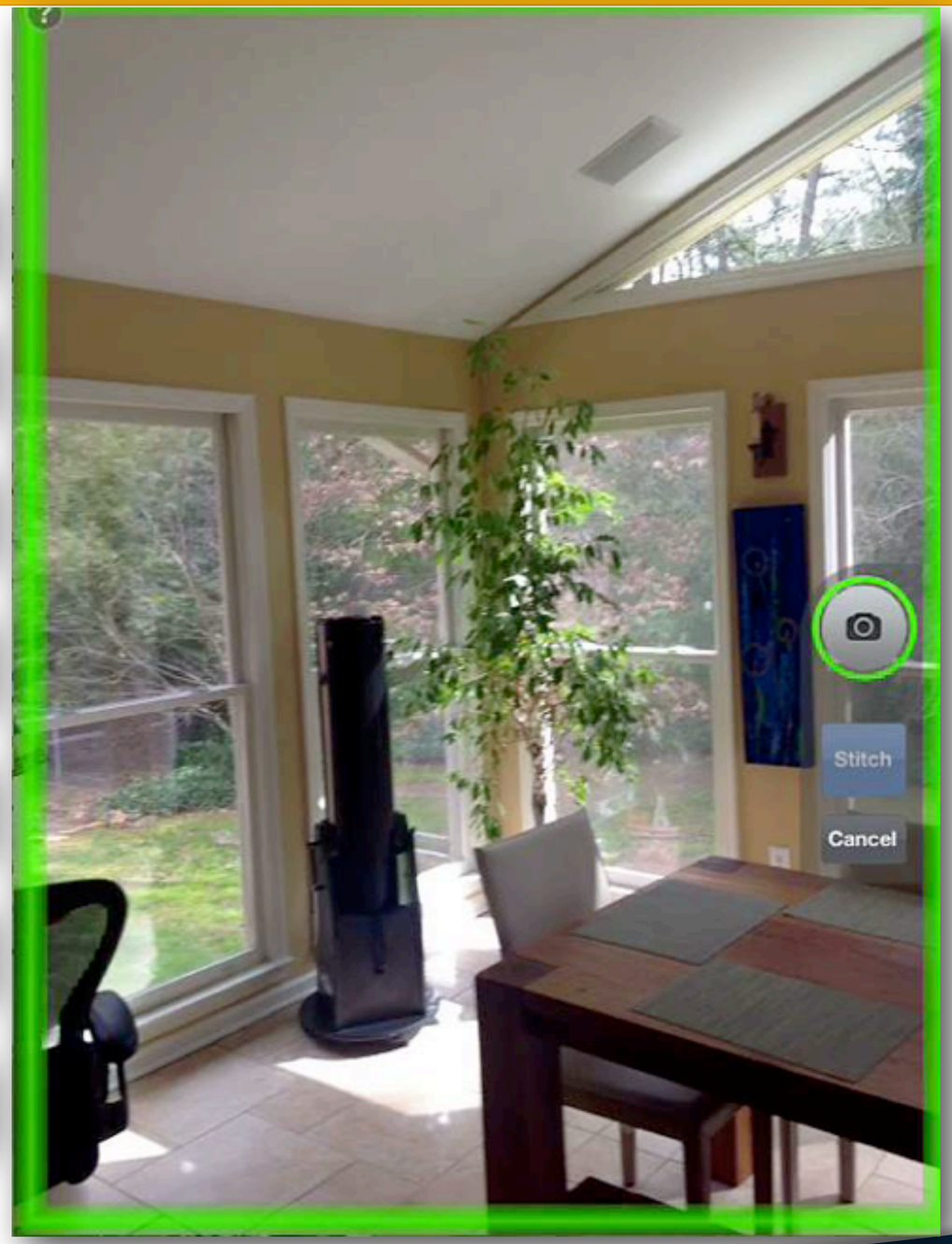

autostitch™ by Cloudburst Research

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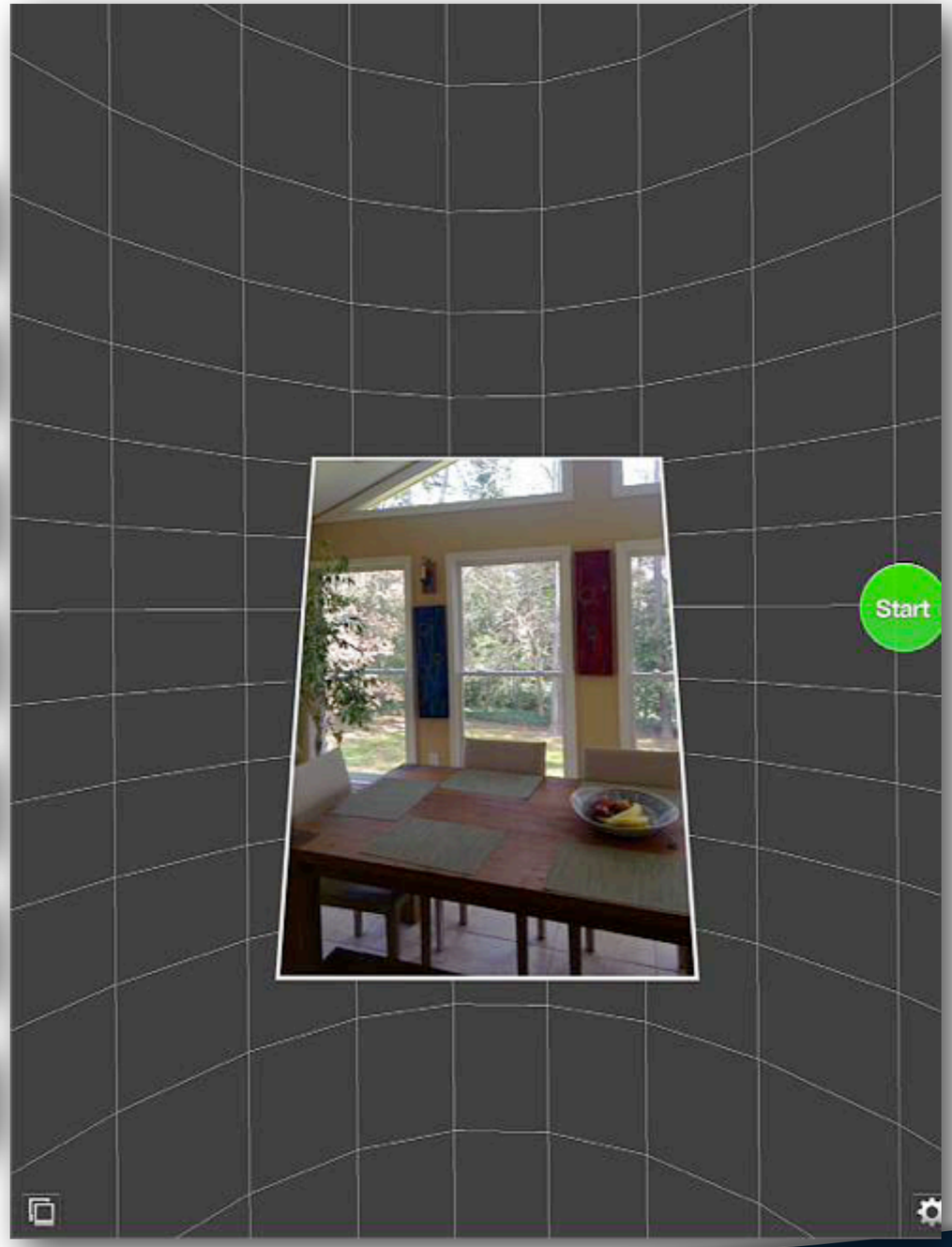
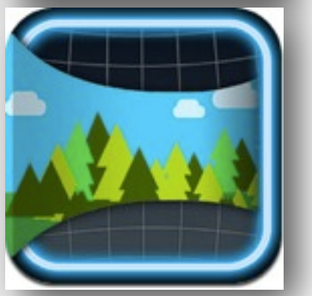


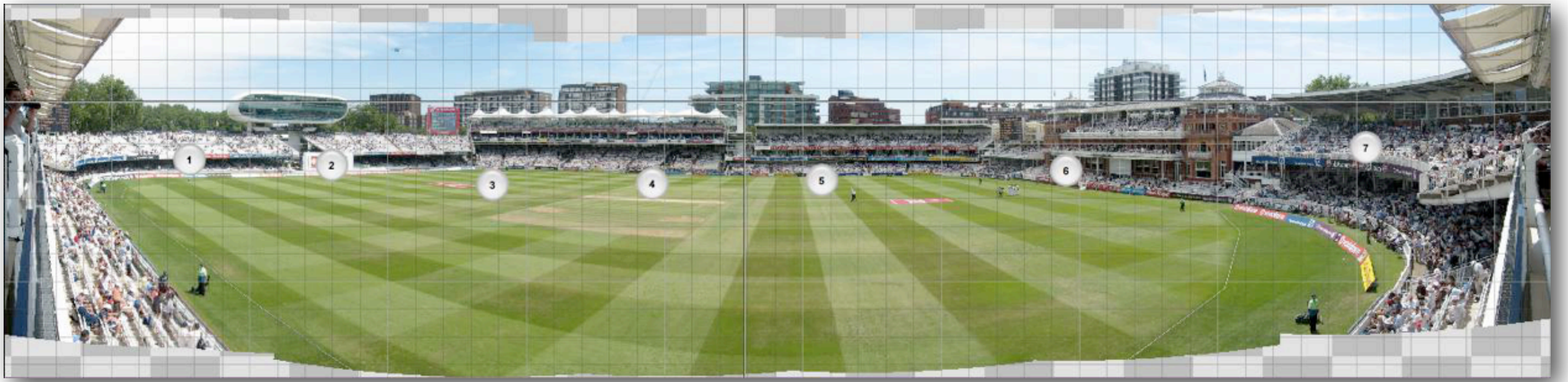


Step 1: Taking Pictures

360 Panorama™ by Occipital

Using kolor autopano giga™ v3

Consider the steps following Capture: Matching to Warping



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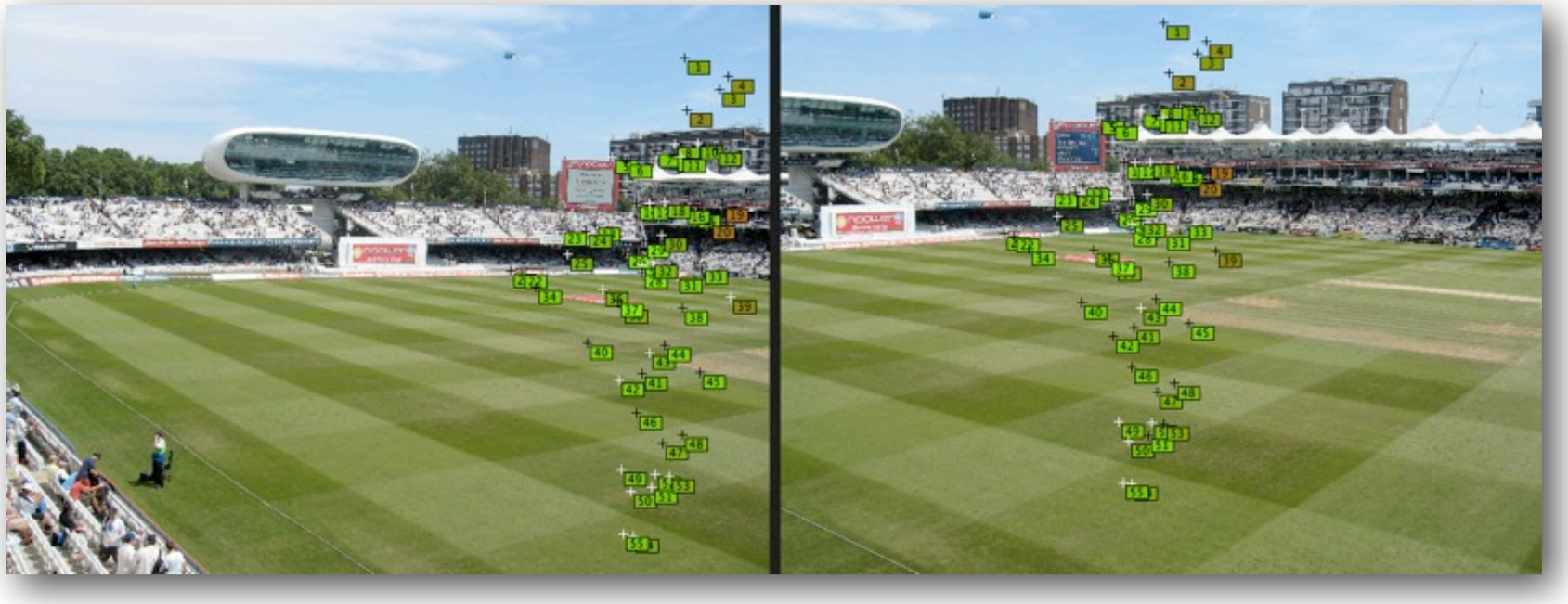
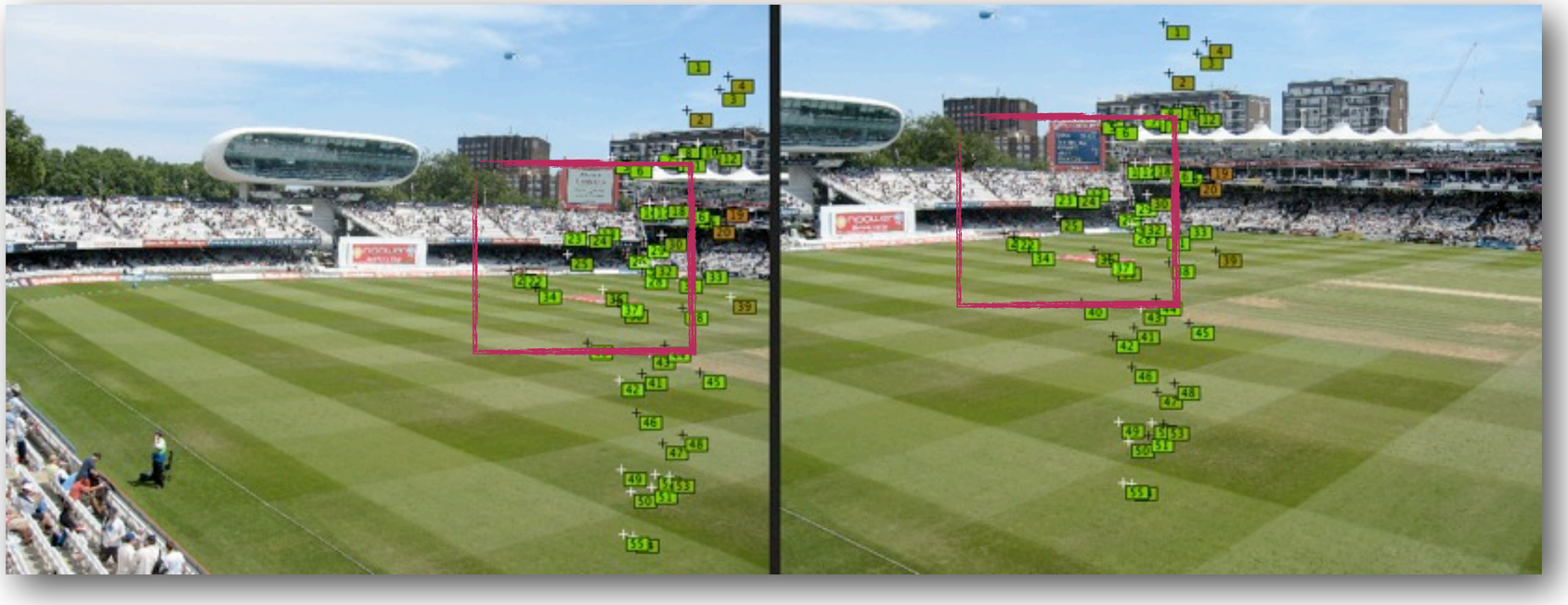


Step 2: Detection and Matching



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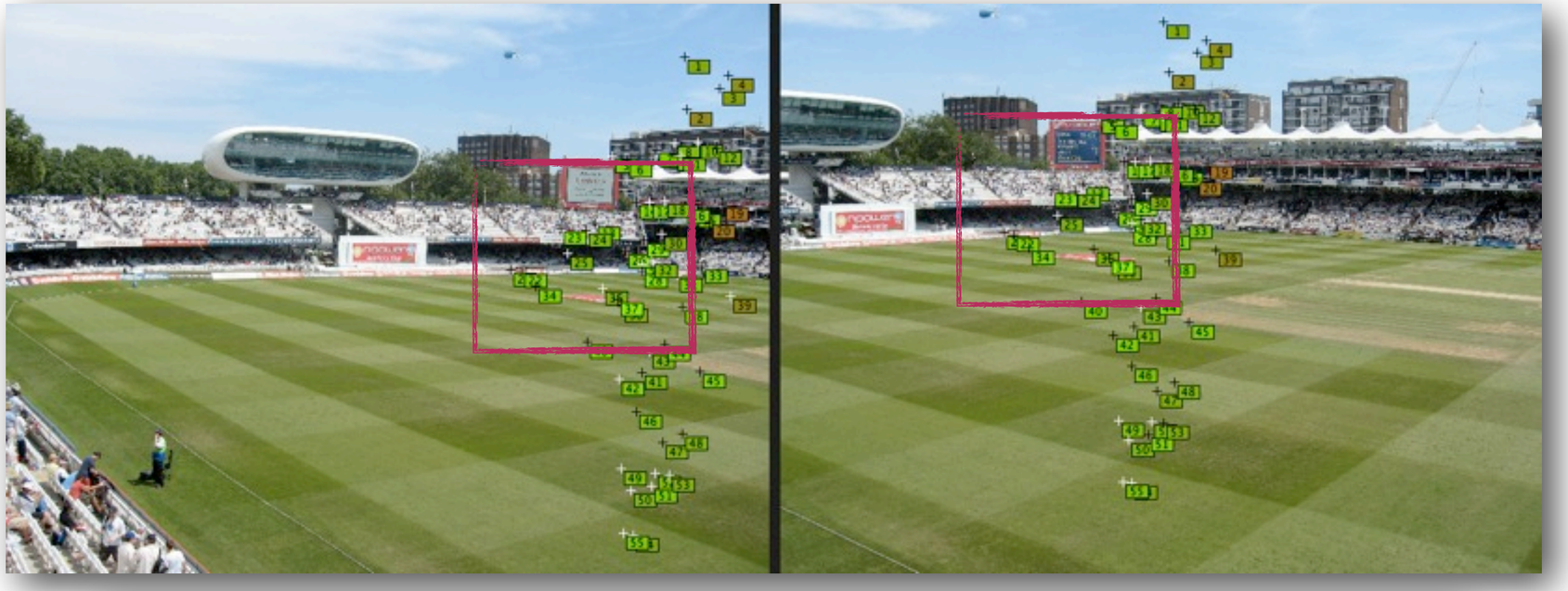

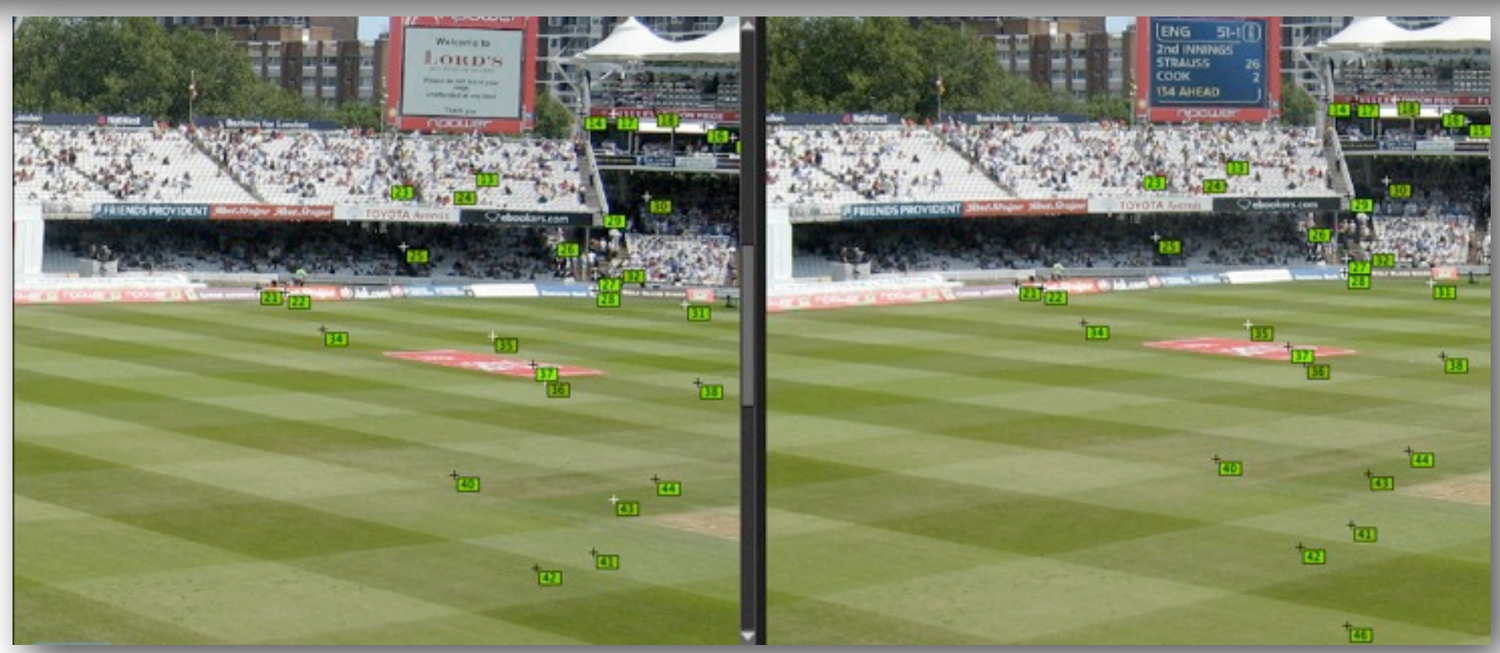

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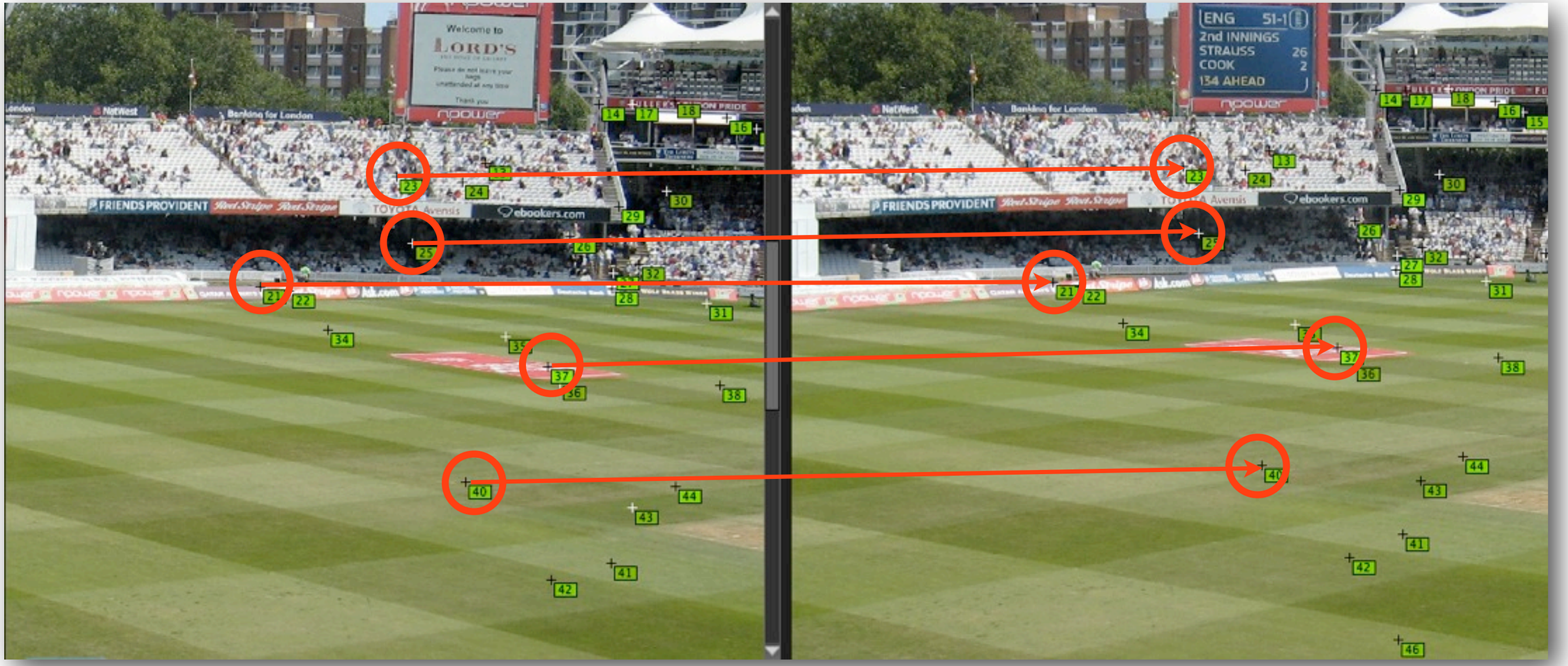

Step 2: Detection and Matching

Step 3: Warping

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Step 3: Warping

Step 3: Warping

Step 3: Warping

13

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13

Step 4: Fade, Blend, or Cut

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Now we need to choose which pixels from which of the images should be visible.

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Step 5: Crop (Optional)

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5 Steps to Make a Panorama

(Lords Cricket Ground, London, UK, by I. Essa)

1. Capture Images
2. Detection and Matching
3. Warping
4. Blending, Fading, Cutting
5. Cropping (Optional)

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Summary

- ★ Introduced the Concept of a Panorama
- ★ Presented the Steps required to make a Panorama
- ★ Related the Steps of building a Panorama to the basic elements of Computational Photography.

Next Class

- ★ Why study Computational Photography?
- ★ Overview of Computational Photography
  - How it relates to other disciplines?
  - How it extends traditional and digital photography?

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Credits

- ★ Softwares used
  - Autopano Giga™ 3.0 by kolor for MacOS
  - Autostitch™ by Cloudburst Research for iOS
  - 360 Panorama™ by Occipital for iOS
- ★ Creative Commons Images
  - https://encrypted-tbn2.gstatic.com/images?q=tbn:ANd9GcTRryGOLad4fLrnWpTFtW9_86qcFv31YIcEFfl7uphiFaRmgp82
  - http://www.gigapan.com/images/epic-100.jpg

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