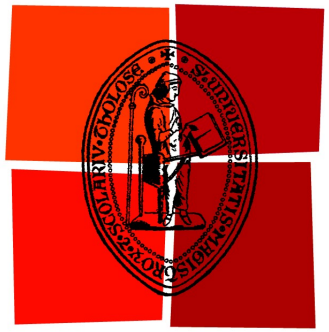

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3D Interest Maps from Simultaneous Video Recordings

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Regions Of Interest

- **ROI**: a region of a multimedia content that contains semantic information that a user or a group of users may find interesting.
- Highly subjective, dependent on
  - Users
  - Context
  - Etc.

→ Difficult to predict automatically

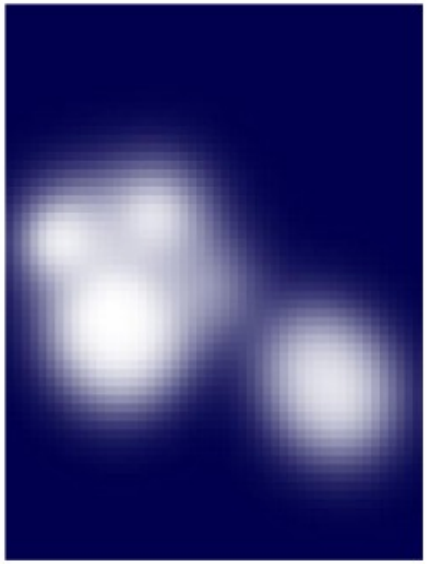
Related Work

- Saliency detection

Goferman et al, PAMI*'12*

- Usage-based approaches

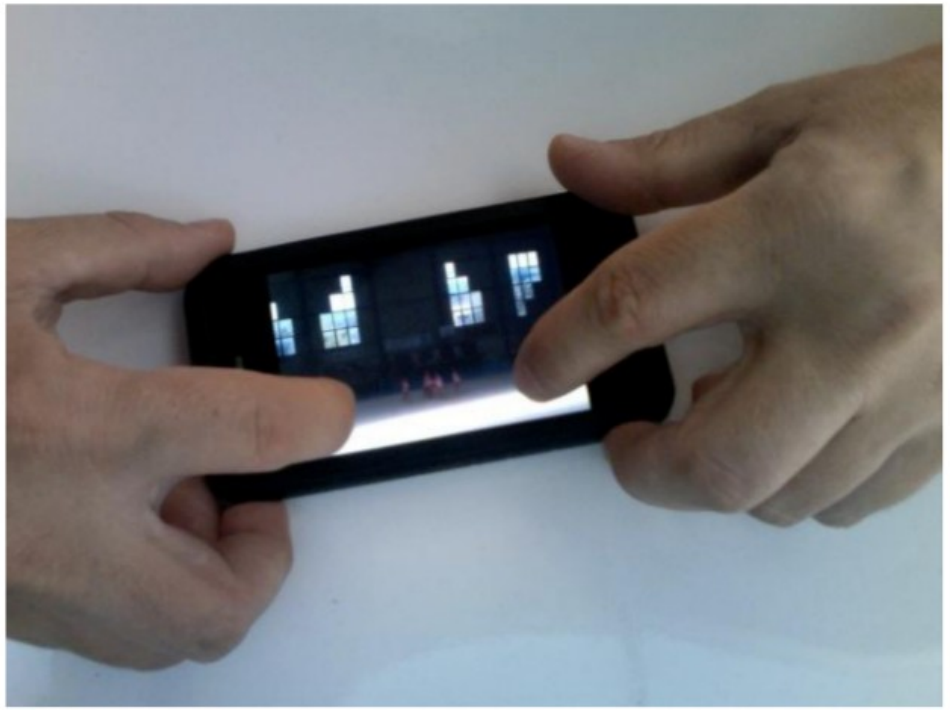
(a) Original image

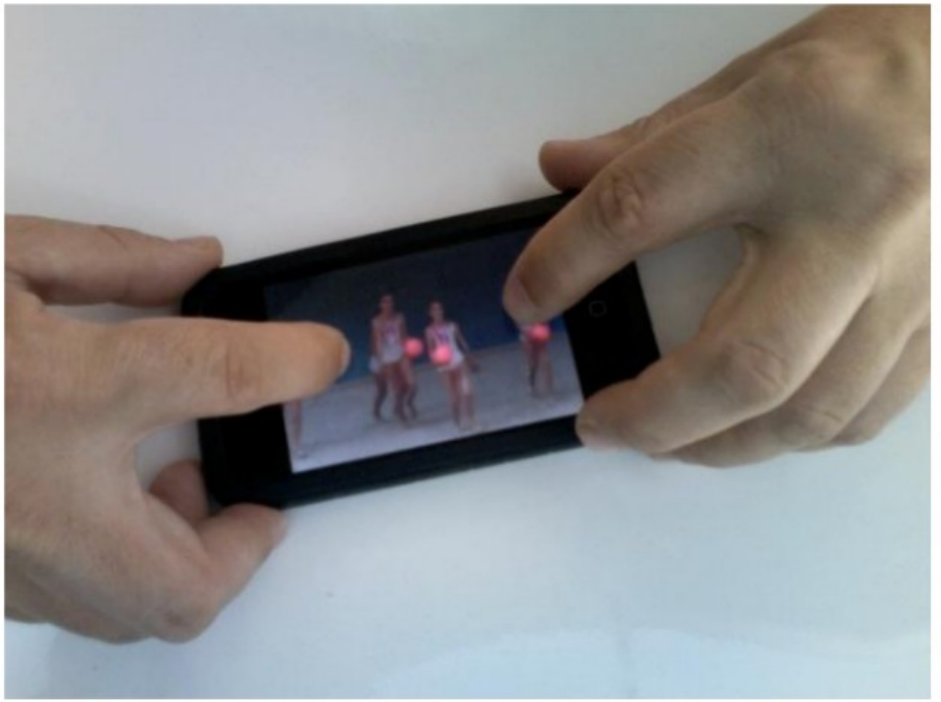


(b) User interest map

Xie et al, *CHI'05*

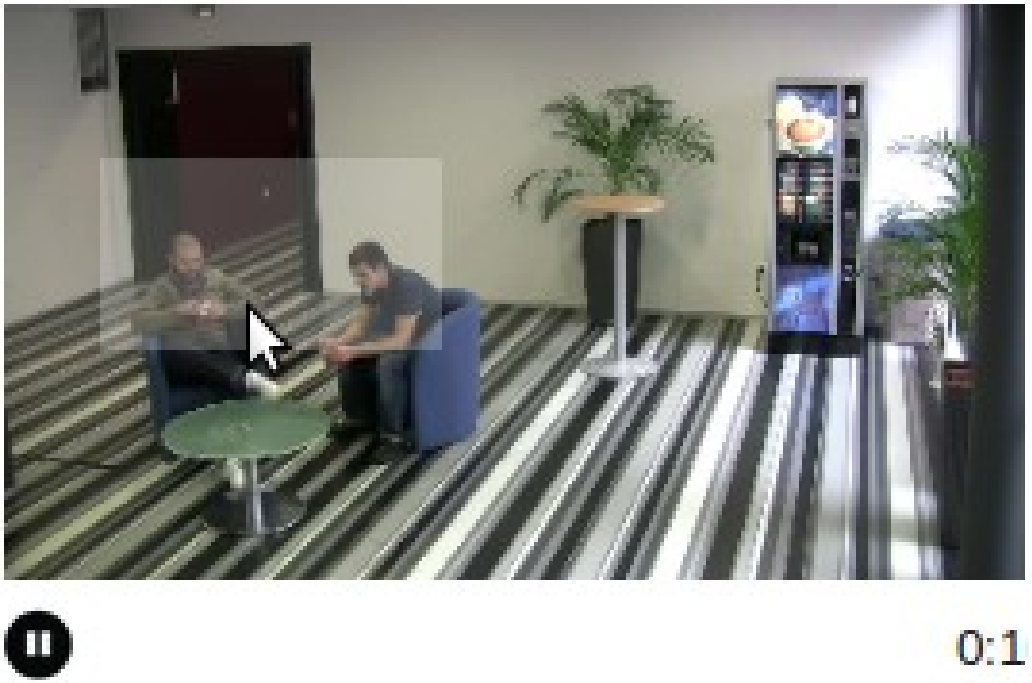
- What people zoom into is interesting





[Carlier et al] **Crowdsourced Automatic Zoom and Scroll for Video Retargeting**, MM *2010*

Zoomable Video



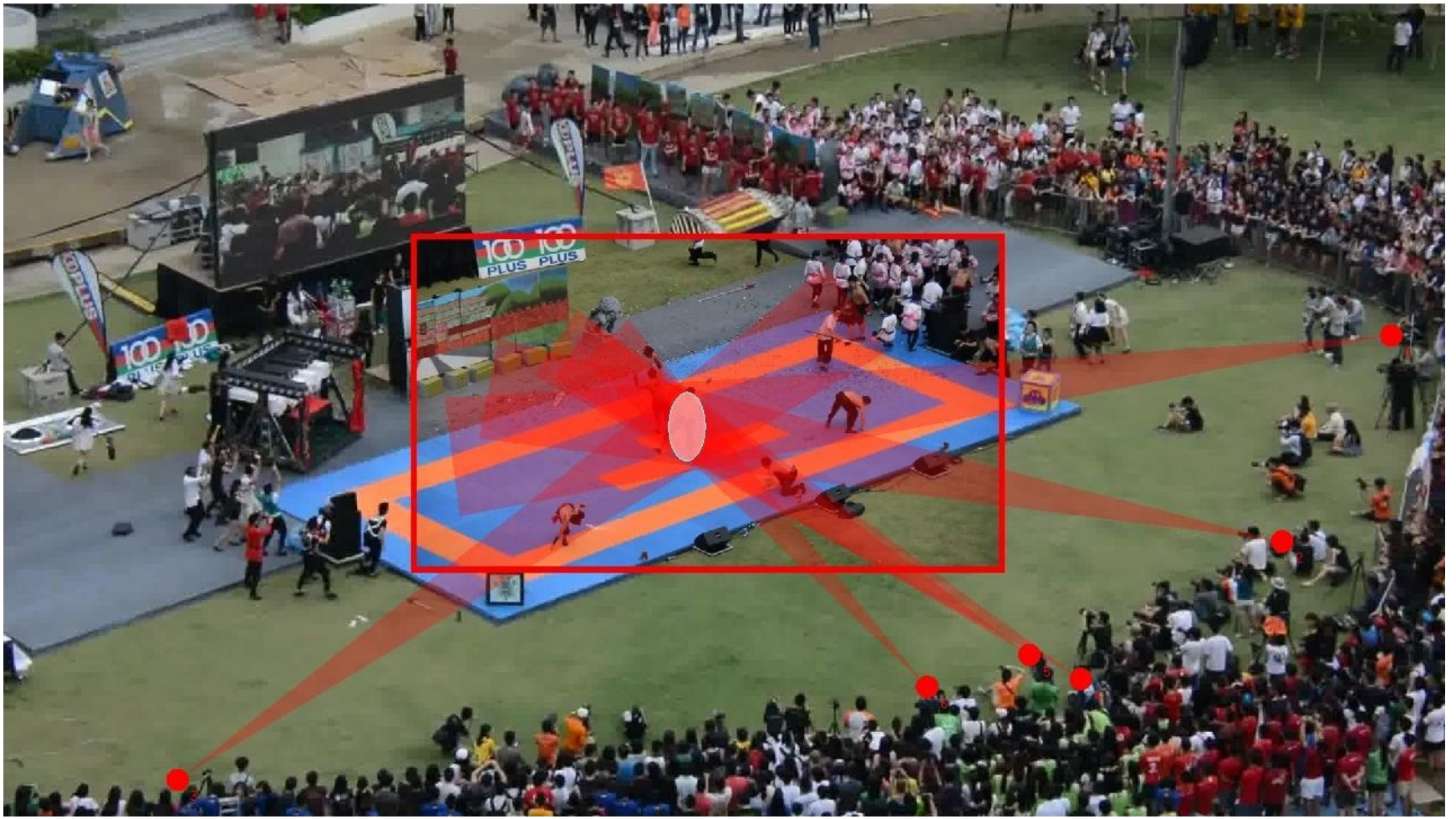
Viewports

User interest maps

From 2D to 3D

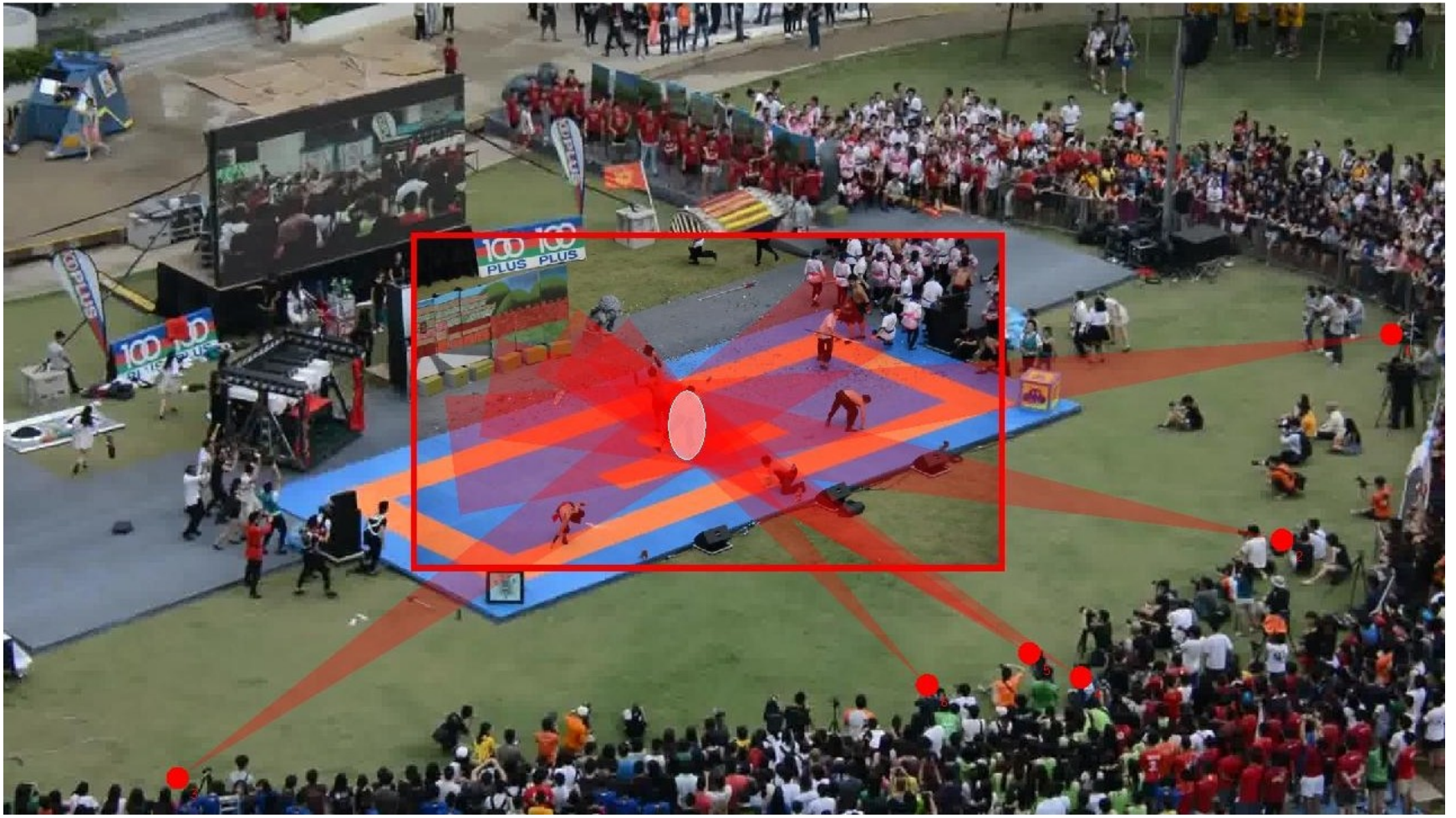
Idea

- What people choose to film is interesting



The setup

- Assumptions: calibration and synchronization to a certain extent

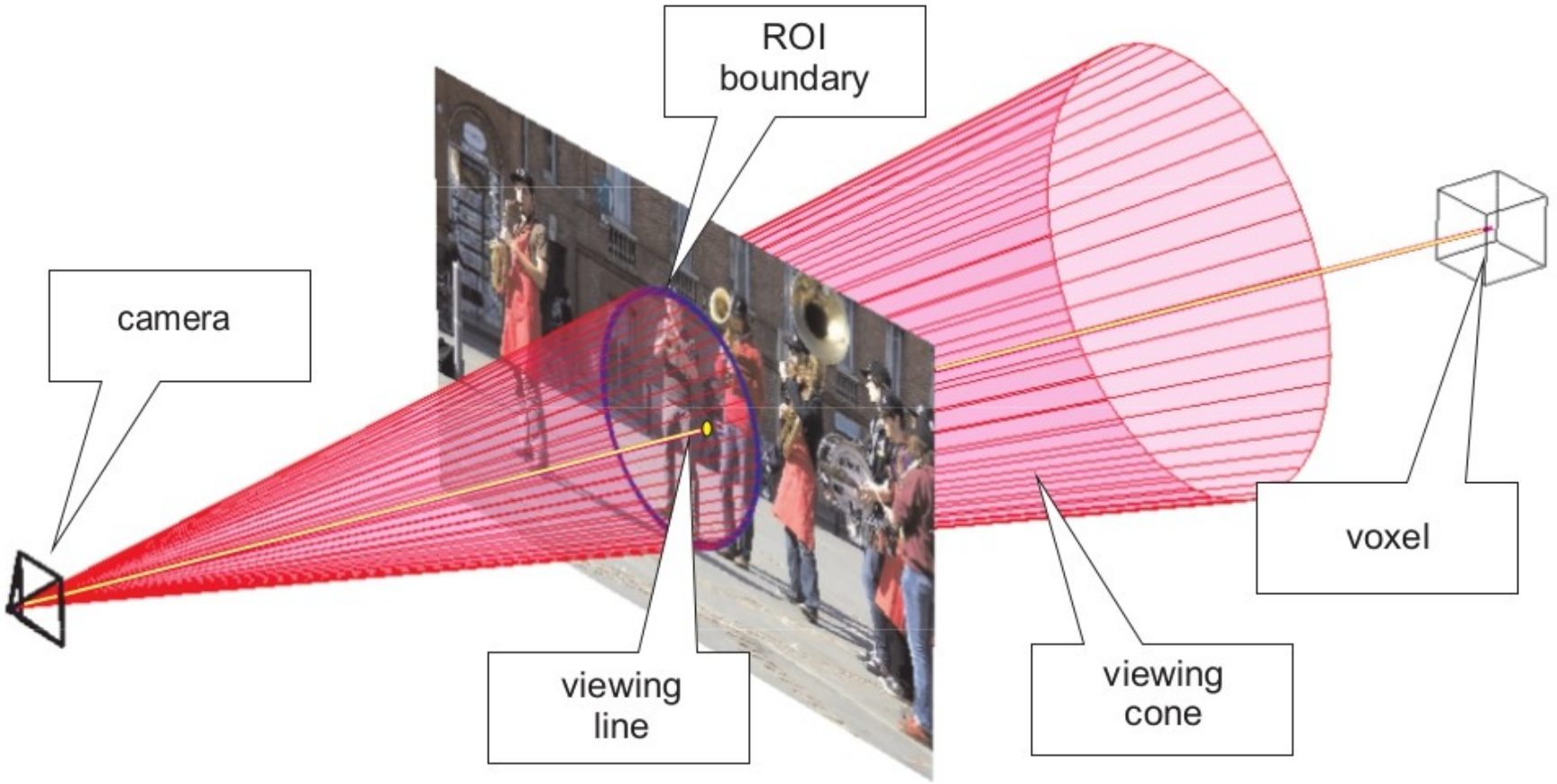


2D Regions Of Interest

With motion

Without motion

Back-Projection to 3D



3D Interest Maps

- Measure of the interest of a voxel v_i

$$Int(v_i) = \frac{1}{|\mathcal{E}|} \sum_{E \in \mathcal{E}(v_i)} \frac{\mathrm{Vol}(\Lambda(E) \cap v_i)}{\mathrm{Vol}(v_i)}$$

$\mathcal{E}$	Set of 2D ROIs on all images
$\Lambda(E)$	Viewing cone of the ROI E

3D Interest Maps

- Probabilistic form of the interest

$$\widetilde{Int}(v_i) = Int(v_i) / \sum_{i \in I} Int(v_i)$$

A **3D interest map** is the limit form of the 3D histogram with voxels as bins with respect to this measure.

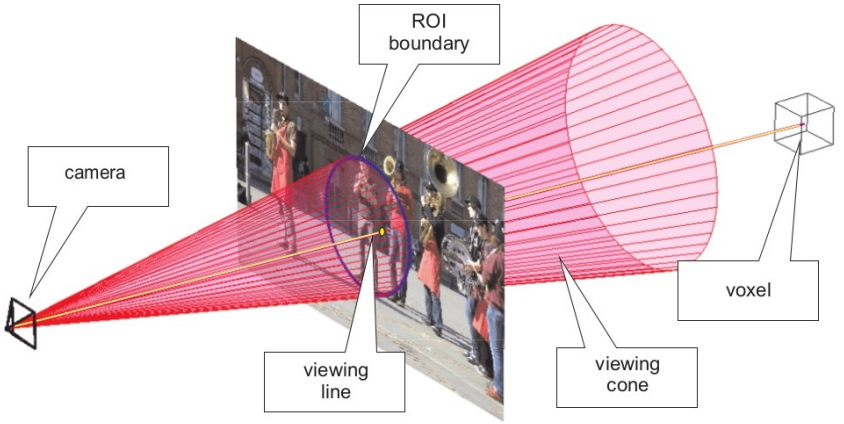
3D Interest Maps

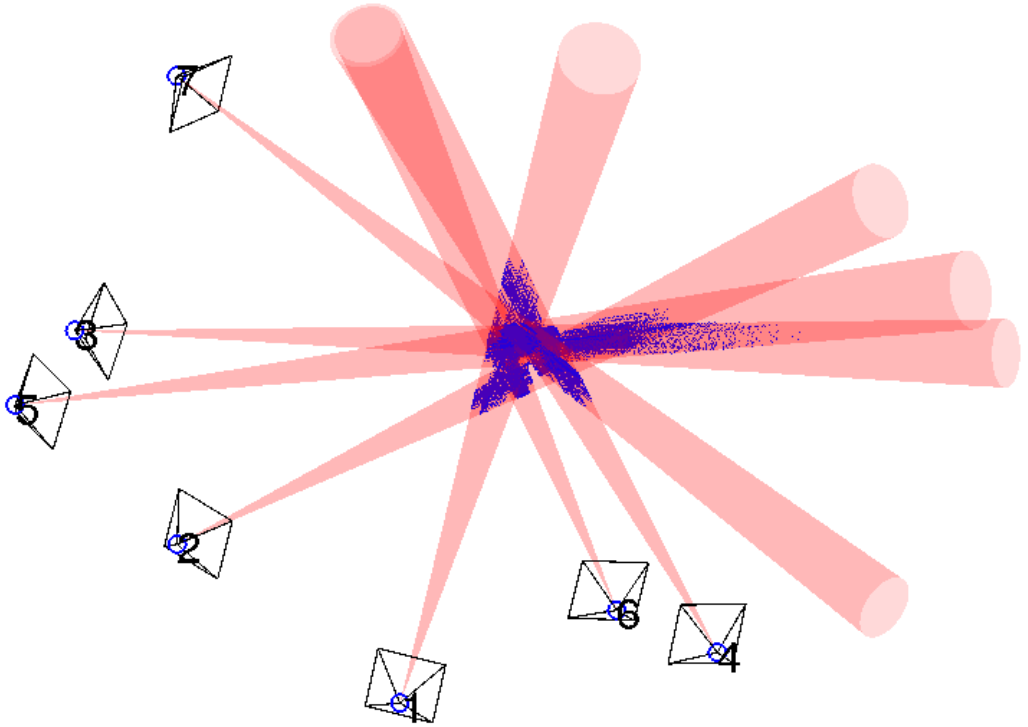
- We model our **3D interest map** with a Gaussian Mixture Model:

$$\widetilde{Int}(v) = \sum_{g=1}^{G} w_g \mathcal{N}(v; \boldsymbol{\mu}_g, \Sigma_g)$$

How to estimate the GMM parameters?

GMM estimation





Mean Shift Clustering

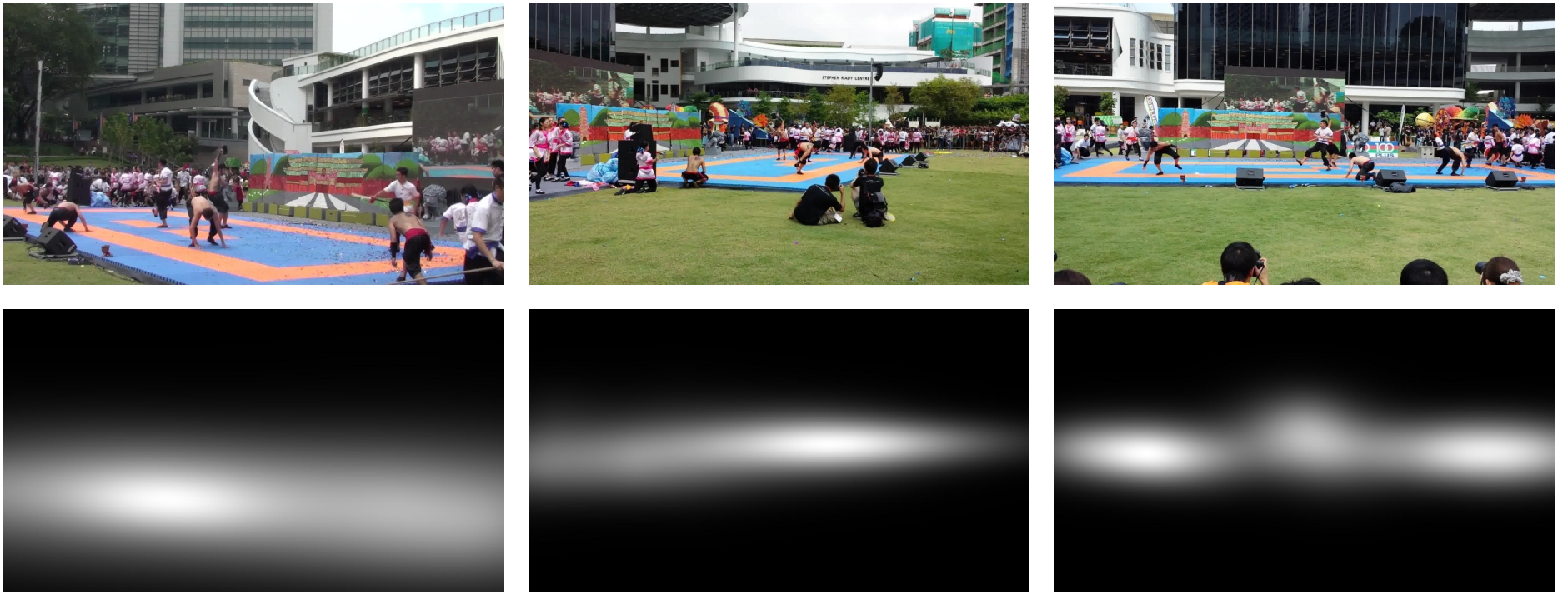
↓

1 Cluster

=

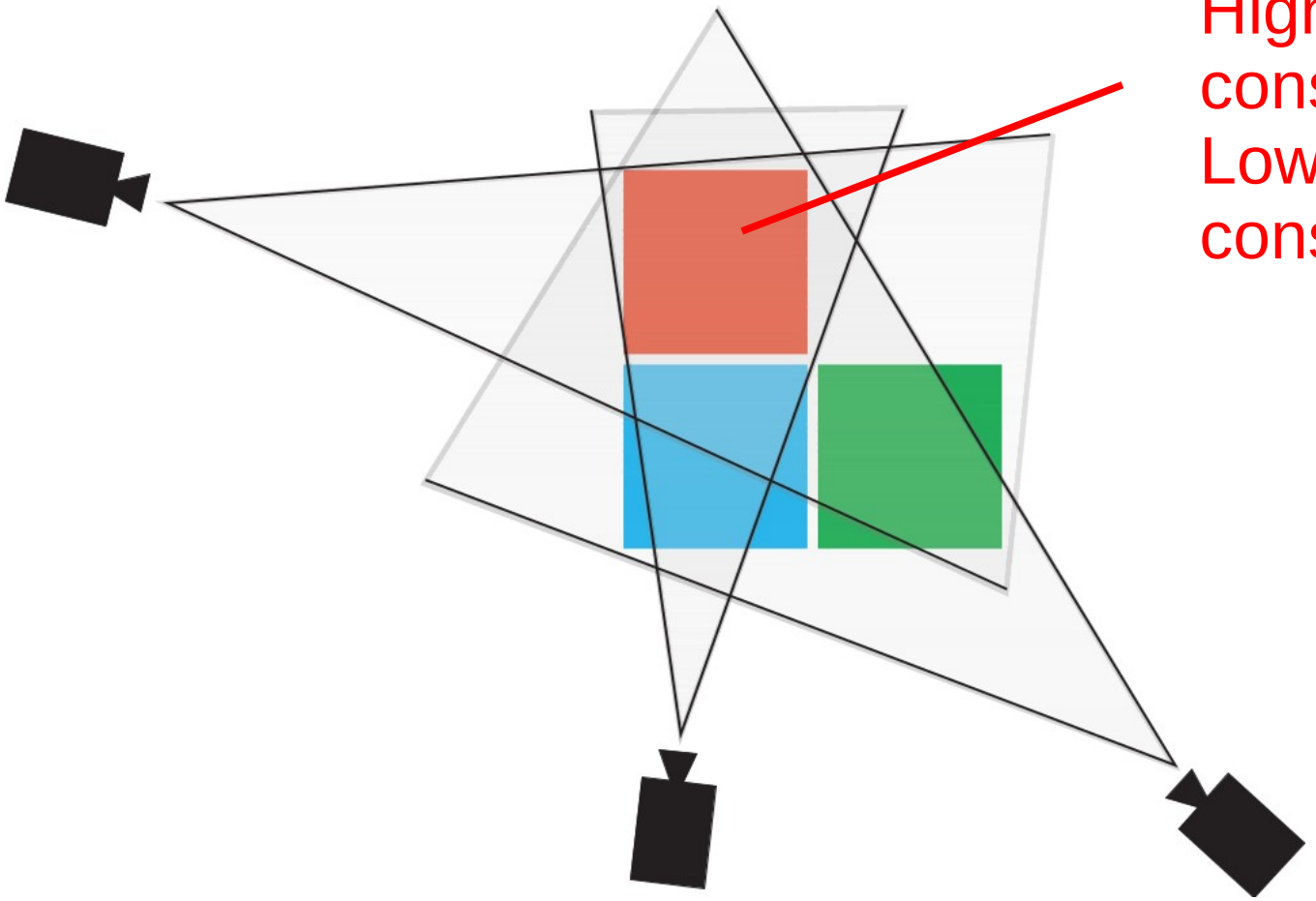
1 Gaussian

Results



Coarse results, because of the lack of photometric consistency

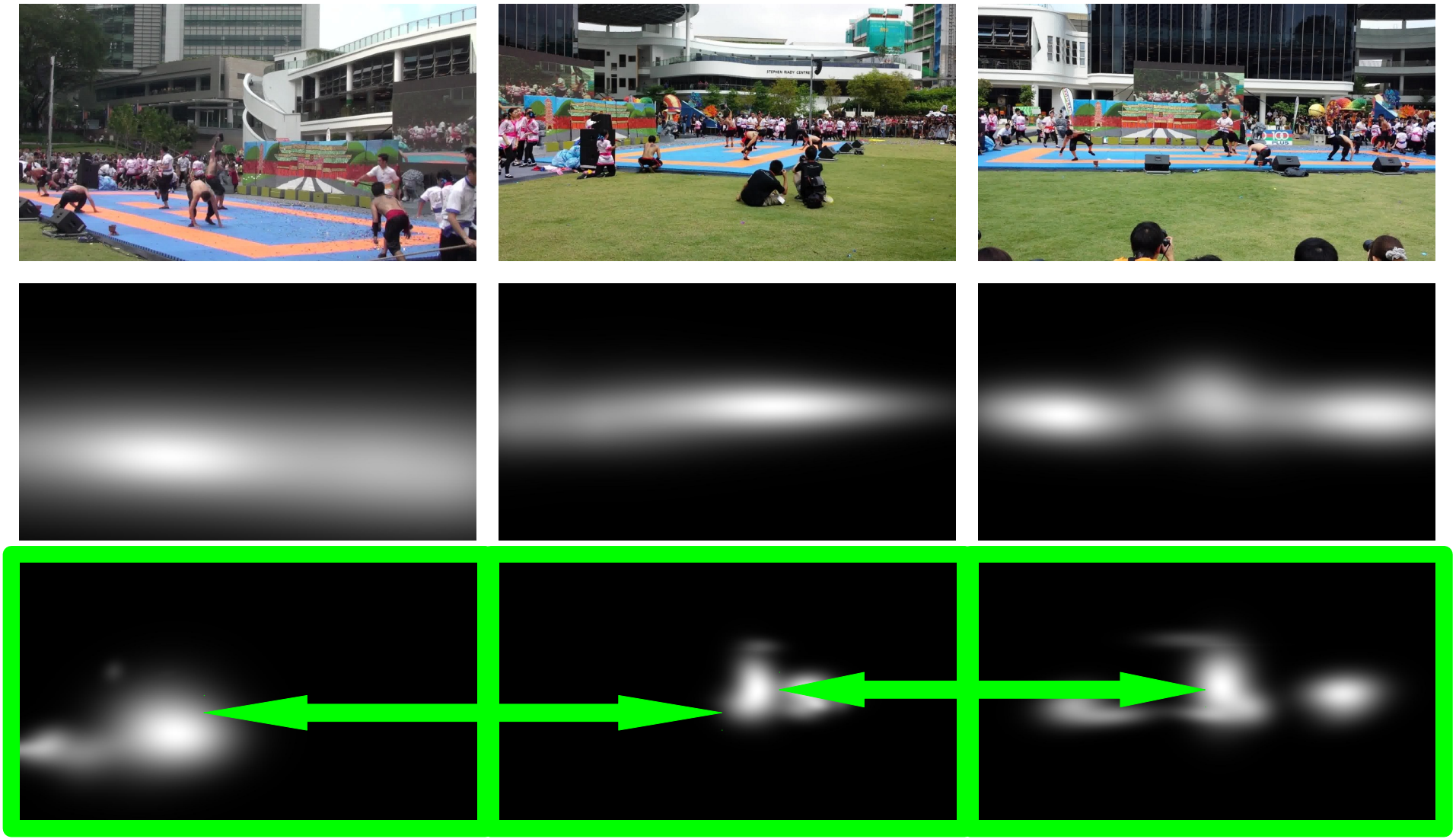
Photometric Consistency



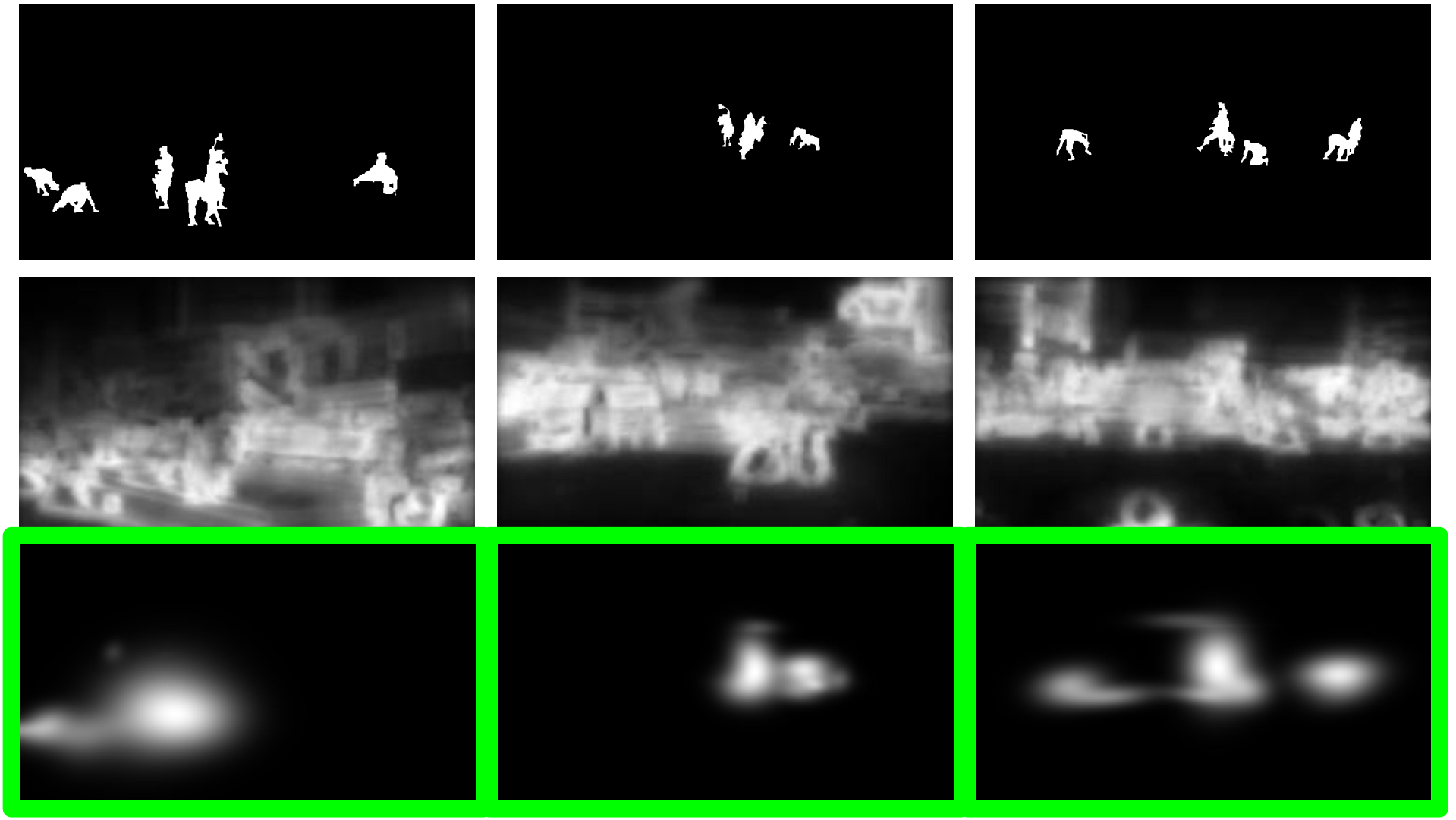
High geometric consistency
Low photometric consistency

[Furukawa et al] **Accurate, dense, and robust multiview stereopsis**, PAMI *2010* (a.k.a. PMVS software)

New results

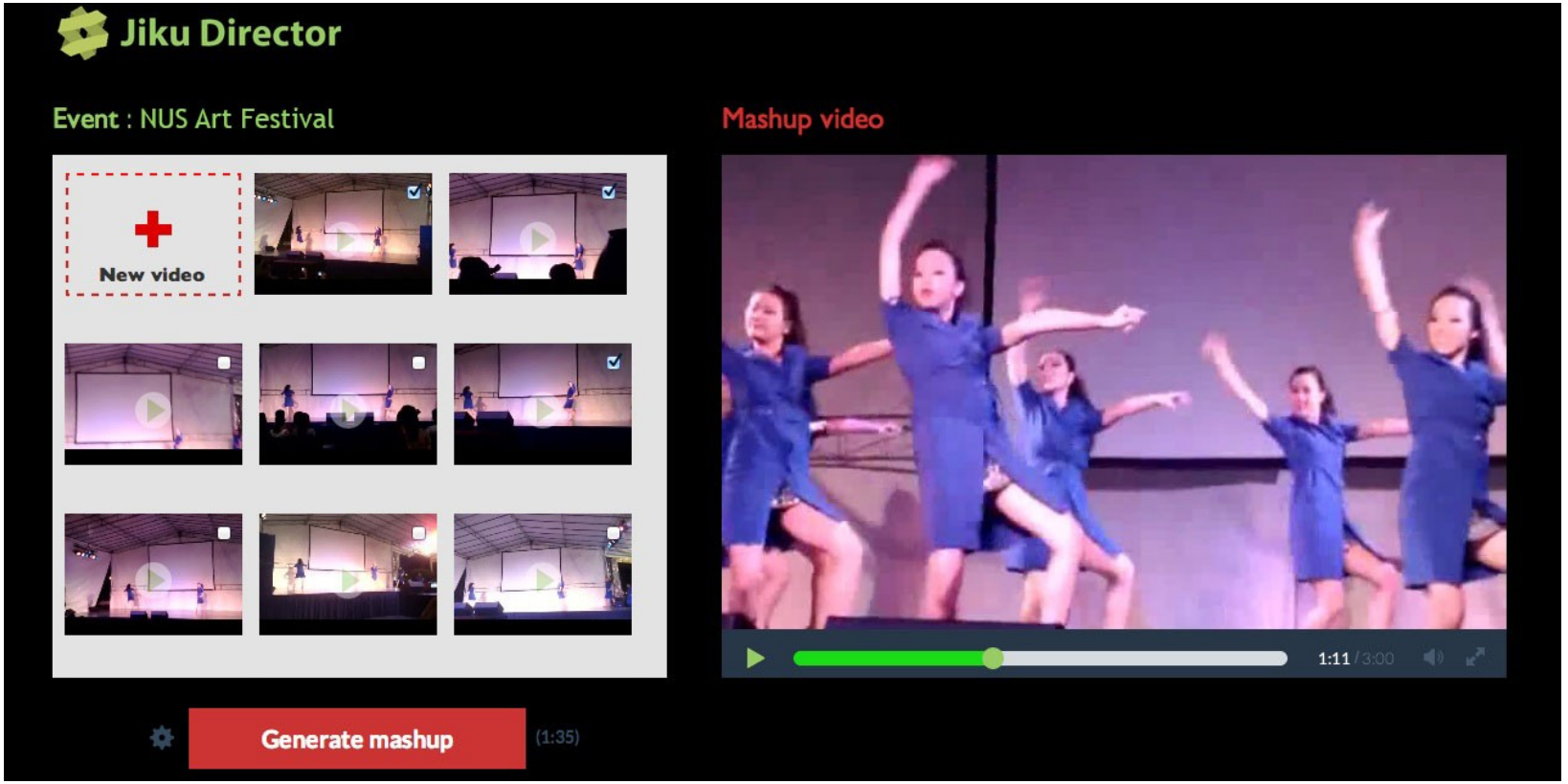


Comparison with Saliency



An application of 3D Interest Maps

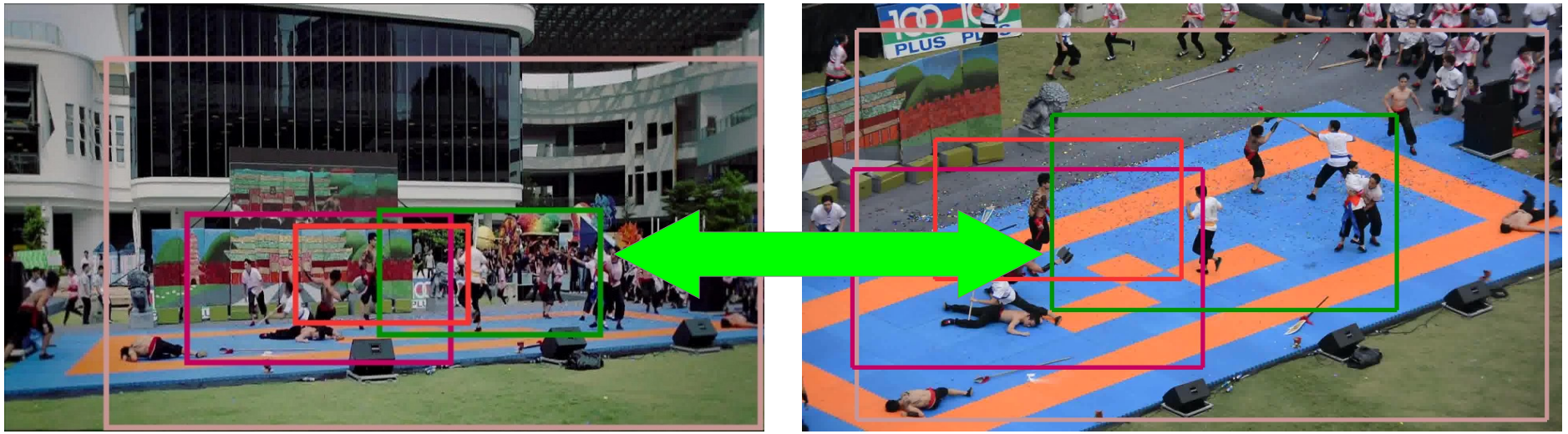
Mashup Video



[Saini et al] **Movimash: online mobile video mashup**, *MM 2012*

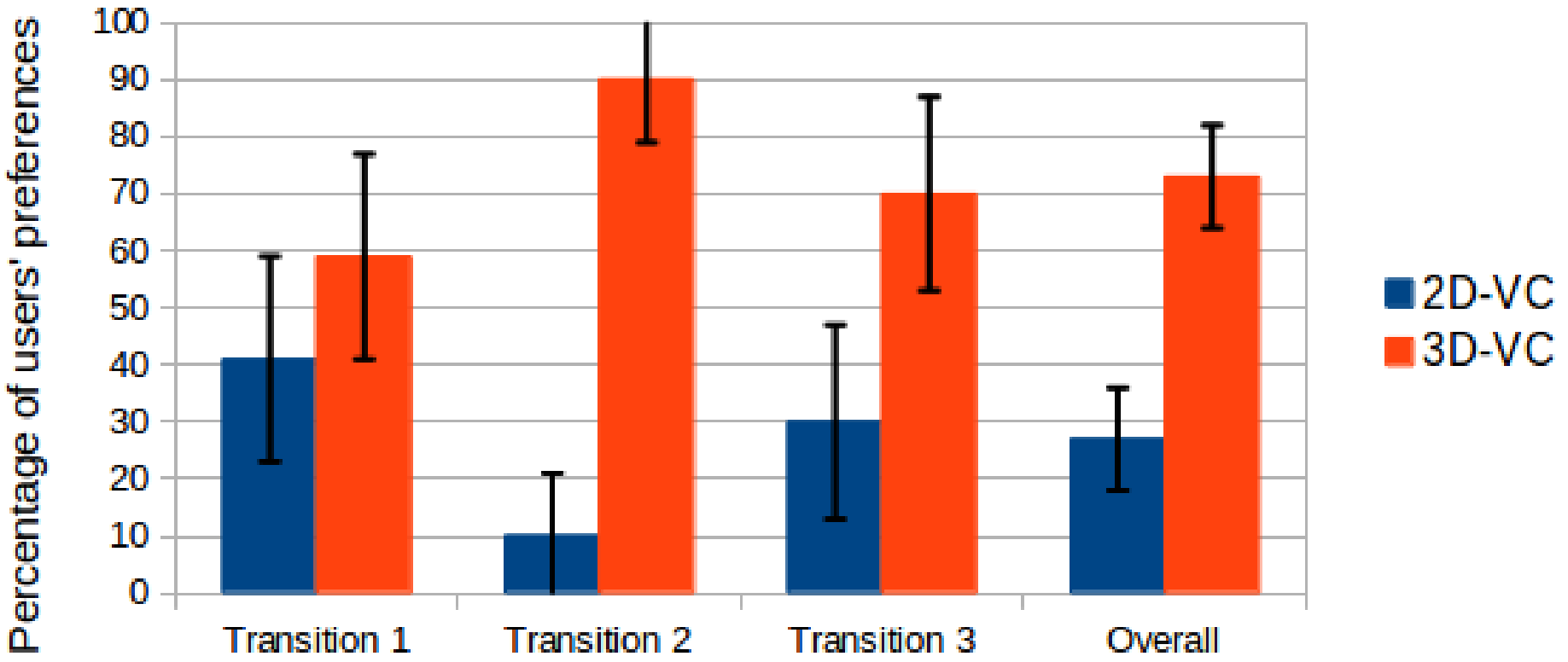
Automatic Video Edition

3D transition


PLUS

Result

Evaluation



2D-VC: JikuDirector 2.0 (demo)

3D-VC: this paper

Conclusion

- Formal definition of 3D interest maps
- A common space for representing interest in many simultaneously recorded videos
  - Thanks to our strong assumptions, this common space is the 3D space
- Many applications, including video mashup