

OBSERV3D QUEUE ANALYSIS

ENABLING ACTIVE QUEUE MANAGEMENT

SCIENTIFIC VISION DAYS: 09.11.2016, 11:40-12:00

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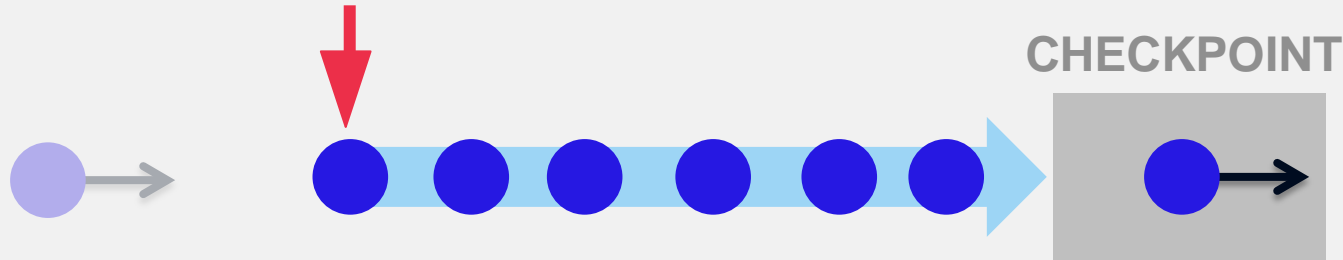
FFG





Queue Length + Waiting Time estimation

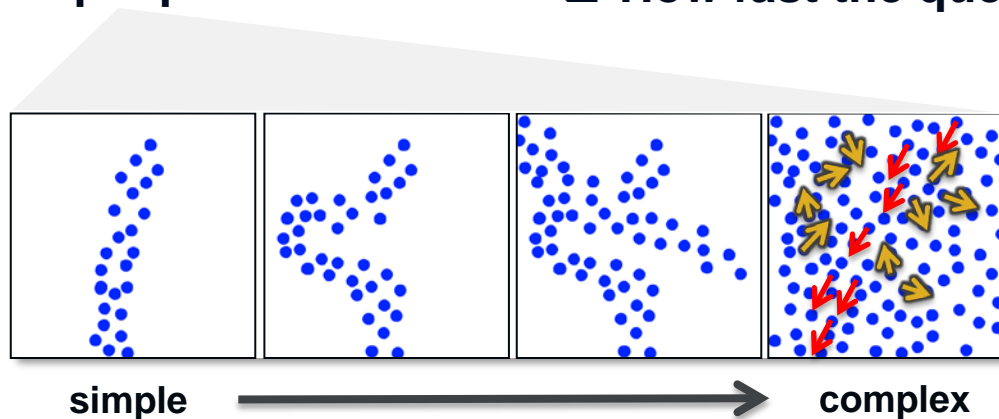
Estimated waiting time
for the last individual in the queue



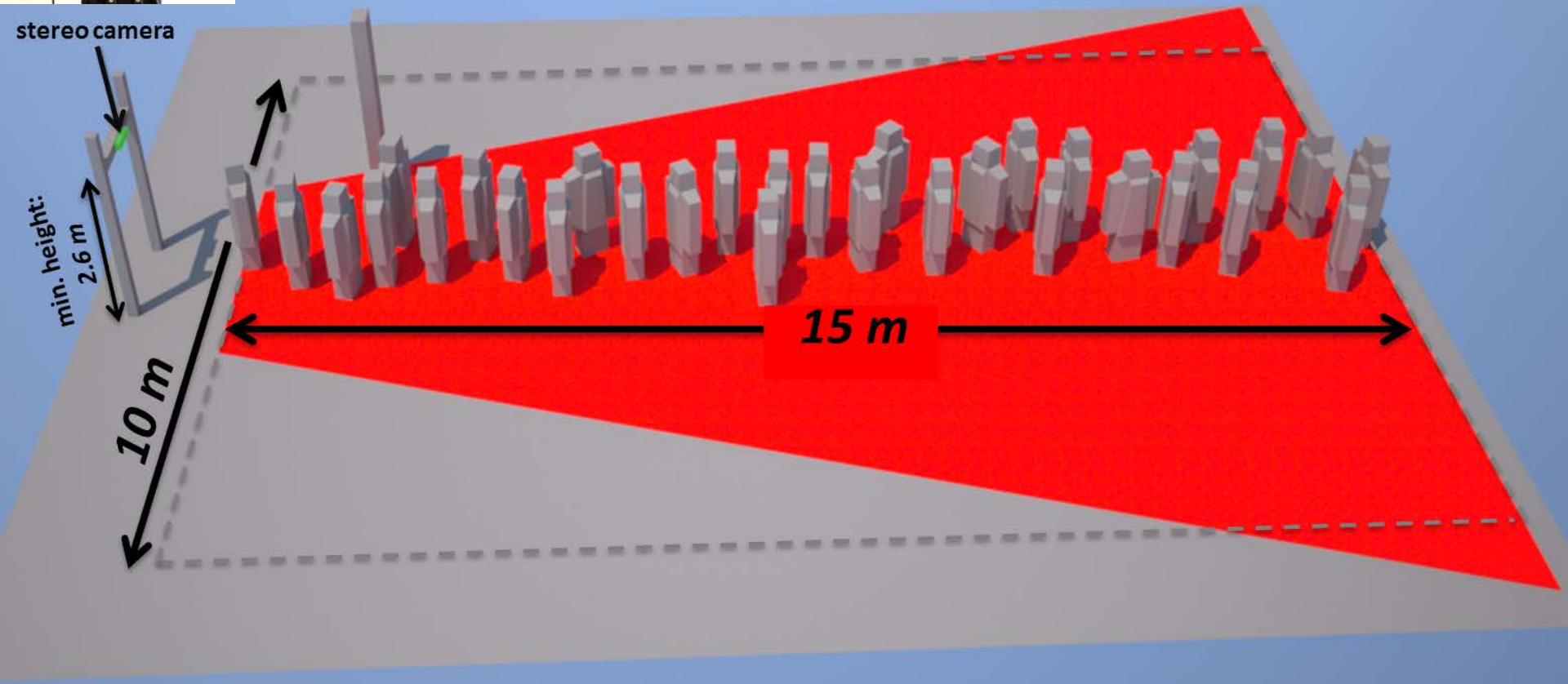
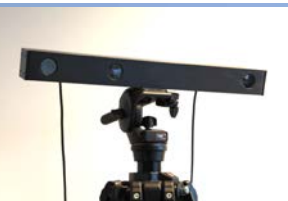
Two questions must be answered:

Where are the people?

How fast the queue moves?



Stereo Vision based Queue Analysis



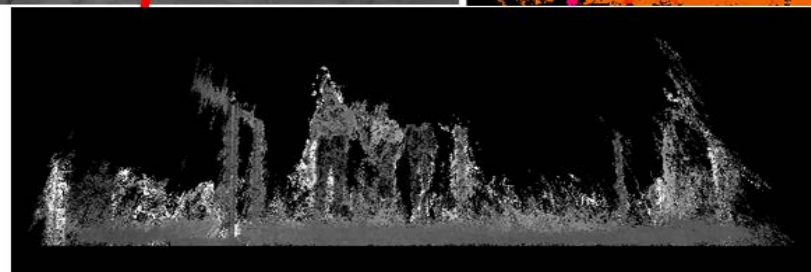
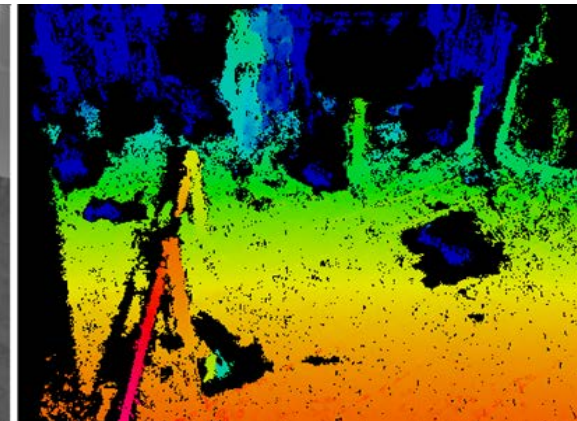
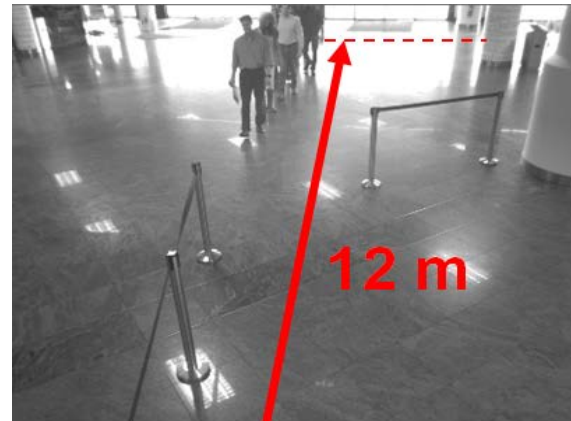
Passive stereo based depth measurement

- 3D stereo-camera system developed by AIT
 - Area-based, local-optimizing, correlation-based stereo matching algorithm
 - Specialized variant of the Census Transform
 - Resolution: typically ~1 Mpixel
 - Run-time: ~ 14 fps (Core-i7, multithreaded, SSE-optimized)
 - Excellent “depth-quality-vs.-computational-costs” ratio
 - Ethernet interface

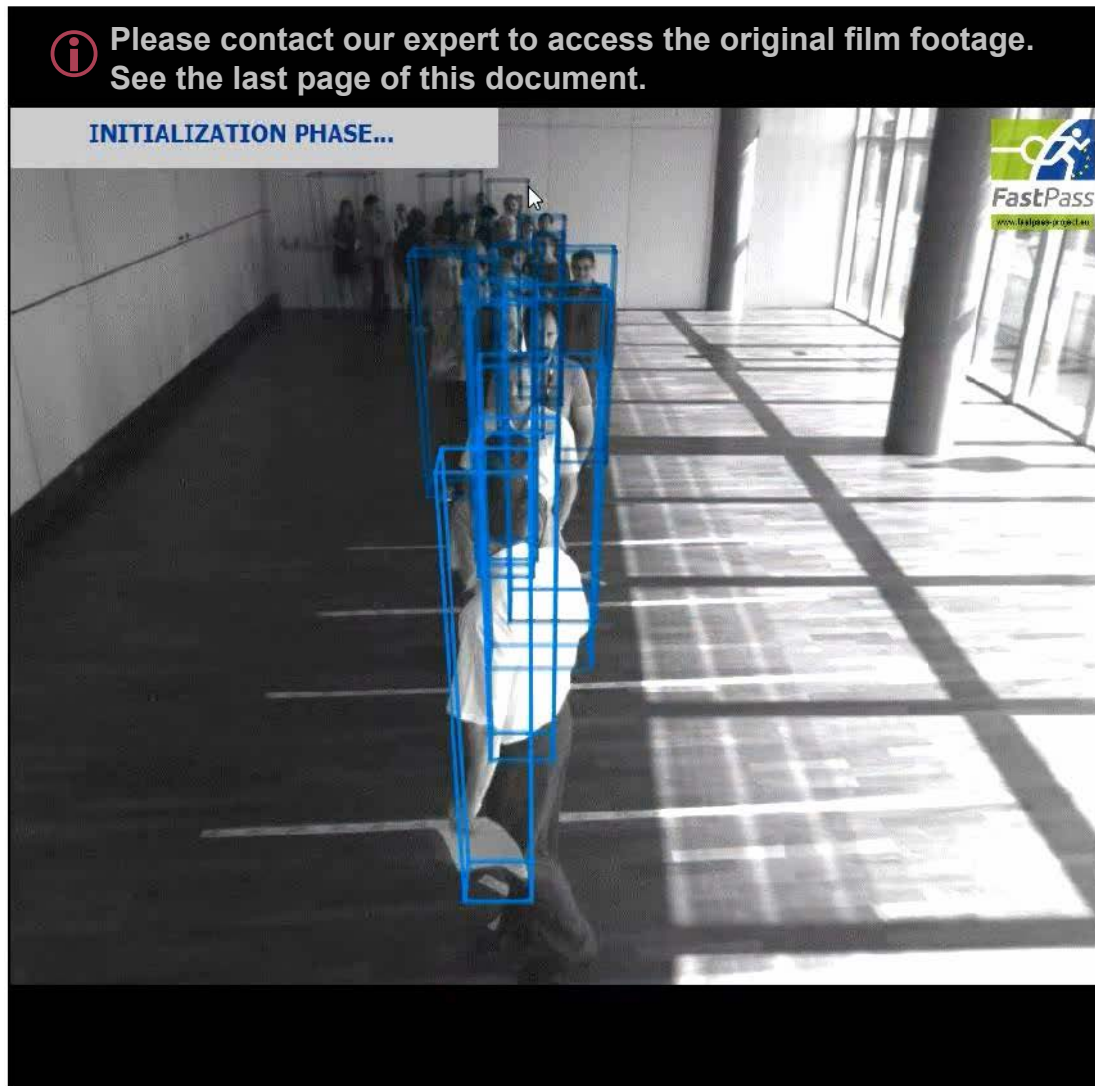



-> Advantages

- Depth ordering of people
- Robustness against illumination changes & shadows
- Enables scene analysis



Queue Analysis (run-time: 6-7 fps)



Visualizubon 

Displayed Image:

Input Image

ParticleAdvection tracks

Top View

Disparity Map

Save Output Images

Enable: Wutermark

Status List

16:14:50 Shared Memory Import: Successful

16:14:50 Groundplane Groundplane loaded from file.



Frame: 109

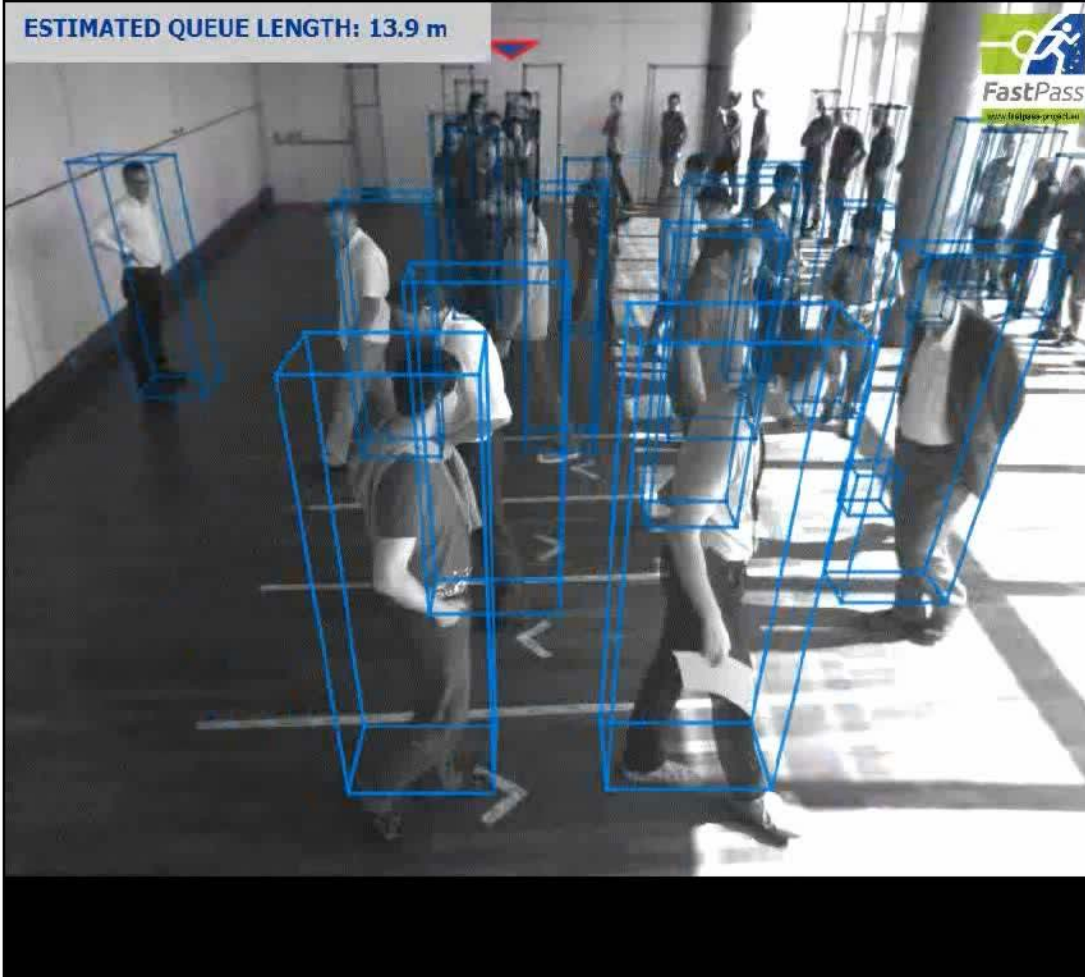


Visualization OpenGL Configuration

Queue Analysis (run-time: 6-7 fps)

i Please contact our expert to access the original film footage.
See the last page of this document.

ESTIMATED QUEUE LENGTH: 13.9 m



Frame: 1439



OpenGL 5

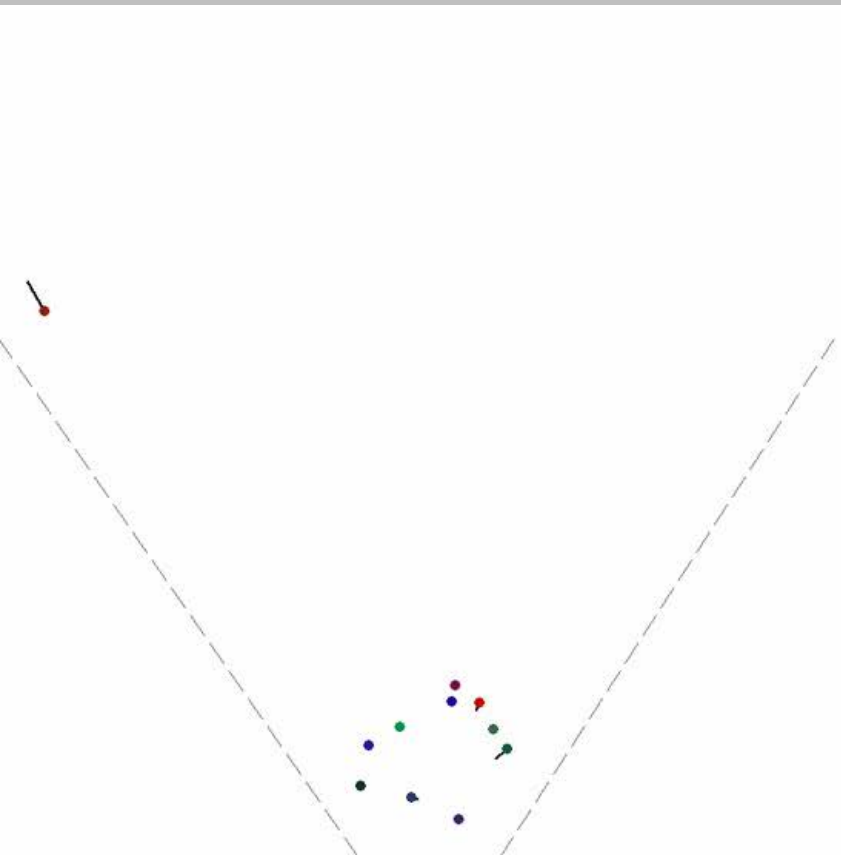
enable OpenGL Visualization

x-Translation: -0.850 x-Rotation: 276 Zoomfactor: 0.215
y-Translation: -1.585 y-Rotation: 183 (90, 414)

Visualization OpenGL Configuration

Adaptive estimation of the waiting zone

Estimated configuration
(top-view)



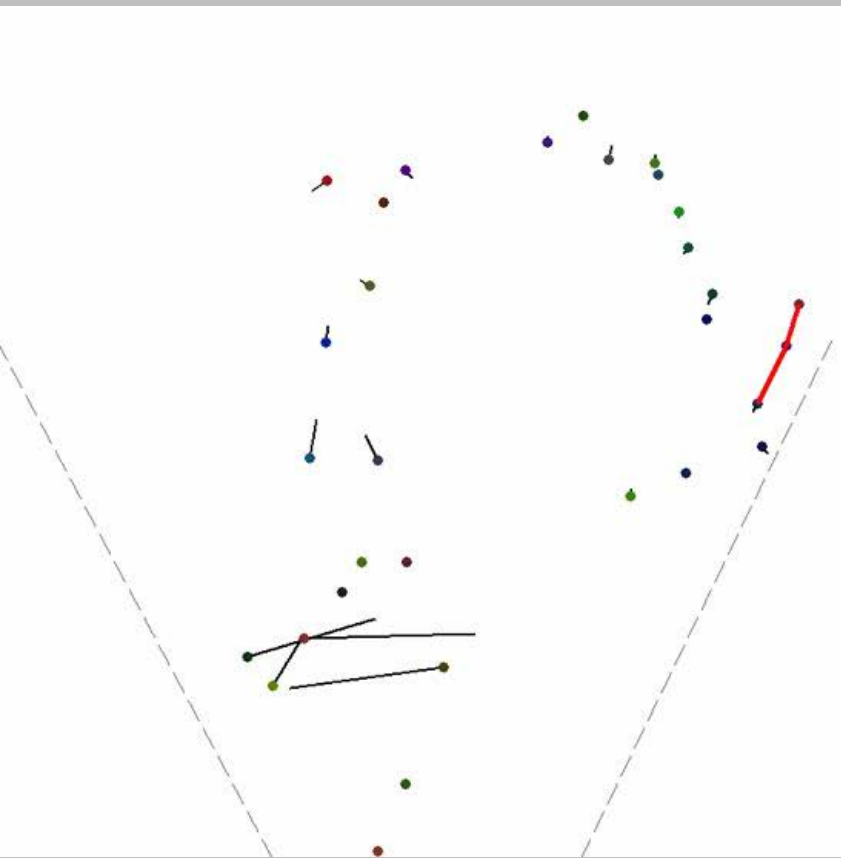
Detection results



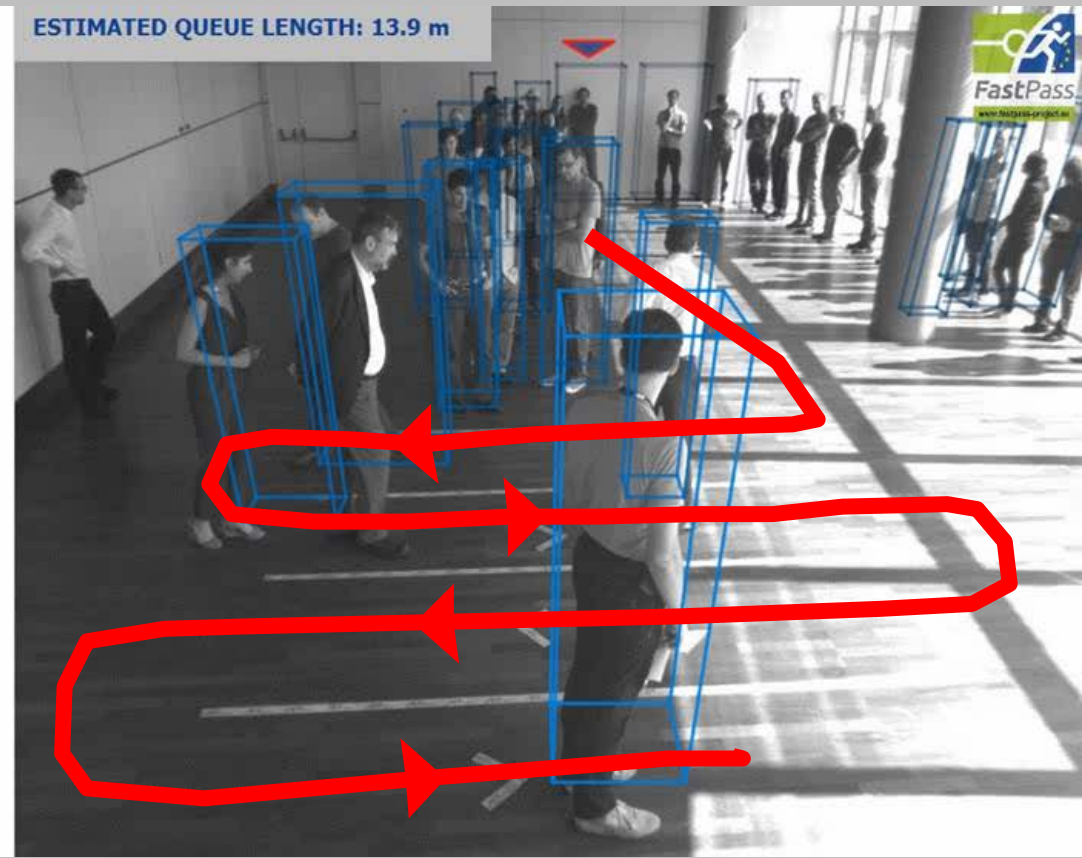
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Adaptive estimation of the spatial extent of the queueing zone (meander-style queue)

Estimated configuration
(top-view)

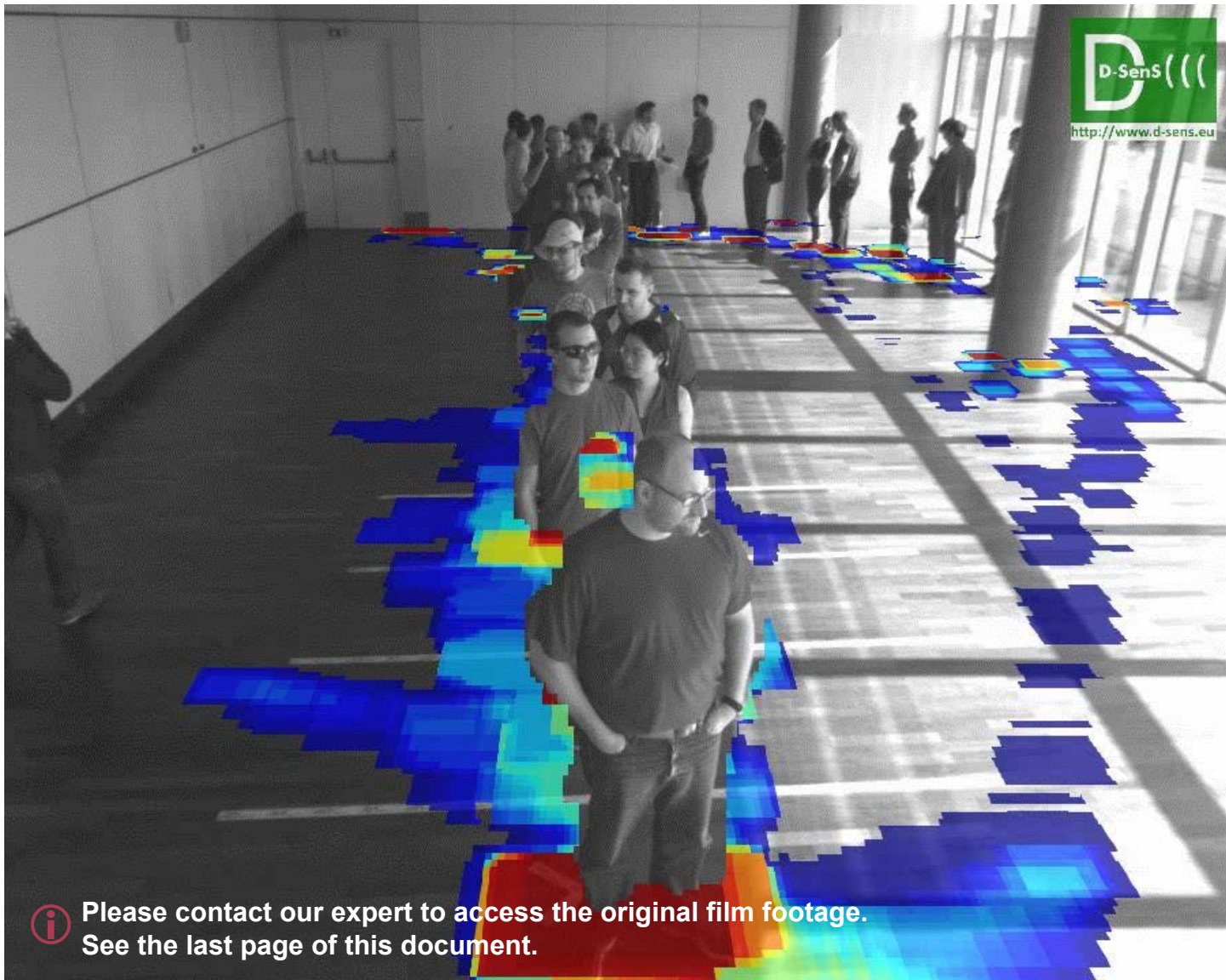


Detection results



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Location-based statistics



Key Features

- Ease of installation -> no configuration needed
 - Camera mounting – agnostic w.r.t. lookdown-angle (issue at low ceiling height)
 - Self-calibrating - single view
 - Ethernet connectivity
 - Large observation area by one stereo-camera (10m x 15m)

- Analytics performance in realtime
 - Highly robust against varying environmental conditions
 - Accurate person detection and tracking even in crowded situations
 - Adaptive estimation of the queueing zone
 - Analytics runs as a service

- System output
 - Number and location of detected persons, shape and location of queue
 - In queue or queue waiting time and velocity of queue
 - Live camera views

Targeted Markets & Applications

... with the need of improved customers' experiences by intelligent queue management for your service operations in

- Security (e.g. check-in desks at airports, intelligent escape routes)
- Retail (e.g. pay desk)

because of impact on customers' perceptions of your services

Possible Applications:

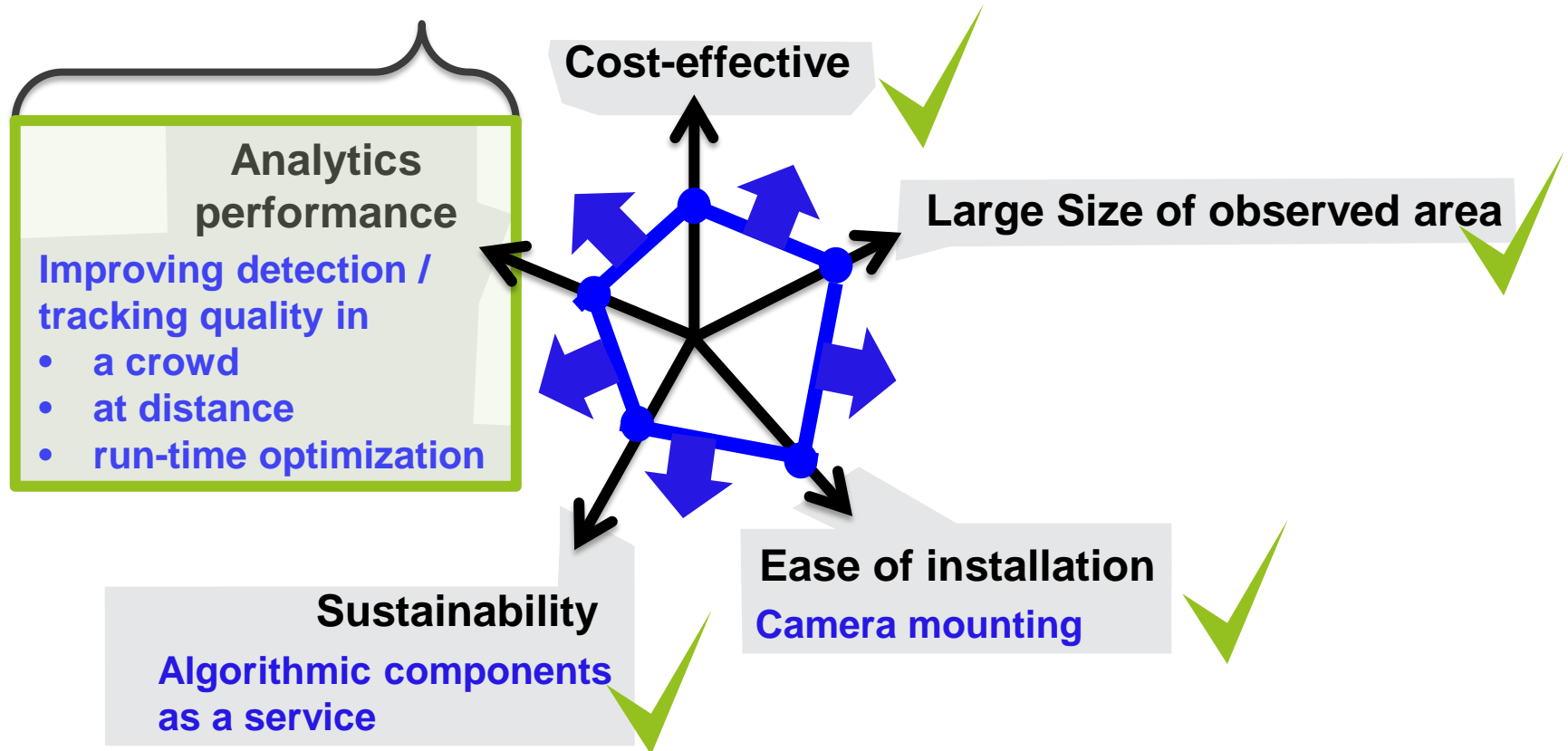
- Announcement of waiting times
- Queue load balancing for multiple queues
- Creating reports or real-time alerts to improve performance of customer service
- Staff management of the operator

Current Demo-Installation:

- Vienna International Airport Vienna (4 systems)

Summary, further steps

- Long-term quantitative evaluation till 12/2016
- Operational installations at 2 more European airports in 2017
- Additional iteration of algorithmic improvements, if necessary



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your ingenious partner

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