

# Event Detection in Video

Filip Nálepa

# Outline

- Motivation
- Application
- Formalization

# Motivation

- Automatic surveillance video analysis
- Real-time alarms for suspicious behaviour



Staticflickr.com

# Event Detection Application

- People related events
  - Restricted area entrance
  - Waiting
  - Meeting
- Real-time detection
- OpenCV library
- Four-step event detection process

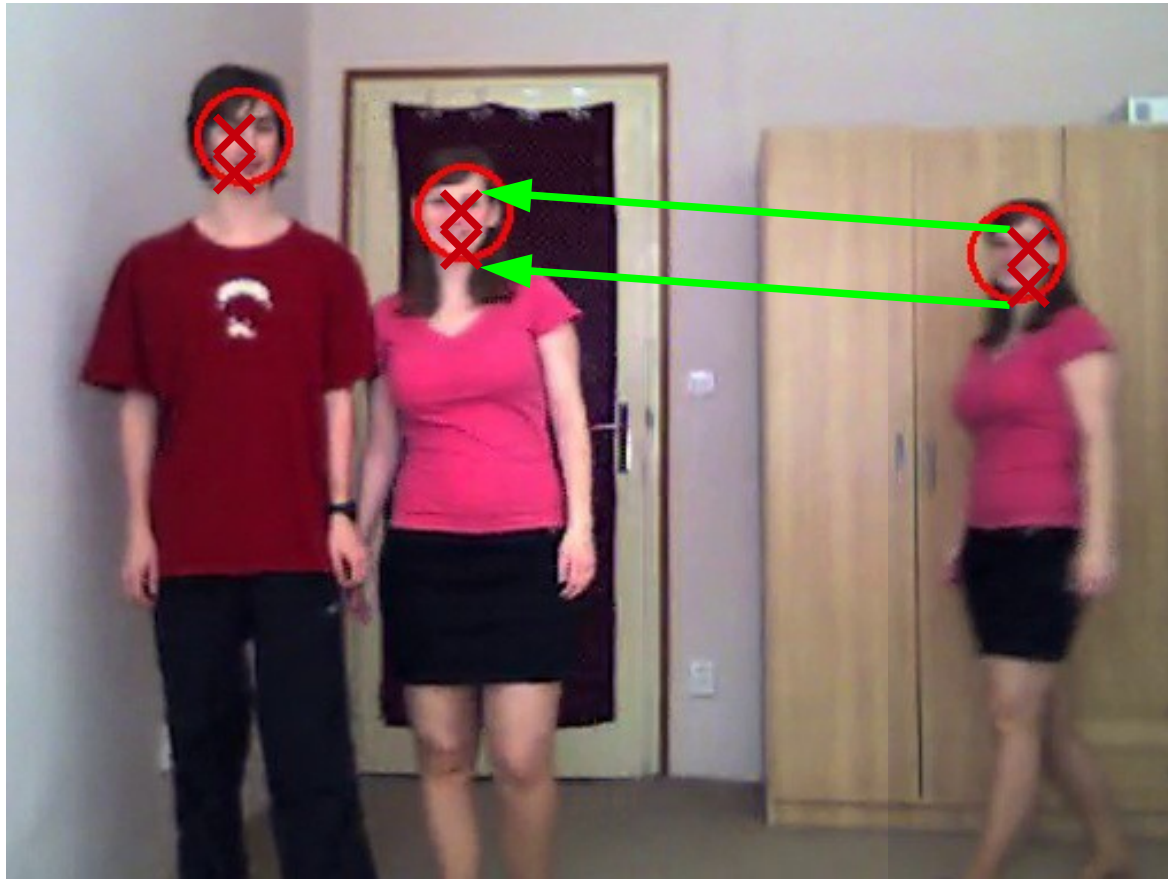
# Person Detection



# Tracked Point Selection



# Person Tracking



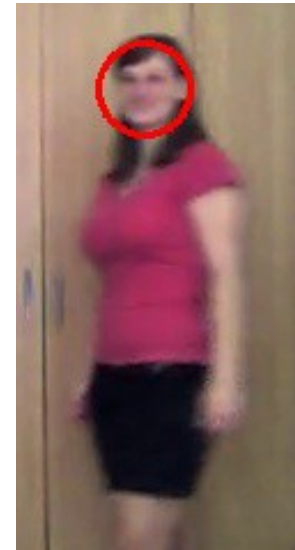
# Event Detection





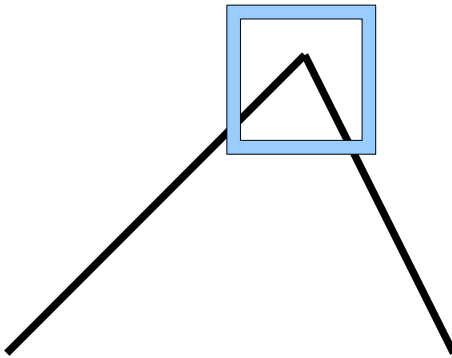
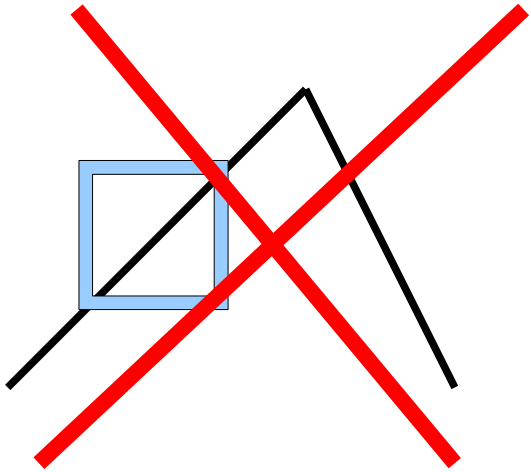
# Person Detection

- Face detector
- No adaptation needed
- Easy detector replacement



# Tracked Point Selection

- Well trackable points selected automatically
- Corners – easily indentifiable
  - Method by Shi and Tomasi



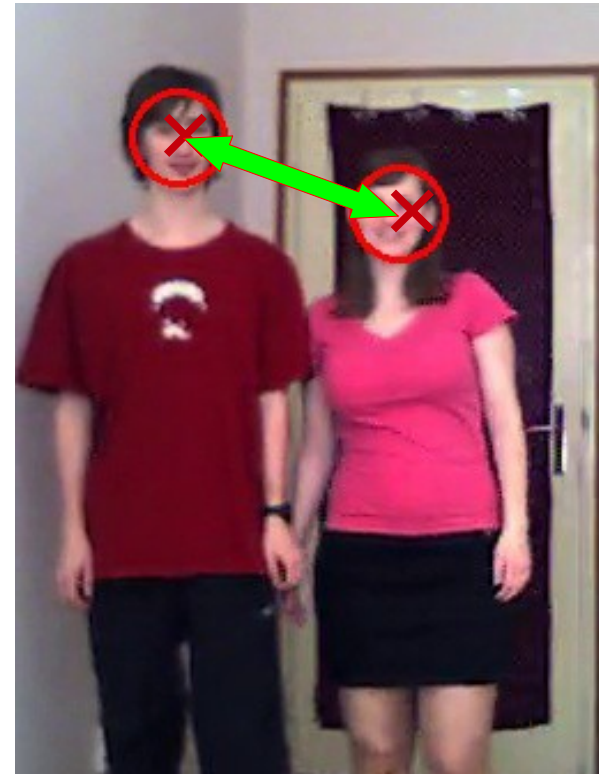
# Person Tracking

- Optical flow method – motion vectors
  - Lucas-Kanade algorithm
- A few points tracked  
→ fast



# Event Detection

- Only one reference point of each person
- Event types
  - Time related
  - Speed related
  - Place related
  - Meeting
  - Person identification
  - Combinations
    - concurrence, sequence



# Application Screenshot

## Video input

video file  ...  
 camera

## Event definitions

Save configuration

Load configuration

Approach to point

New event

Edit event

Remove event

Remove all

ID	Configuration	Watch?
1	Meeting, distance: 100; duration: 1,000 ms	<input checked="" type="checkbox"/>
2	Appearance in area (350; 40; 550; 240); duration: 500 ms	<input checked="" type="checkbox"/>

Launch

Stop

## Events

Filter

Event	Start	End
Appearance in area (350; 40; 550; 240)	0:1:16	0:1:18
Appearance in area (350; 40; 550; 240)	0:1:12	0:1:14
Meeting	0:1:8	0:1:11
Appearance in area (350; 40; 550; 240)	0:1:5	0:1:7
Appearance in area (350; 40; 550; 240)	0:0:45	0:0:47
Appearance in area (350; 40; 550; 240)	0:0:41	0:0:43
Meeting	0:0:35	0:0:40
Appearance in area (350; 40; 550; 240)	0:0:31	0:0:33

## Event frames

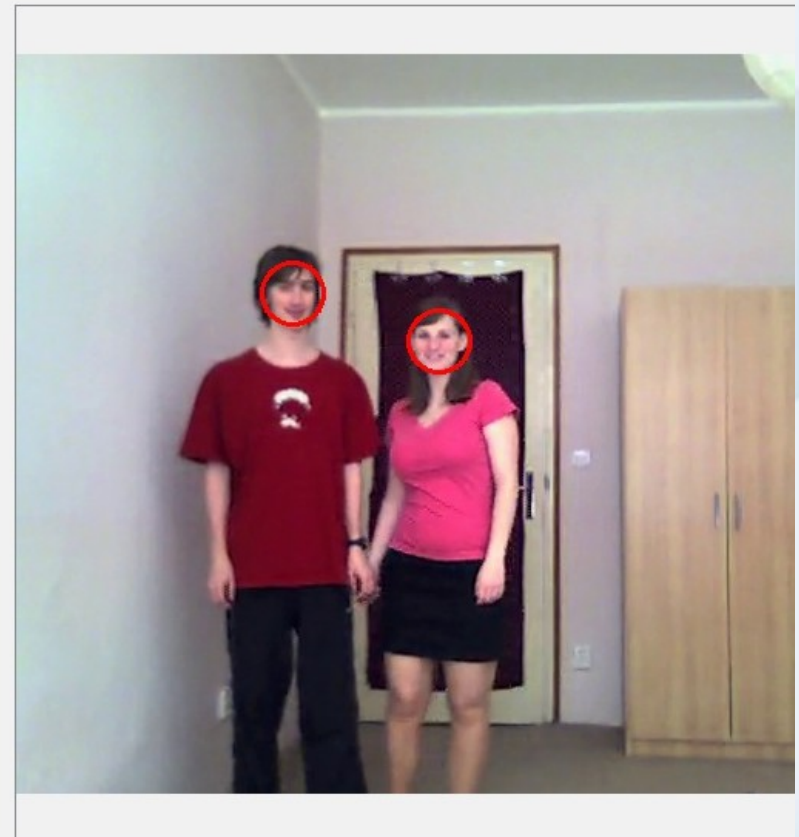
First

Previous

Next

Last

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# Formalization

- Event detector – function
- BasicEventDetector: Video  $\rightarrow \mathbf{P}(\text{Event})$
- AdvancedEventDetector:  $\mathbf{P}(\text{Event})^k \rightarrow \mathbf{P}(\text{Event})$

# Summary

- Application for human tracking in video
- Real-time event detection
- Event detection formalization

**Thank you for your attention.**