#FOROINNORMADRID

Nuevos Avances en Ciberseguridad y Blockchain

1 de octubre de 2019

Nuevos Avances en Seguridad: Ciberseguridad, Control de Acceso y Monitorización

Video Monitorización

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Video Processing and Understanding Lab

Escuela Politécnica Superior

Who we are? Which are our targets?

Video Processing and Understanding Lab

Established 2002

A STABLE TEAM OF PHD ENGINEERS WORKING TOWARDS THE SAME OBJECTIVE

PLUS PHD, MASTER AND GRADUATE STUDENTS, AND TECHNICAL STAFF

Research on theory, methods and applications related to

Image Processing & Computer Vision

focused on exploiting the temporal dimensión (image/video sequences) and the 3D projective relations (multiple and moving cameras) on real-time applications.

Research-intensive engineering

- **Research…**
  - Over 80 top-ranked journal papers, 5 book-chapters, over 100 conference papers.
  - Basic research projects (public national funding)
  - Applied research projects (public national and EU funding)
    - involving industrial partners.
- **…and Technology Transfer**
  - Research and innovation activities in technological projects with the industry (private funding).

Focused training for talent attraction

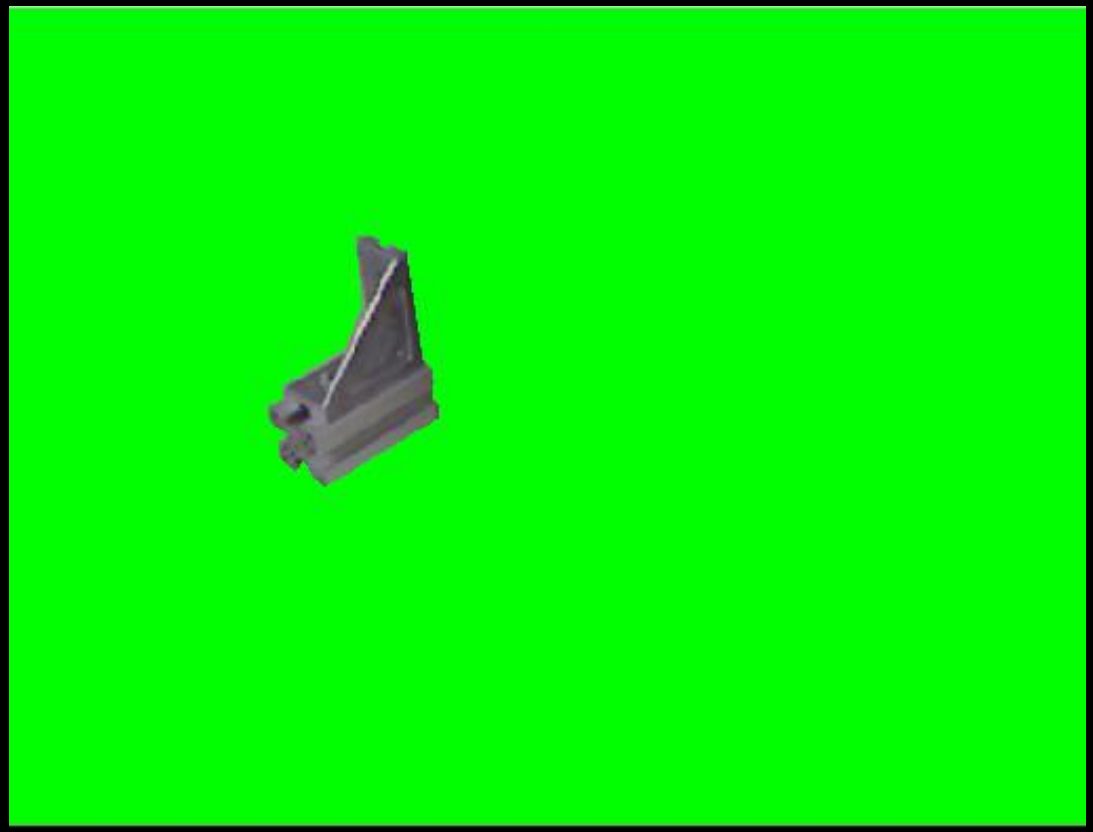
- **Undergraduate training:**
  - 4-Years Bachelor Degree in Telecommunications Engineering, including one year specialisation in Audio and Video Processing
- **Postgraduate training:**
  - 2-Years Erasmus Mundus Joint Master Degree in Image Processing & Computer Vision (UAM, Université Bordeaux and PPCU-Budapest)
  - PhD Program In Computer Science and Telecommunications Engineering (currently 5 VPULab PhD Students)
  - *Master Degree in Applied Deep Learning for Audio and Visual Signals (expected for next course)*

Some Main Topics

- **Object identification**
- **Detection and tracking: fixed cameras**
- **Detection and tracking: mobile cameras**
- **Event simulation**
- **Monitoring for health, diagnosis, …**

Perception-based object identification

Severe-occluded 3D object identification based on RGB-Depth information, just trained with 1-8 instances (non CNN-based)



"Severe-occluded 3D object identification via region-based descriptions"
Signal Processing Image Communication, 2017, DOI: 10.1016/j.image.2017.07.007

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Flow control from fixed cameras

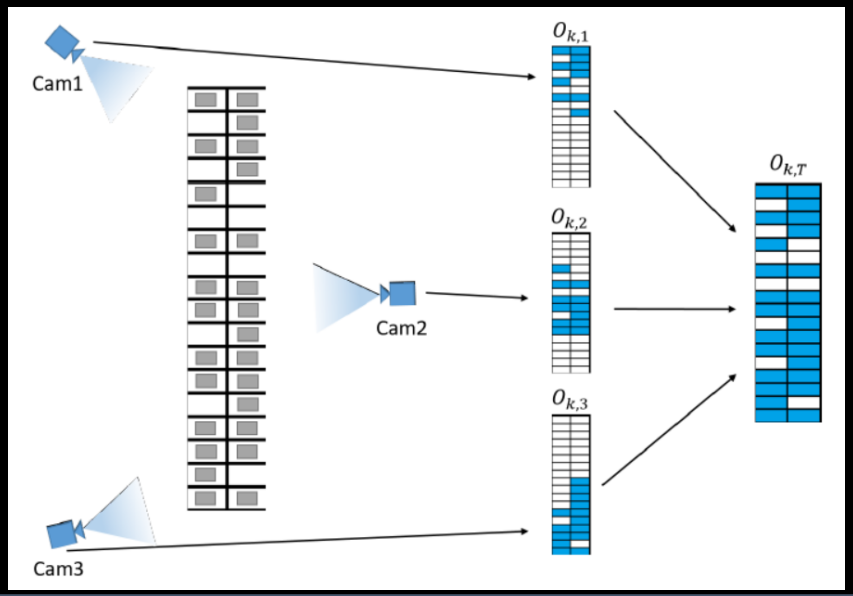
Tracking of vehicles and people

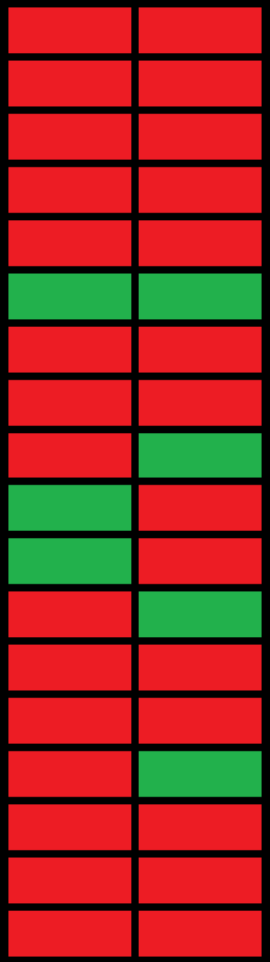
CNN-based detection

Automatic traffic monitoring

Parking vacant detection

- **Multiple cameras to handle difficult viewpoints**





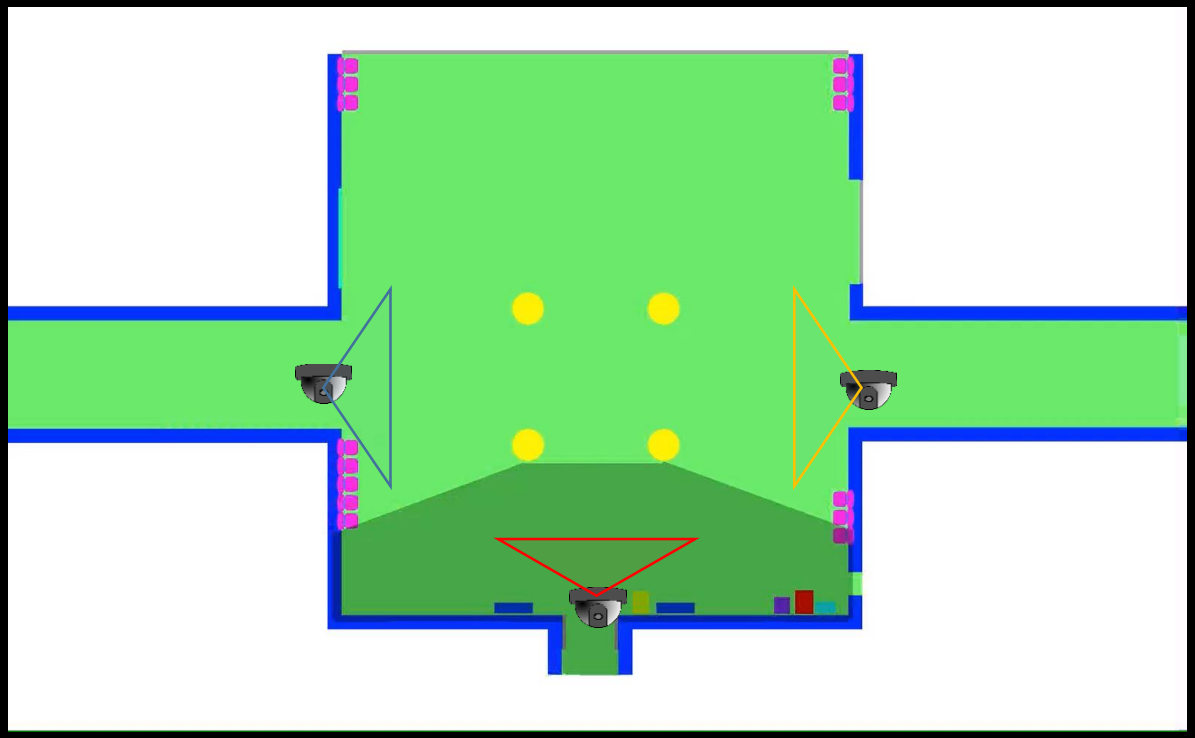
Automatic parking management system

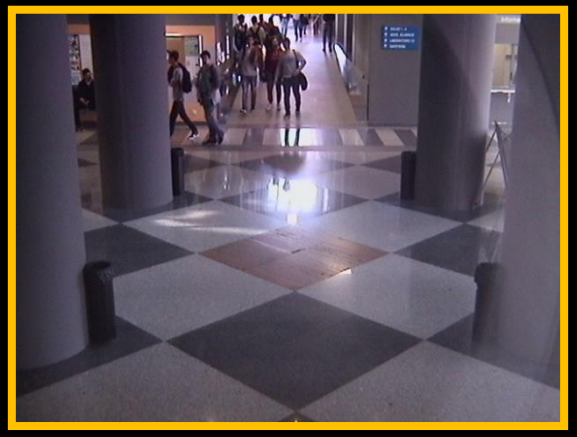
- **How many people are needed for the management of this parking?**

Automatic parking management system

- **Pittsburgh International Airport (PIT)**

Crowd density estimation





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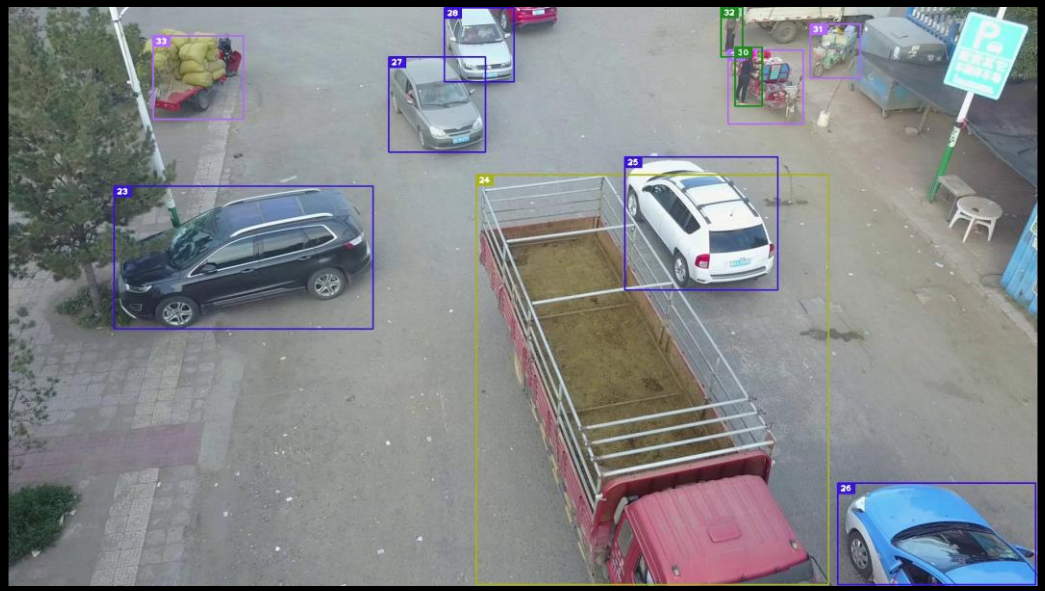
Flow control from mobile cameras



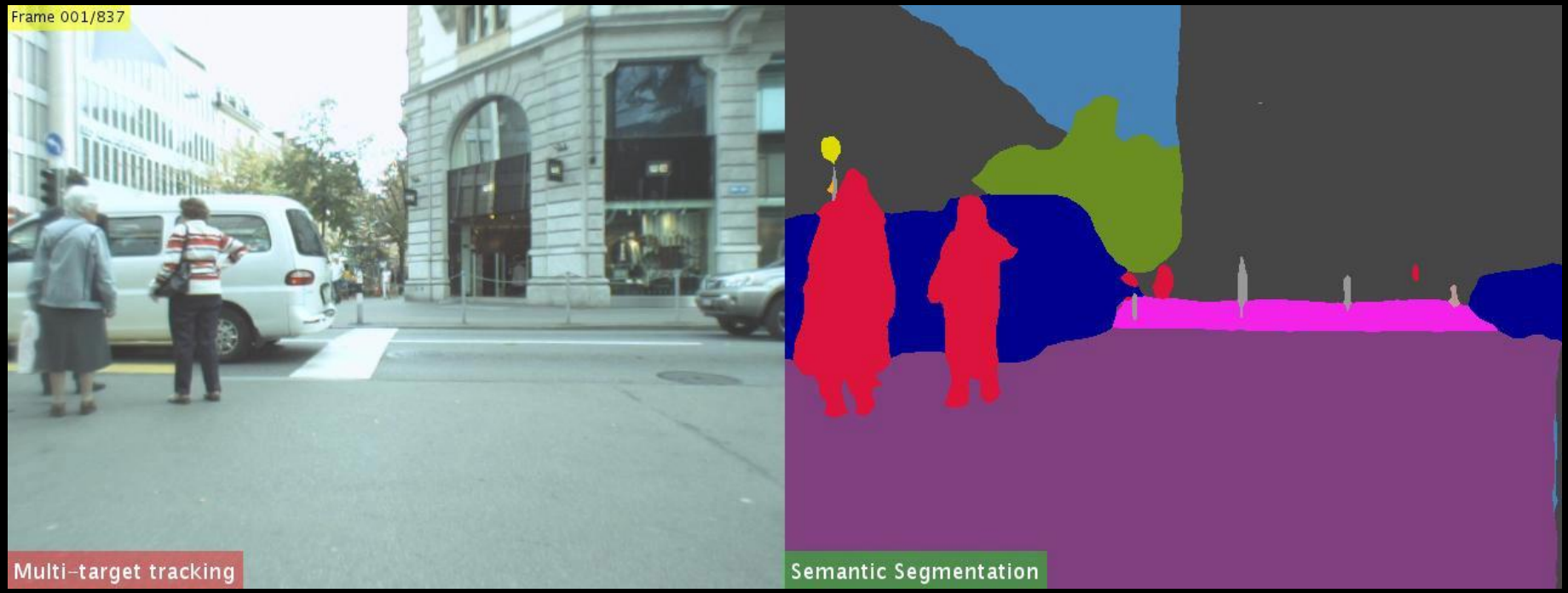
Tracking of vehicles and people

CNN-based detection

Tracking to guide the mobile platform

Wearable cameras

- **Combining multi-target tracking and semantic segmentation**



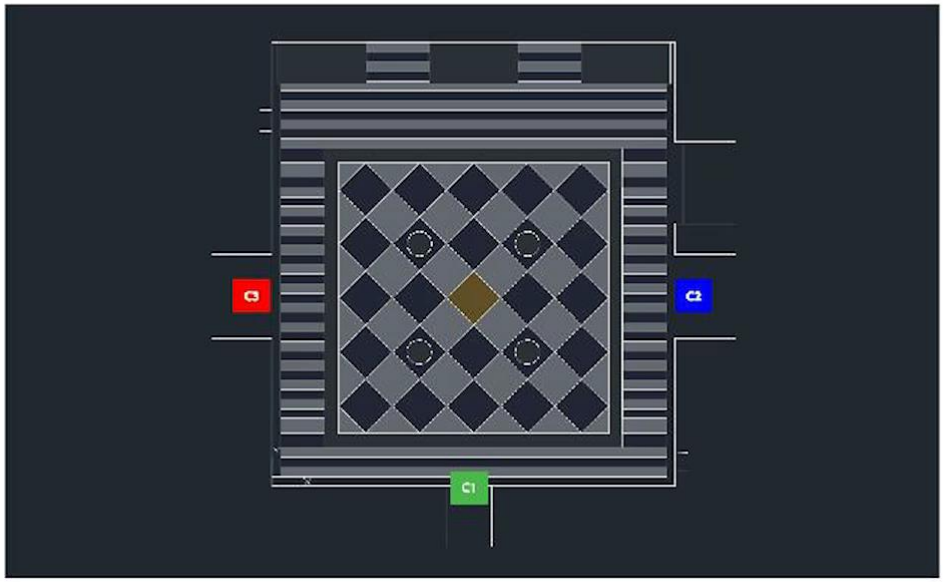
Crowd density estimation

Camera 1

Camera 2

Camera 3

Cenital View



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Event Simulations

- **System evaluation and CNN-based system training**

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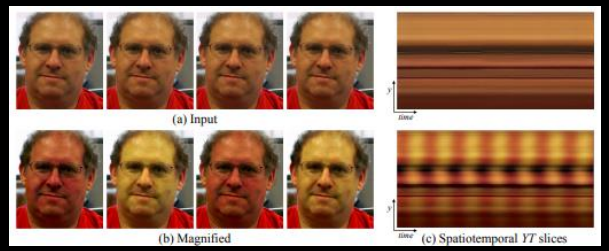
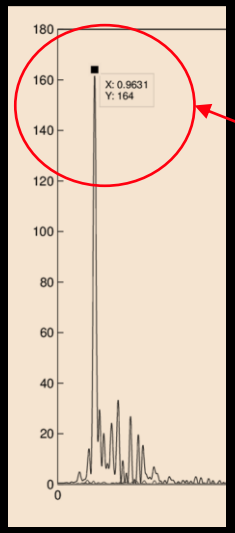
Video-based heart-rate estimation

RGB+Depth capture

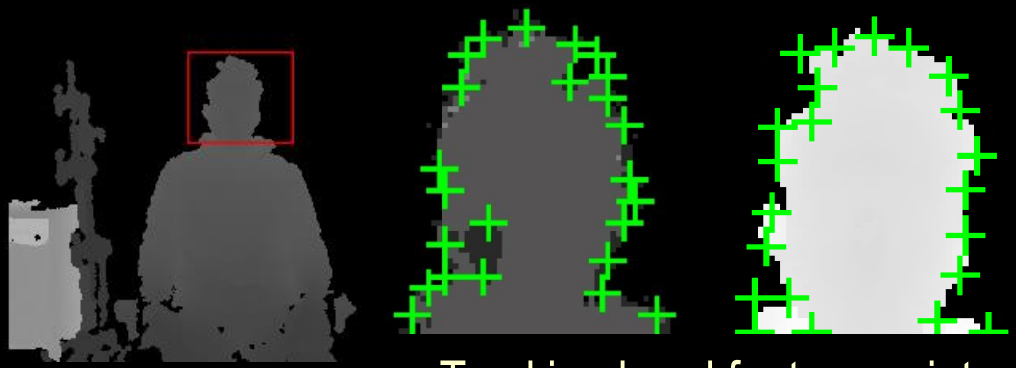


© MIT



HR=62,09 ppm
GT=63 ppm
HR=57,79

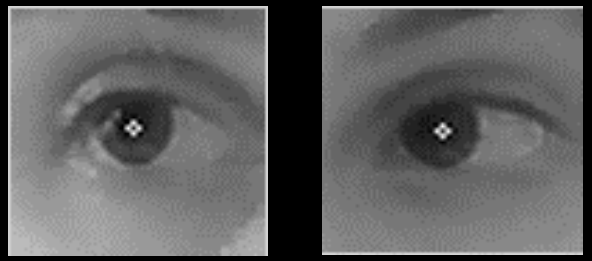
Estimating colour variations (RGB) or periodic motion (Depth)



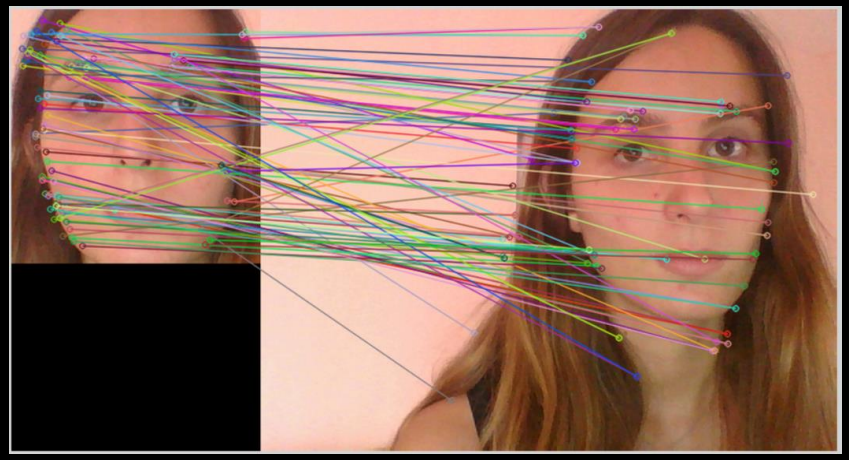
Tracking head feature-points

Focus of attention monitoring

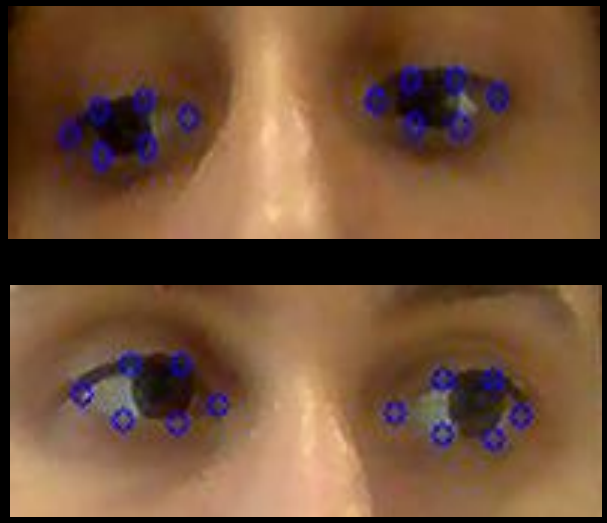
Obtaining the pupil center



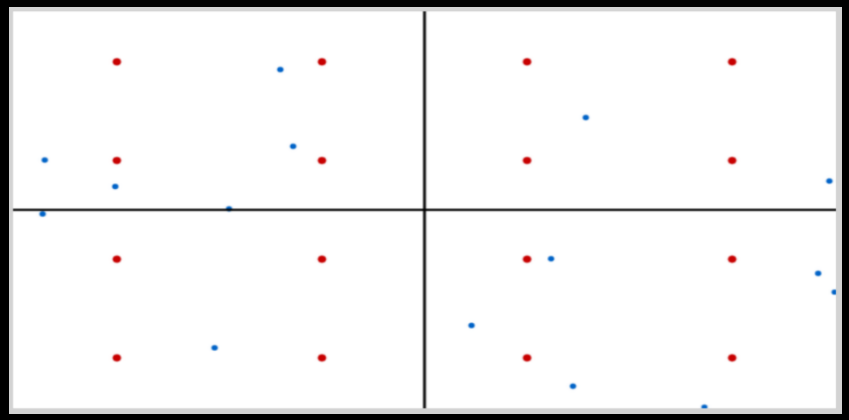
Tracking the head location



Computing the pupil relative position



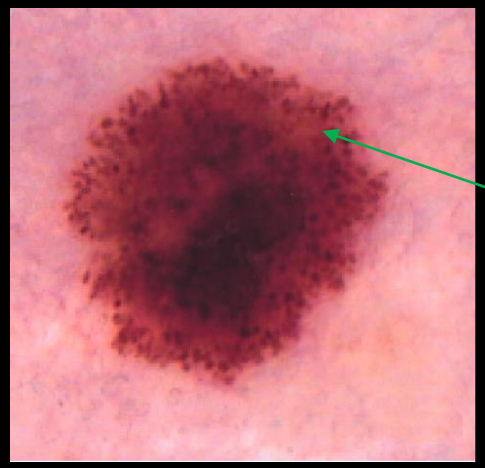
Estimating the observed point

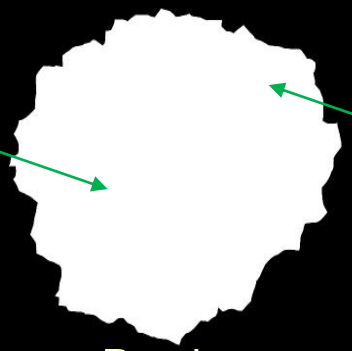


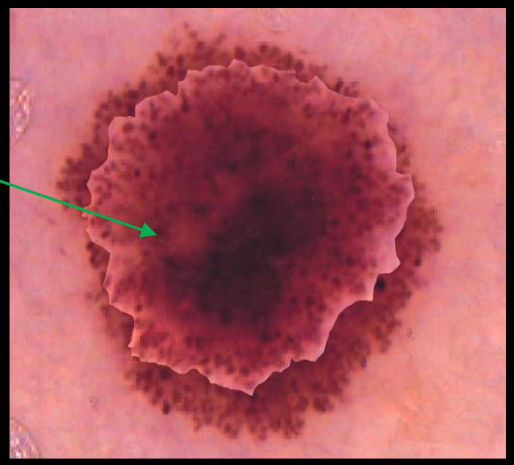
Analysing the evolution of skin lessions

Day 1 capture

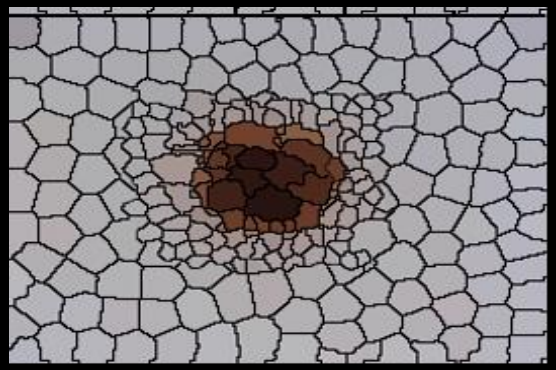
Day 1 capture over Day N capture







Precise segmentation



"Accurate segmentation and registration of skin lesion images to evaluate lesion change"
IEEE Journal of Biomedical and Health Informatics, 2018 DOI: 10.1109/JBHI.2018.2825251

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