Face Recognition

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Outline

• Aims of Face Recognition
• Face Recognition Process
  – Face detection
  – Face identification
• Live demo

Source: https://blog.htwchur.ch/blog/der-pin-hat-ausgedient-heute-gilt-die-gesichtserkennung/
Aims of Face Recognition

Decision making
Face detection: Is there a face in the image? Where is it?
Face identification: Which person does it belong to?
Face Detection

Standardized input image

Face detected with all 4 tested algorithms

High detection rate with any algorithm

Source: stva.zh.ch
Face Detection

Efficiency

Search for predominant intensity patterns

Viola Jones, Haar features

3 out of 6 faces detected

OpenCV Haar: FPS: 12.89

Face Detection: Comparison of 4 Algorithms

Lighting, viewing direction

Haar Features

Histogram of Gradients (Support Vector Machine)

Deep Neural Net (ResNet-10 based)

Convolut. Neural Net (Max-Margin Object Detection)
Face Recognition: Typical Detection and Identification Process

Extract feature vector (128 elements) = numerical representation of given face
Requirement Engineering for Face Recognition

Target Challenges

Hardware Requirements
- processing speed
- memory
- energy consumption

Recognition Challenges
- selection of algorithm and model
- face size (minimum number of pixels)
- side view / tilted head
- occlusion
- lighting
- algorithmic bias (race, gender, ...)

Add 3D Information
- added accuracy
- added security

Source: Gesichtserkennung statt PIN?, SwissEngineering STZ, Apr 2018
Outlook: Some Hot Topics in Face Recognition

- merging 2D and 3D data
- combination with other profiling approaches (e.g. gait)
- facial expression analysis (e.g. driver drowsiness)
- advanced image analysis (of context, e.g. location from background, activity, ...)

Deep neural networks
- bias in learning data and algorithms

Big Data
- user profile
  - private: retail shops, google, facebook, etc.
  - government: track interactions
  - legal aspects of storing data

Evade surveillance
- Techniques to counter identification