Face Recognition Technology

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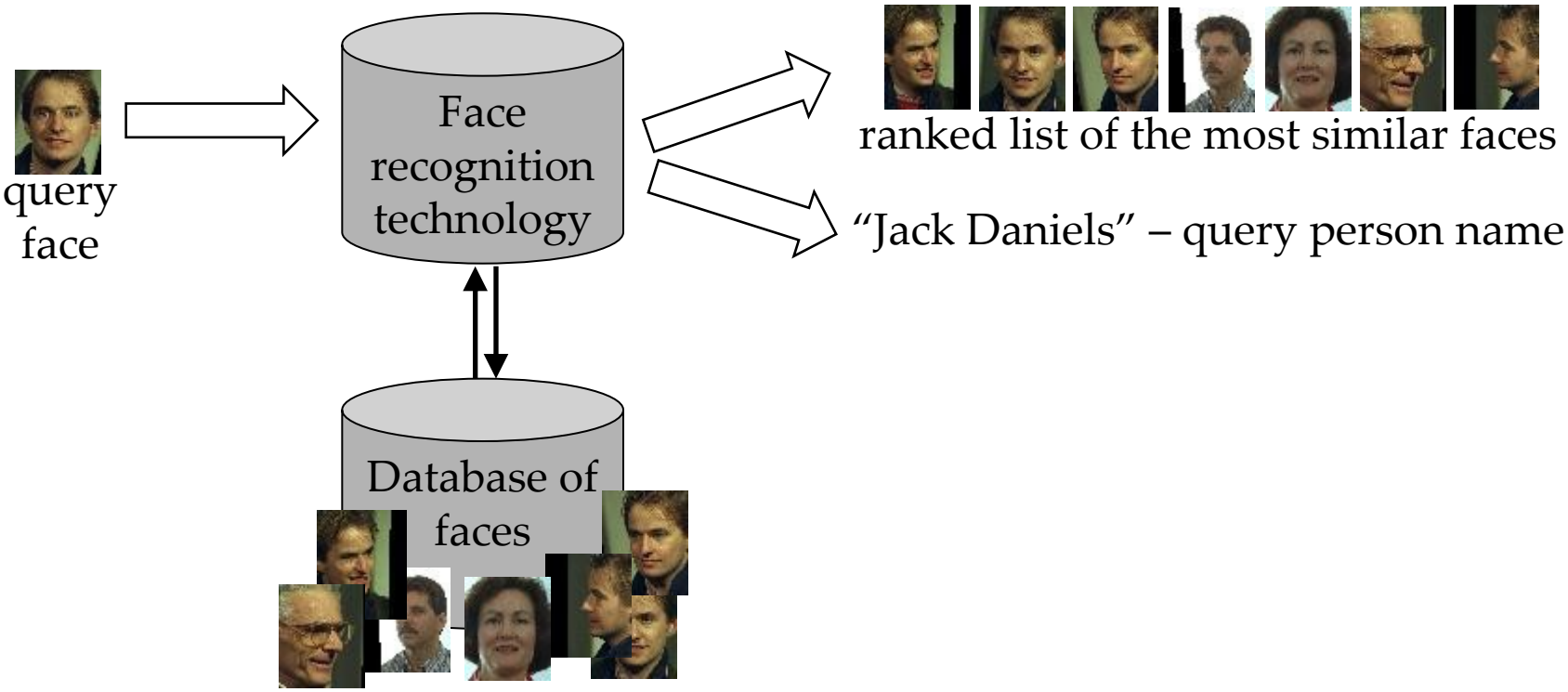
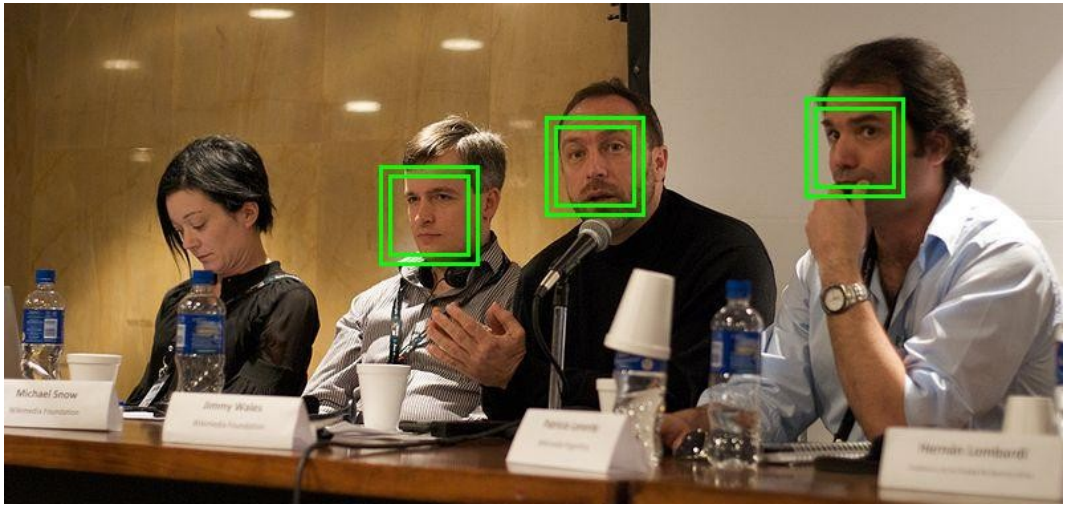
Motivation

- Face recognition technology



Motivation

- Components of face recognition technology
  - Detection – automatic localization of faces in images
  - Recognition – calculation of similarity of two faces
  - Retrieval – search for the most similar faces from a large database



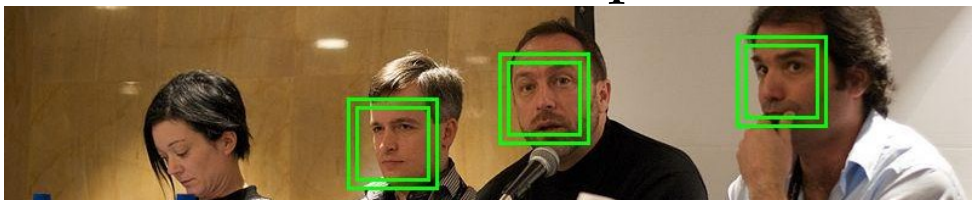
Motivation

- Our objective – to effectively and efficiently retrieve the most similar faces to a query face

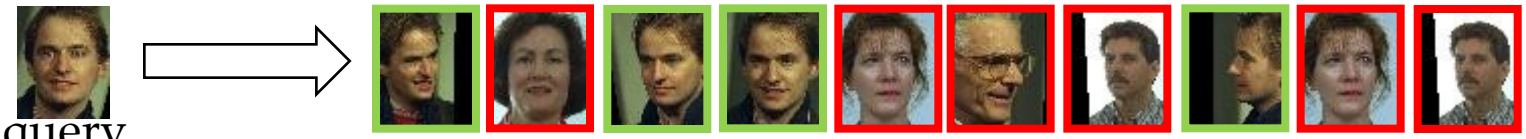
- Approach
  - Multi-technology – more **effective** detection/recognition
    - Combination of existing techniques for detection and recognition
  - Multi-query – more **effective** retrieval
    - Query composed of a number of reference objects
  - Scalability – more **efficient** retrieval
    - Indexing MPEG-7 descriptors + effective re-ranking

Motivation

- Efficiency
  - Time necessary for detection of faces in an image
  - Time necessary for retrieval of the most similar faces
- Effectiveness
  - Detection – recall 75%, precision 100%



  - Recognition/retrieval – recall 50%, precision 40% when 8 relevant faces are in the database



Multi-technology – Face Detection

- Multi-technology approach for face detection
  - Combination of OpenCV, Luxand, Neurotechnology
  - Agreement of at least 2 techniques out of 3

	Low-quality dataset		High-quality dataset	
	Recall	**Precision**	**Recall**	**Precision**
OpenCV	55	89	92	86
Luxand	63	83	95	94
Neurotechnology	73	84	100	96
Combination	**62**	**98**	**97**	**100**

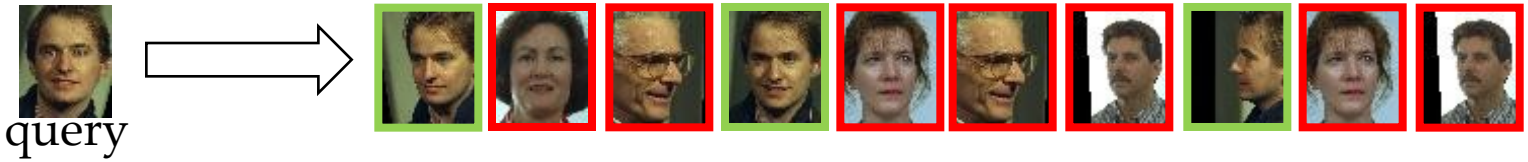
Multi-technology – Face Recognition

- Multi-technology approach for face recognition
  - Combination of MPEG-7, Luxand, Neurotechnology
  - Combination based on normalization of techniques

	Low-quality dataset (1k database faces)		**High-quality dataset (10k database faces)**	
	Recall precision=85%	**Recall** precision=95%	**Recall** precision=85%	**Recall** precision=95%
MPEG-7	24	14	8	3
Luxand	23	16	14	0
Neurotechnology	12	11	53	51
Combination	**31**	**24**	**54**	**51**

Multi-query

- Multi-query
  - Query composed of a number of reference objects



  - Relevance feedback on 1.3M dataset:
    - Manual selection of positive (correct) retrieval results
    - Iterative search where positive results represent query objects
    - 1st iteration: R=P=**6%**, 5th iteration: R=P=**30%** (k=60)

Scalability

- Scalability
  - Efficient search + re-ranking
  - Candidate set retrieved by the metric MPEG-7 function
  - Re-ranking of candidate set by multi-technology approach

Face Recognition Technology – API

- Technology can be controlled by API
  - Management of faces/images:
    - `detectFaces, getImageFaces`
    - `insertImage, insertFace, getAllFaces`
  - Retrieval:
    - `searchByFaceId, searchByFaceDescriptor`
  - Multi-query retrieval:
    - `multiSearchByFaceId, multiSearchByFaceDescriptor`

GUI Design

Thank Petra and her husband very much:

http://www.fi.muni.cz/~xkohout7/facematch/index.html