



Smart cameras for consumer lifestyle applications

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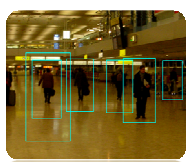
Why cameras

- **Cameras recreate of our first sense**
 - Similar observations as humans
- **Very versatile sensor**
 - Many different observations possible simultaneously
- **Compact and contactless**
 - Passive sensor (low power), embedded solutions
 - Potentially good price/performance

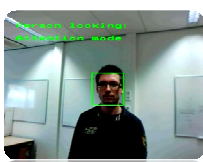
Why cameras in Philips products

- **Wide range of products in several areas**
 - Home, healthcare, lighting
- **Emphasis on user experience, comfort, ease of use**
 - Smart, flexible sensing technology fundamental
- **Focus on high added value products**
 - Personalized, context-aware solutions
- **We make products that can benefit from smart sensors**

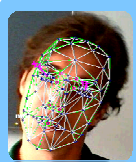
What we are doing



Presence detection



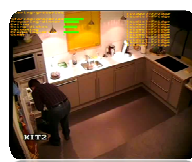
Attention detection



Head pose estimation



Gender, age, id recognition



Activity recognition



Facial expression recognition



Gesture interface



Assistance

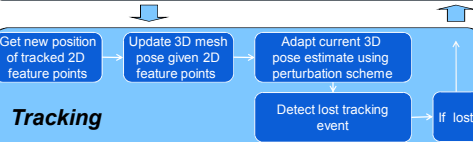
Head pose estimation

- **Real time 2D head pose estimation**
 - Based on subspace learning
Spectral Regression Discriminant Analysis
 - Complex dimensionality reduction
 - Nearest neighbor classification



- **Real time 3D head pose tracking**

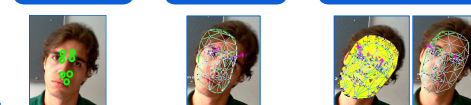
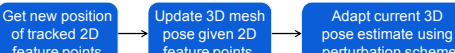
Initialization



Tracking



Real-time tracking



Facial expression

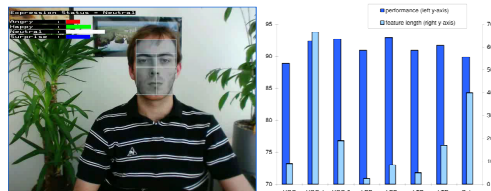
- **Experimental setting**
 - 310 sequences (95 subjects)
 - (linear) SVM, one-against-rest
 - 10-fold cross-validation



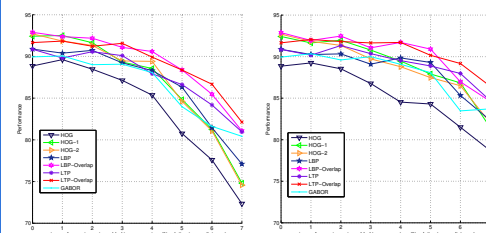
- **Local features analysis**
 - HOG, LBP, LTP, Gabor wavelets

Results

- 4 classes robustly real-time
- State-of-the-art detection rate: **93%**



- **Impact of face registration errors on recognition performance**

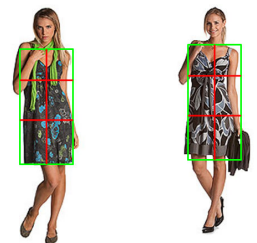


Fashion explorer

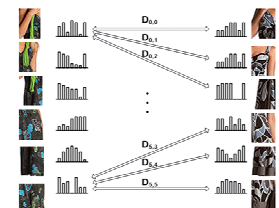
- **Measures "style identity" of a person and gives dressing suggestions**



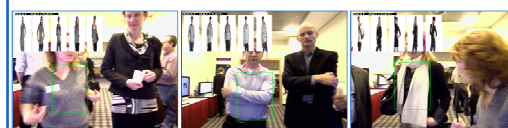
- Image analyzed to detect "dressing style"



- Color and pattern compared to database images



- Most similar images displayed as suggestions



System at work at Philips CL Technology Fair