

# Interacting with Face

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# Face is unique

- Face-to-face interaction/communication is essential





Has worked for millions of years



Convey nonverbal clues



Exchange feeling



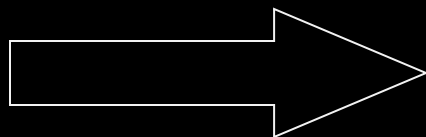
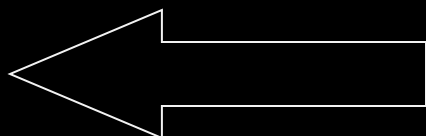
Psychological & physical connection

**Computer  $\leftrightarrow$  Face is challenging**



# Face understanding is the key

*Face Understanding*  
*(low-level, high-level)*



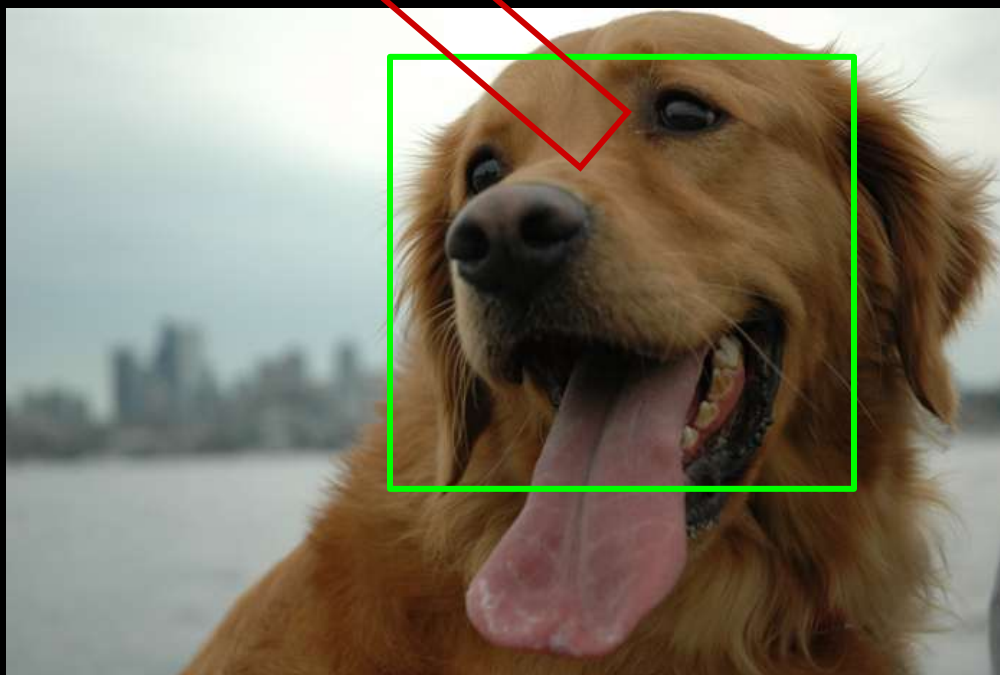
*Application-dependent*



# Face understanding is the key

Direction?

Where?



Emotion?

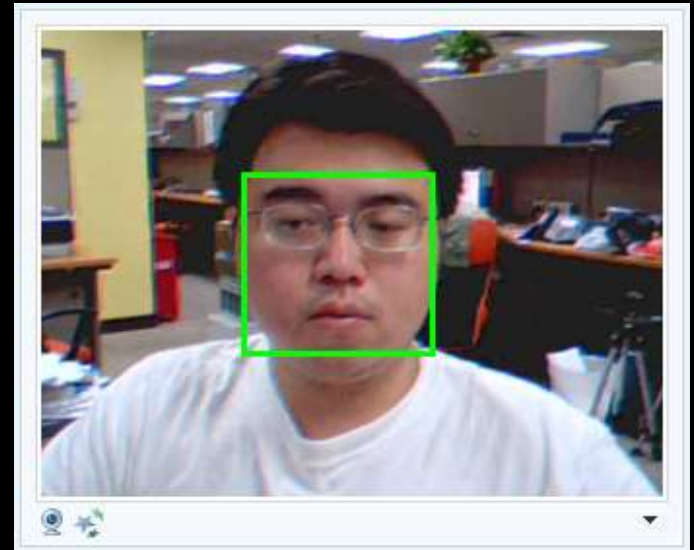
Who?

# Low-level face understanding

- Face Detection
  - Detect 2D frontal face
- Face Alignment
  - Locate face features
- Face Segmentation
  - Extract the whole face region
- 3D Face Pose Tracking
  - Track the face pose and orientation

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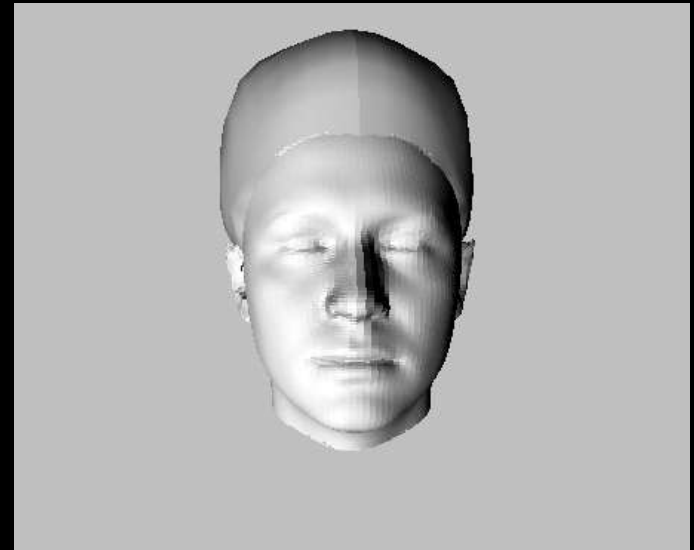
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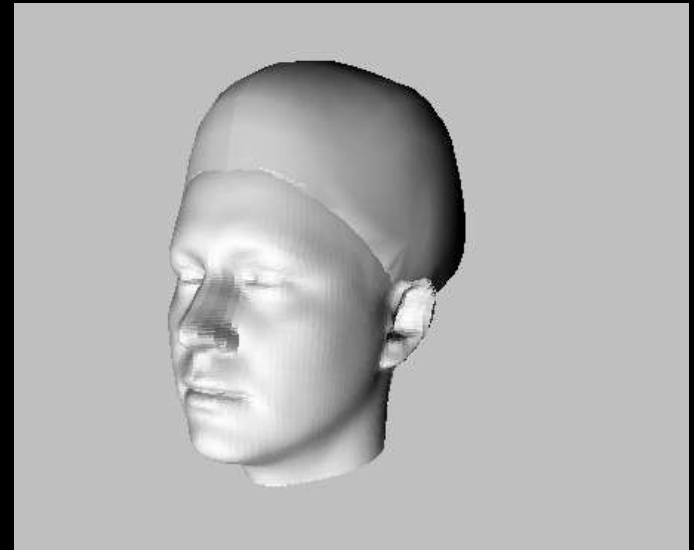
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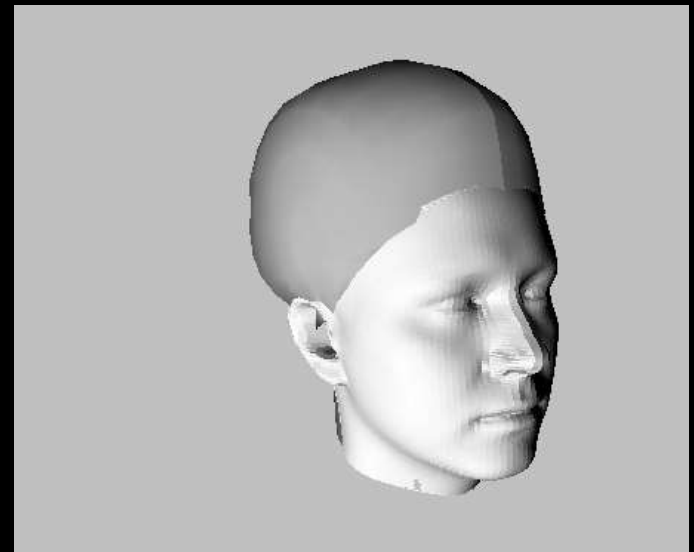
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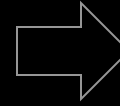
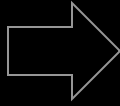
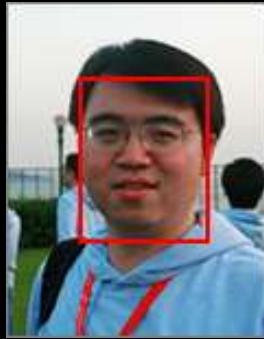
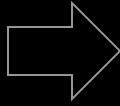
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# Face understanding framework

## Low-level Representation:



$$\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}$$

detection

alignment and  
pose tracking

representation

## High-level Understanding:



Same or not?



Male or Female?



Smiling or not?

...



Identify, age, race, expression, emotion (sad, happy...), ...

# Knowing where you are

- Focus/Exposure control



# Knowing where you are

- For TV - personal settings, parental control, and energy saving



# Knowing where you are

- “Auto Self Portrait”



**Face ↔ Computer ↔ Face**

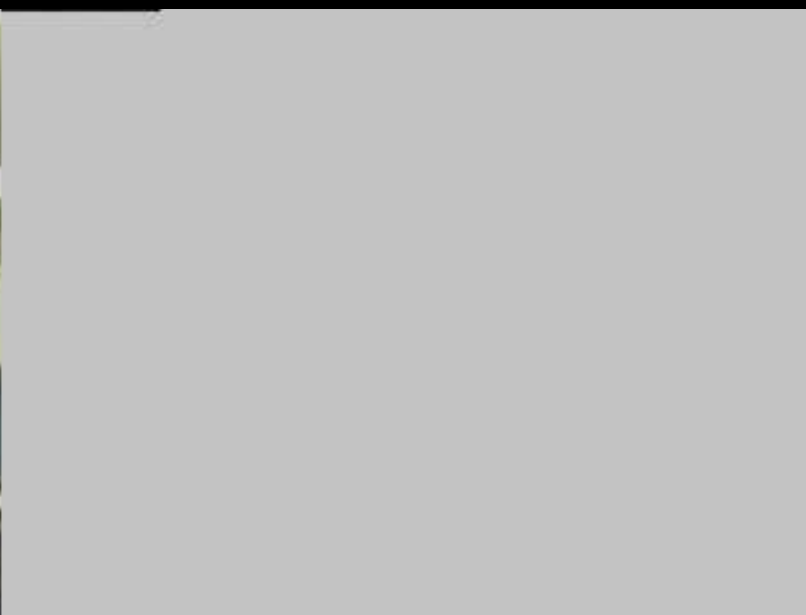
*Face Understanding*  
(low-level, high-level)



*Application-dependent*

# Protect Privacy

- Facial region segmentation



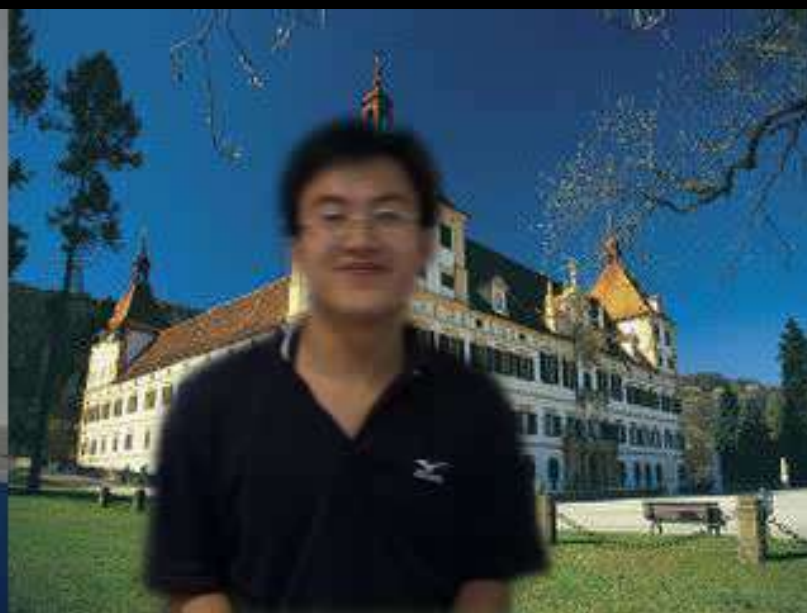
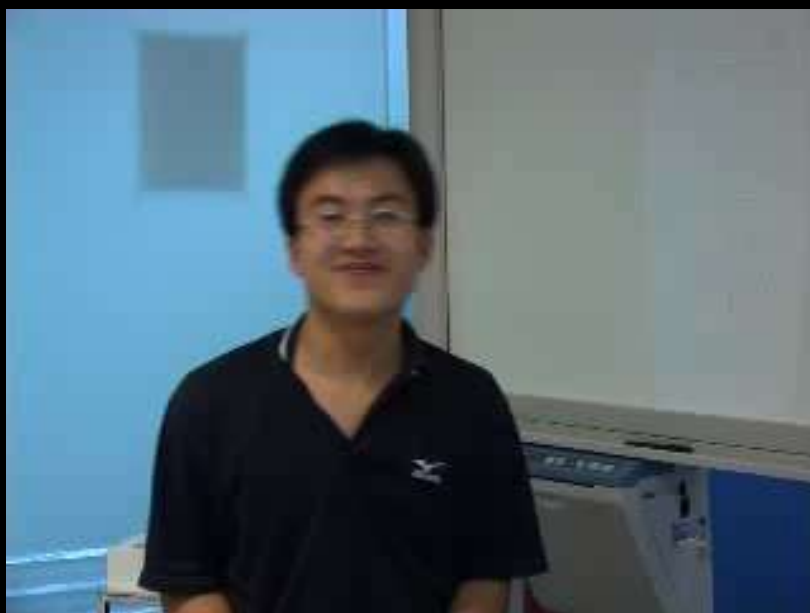
# Protect Privacy

- Background blur



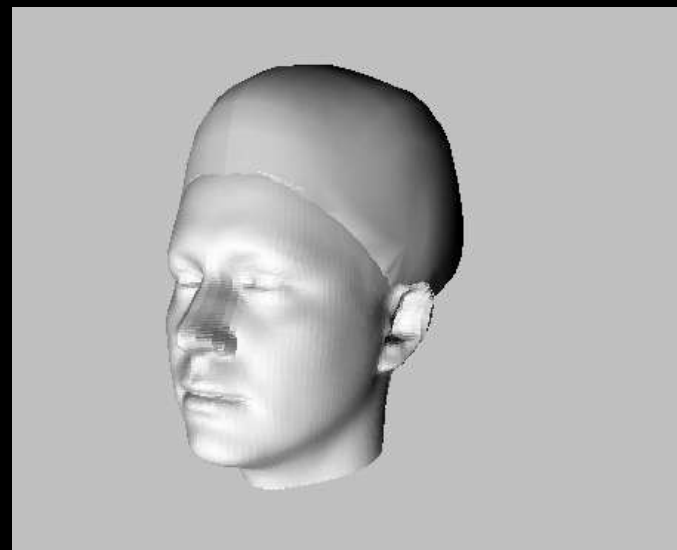
# Protect Privacy

- Virtual background





# Knowing facial 3D pose



# Knowing facial 3D pose (in Microsoft LifeCam)

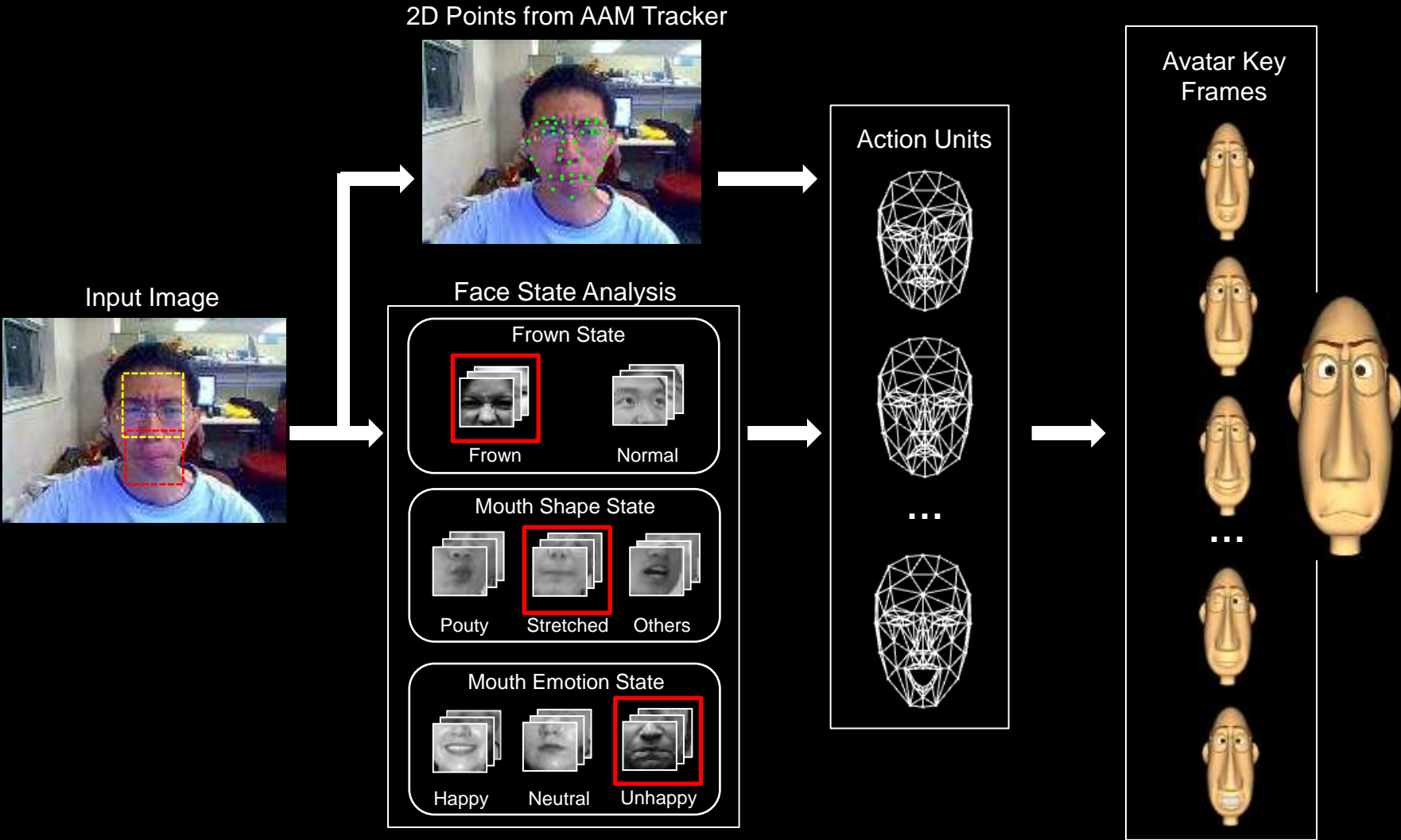


# Knowing facial expression

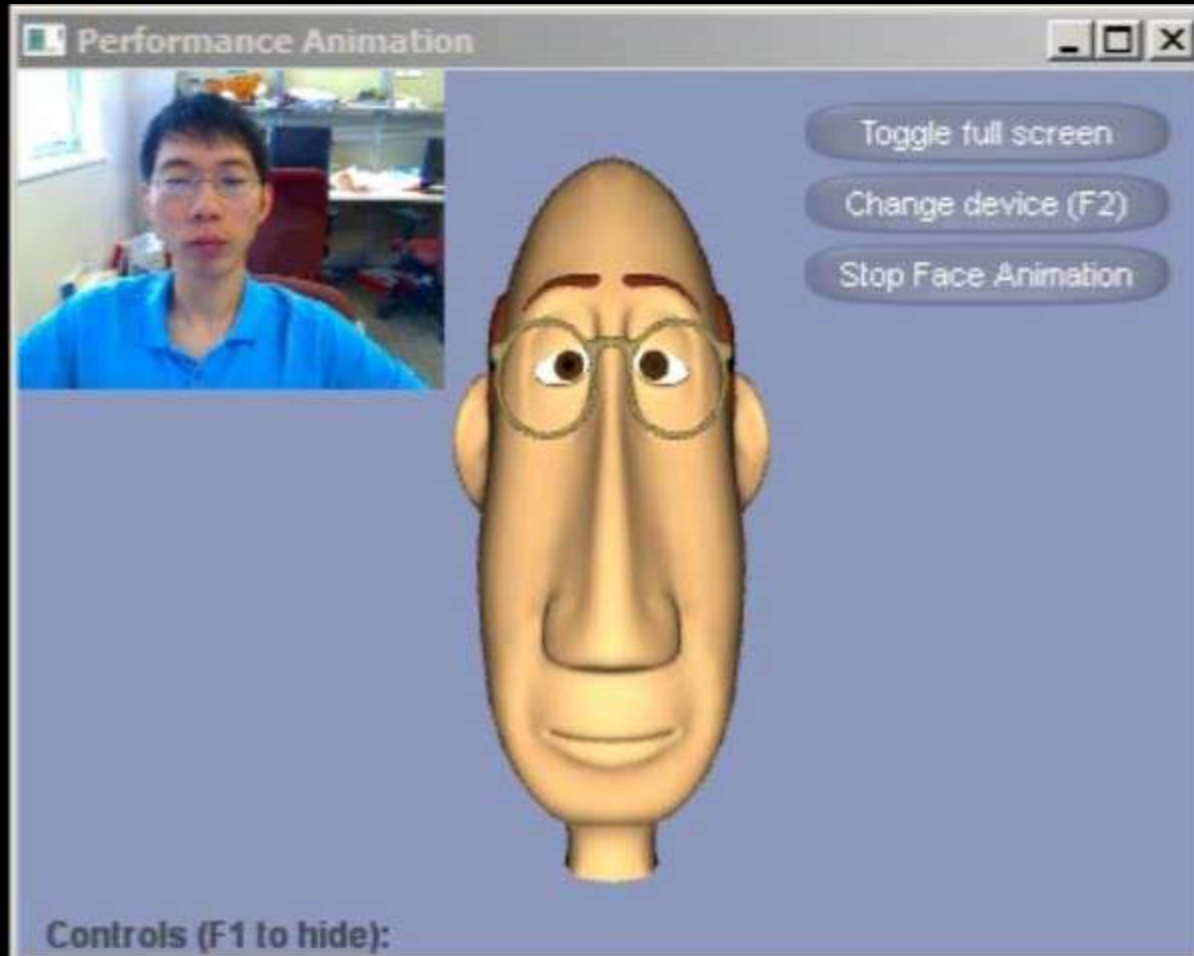
- Chatting room
  - Hang out with friends before & after playing games
- Live meeting
- Facebook, Youtube
  - Funny greetings, avatar comments



# Knowing facial expression



# Knowing facial expression

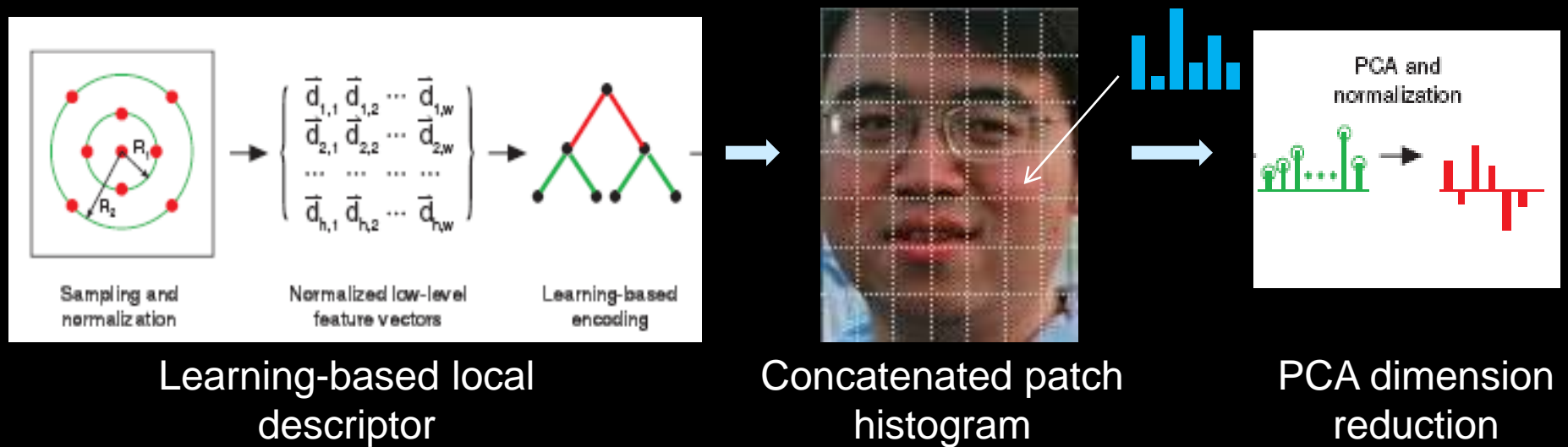


# Knowing identities

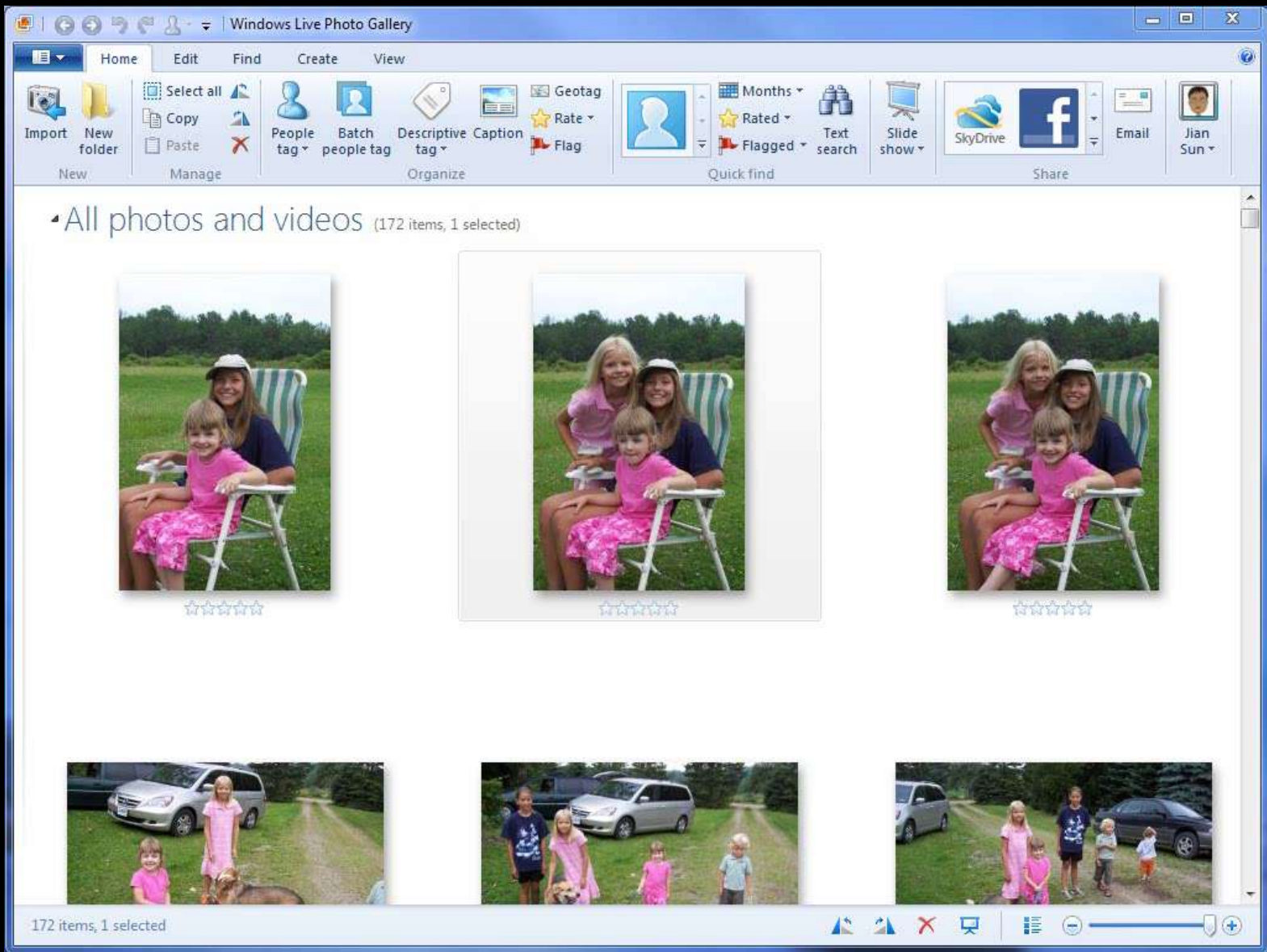


# Knowing identities - *face recognition*

- Recognition feature is learned from data



Zhimin Cao, Qi Yin, Xiaoou Tang, and Jian Sun. Face Recognition with Learning based Descriptor. CVPR 2010.





# Try it out

## Windows Live Photo Gallery 2011



### Photos made fun

Import photos from your camera, organize them into albums, and edit them so they look their best. Use powerful photo tools to create stunning panoramas, movies, slide shows, and more. When you're ready to share, publish your photos and videos to your favorite websites like Facebook and Flickr directly from Photo Gallery.

[Download now](#)

English (change)

Clicking Download now means you agree to the [Microsoft service agreement](#) and [privacy statement](#) | [System requirements](#)

Photo Gallery is part of Windows Live Essentials. You can download just Photo Gallery or all of Windows Live Essentials.\*

\* Windows Live Essentials 2011 includes Messenger, Photo Gallery, Movie Maker, Mail, Writer, Family Safety, and Windows Live Mesh, plus Bing Bar, Messenger Companion, Microsoft Silverlight, and Outlook Connector Pack (Microsoft Outlook Hotmail Connector and Microsoft Outlook Social Connector Provider for Windows Live Messenger).



### Share photos and videos online

Save time by publishing photos and videos directly from Photo Gallery to your favorite social networking sites like SkyDrive, Flickr, Facebook, and YouTube. [Learn more](#)



### Find the photos you're looking for

With new search features and tools like face recognition, finding photos in your collection is easier than ever. [Learn more](#)



### Make photos look great

Make your photos really stand out with powerful and easy-to-use editing tools that you can use to edit dozens of photos simultaneously. Clean up photos, remove blemishes, fix red eye, and more. [Learn more](#)

# Xbox Kinect



- Body skeleton tracking using a depth camera

# Kinect Identity



- A skeleton  $\leftrightarrow$  a game character / a player profile
- But, when player leaves/back or tracking fails/resumes
  - New player or an existing payer? Who is who?



# Summary

- Interacting with face is unique
- **Face understanding** is the key

