UNIVERSITY OF CAMBRIDGE

Facial Affect Mapping Engine

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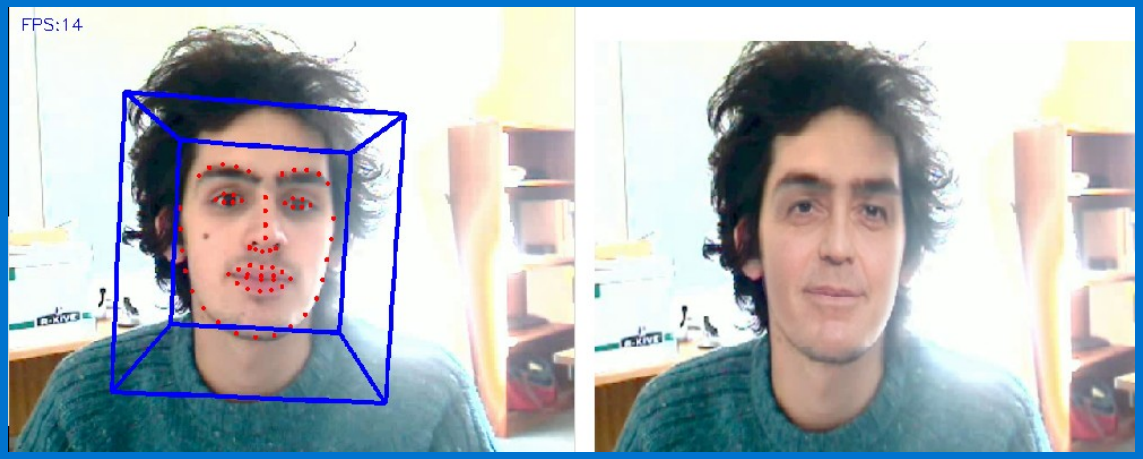
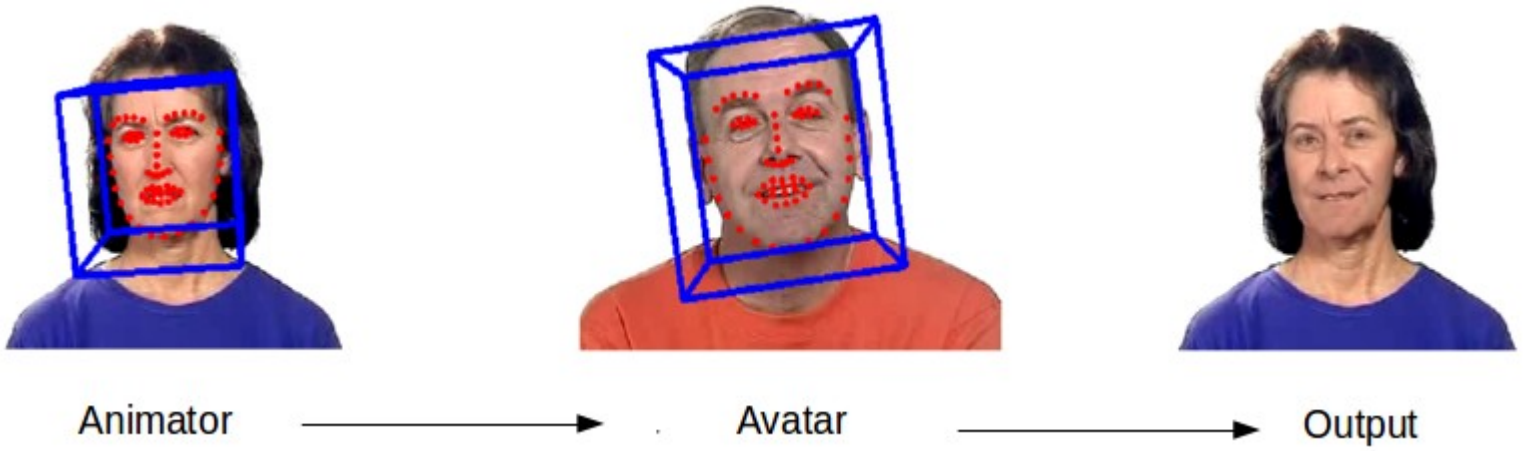


RAINBOW RESEARCH GROUP

Overview - what does it do?

- Maps and manipulates facial expression in real-time across images and video streams
- Automatic (minimal human intervention)
- Works in real-time on generic hardware
- A framework useful for the designers of intelligent interactive digital games

Overview - what does it do?

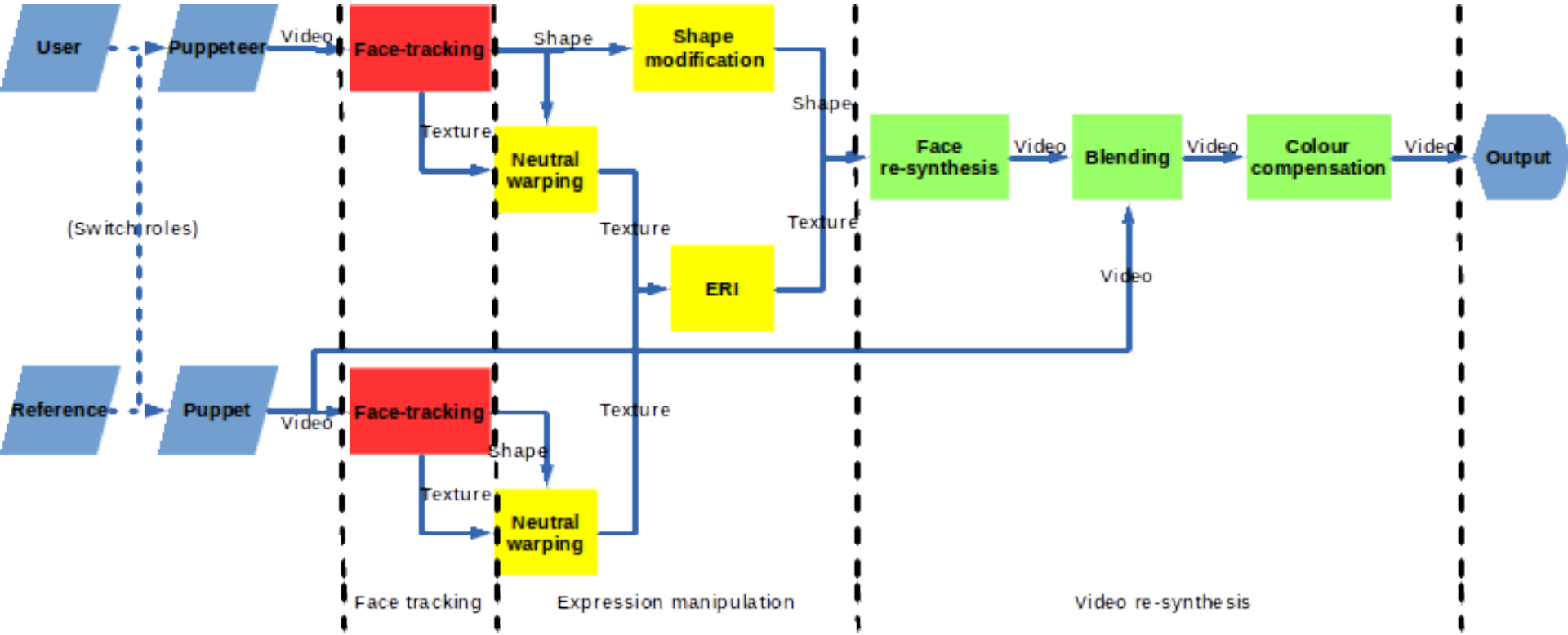


Underlying Technology

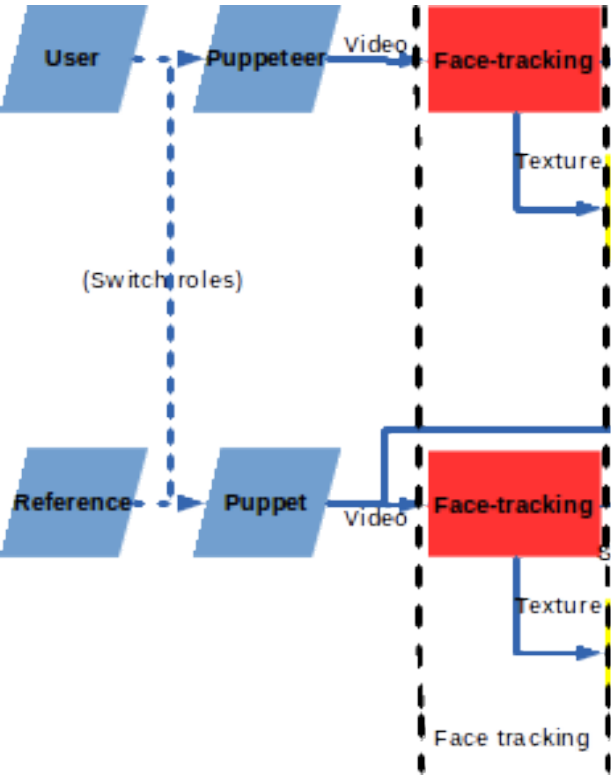
- Digital Avatar Animation, Facial Puppetry
- Expression Ratio Images
- Must-have requirements:

1. Fully automatic
2. Real-time
3. Commodity Hardware
4. Realistic (enough?)

Architecture



Face Tracking

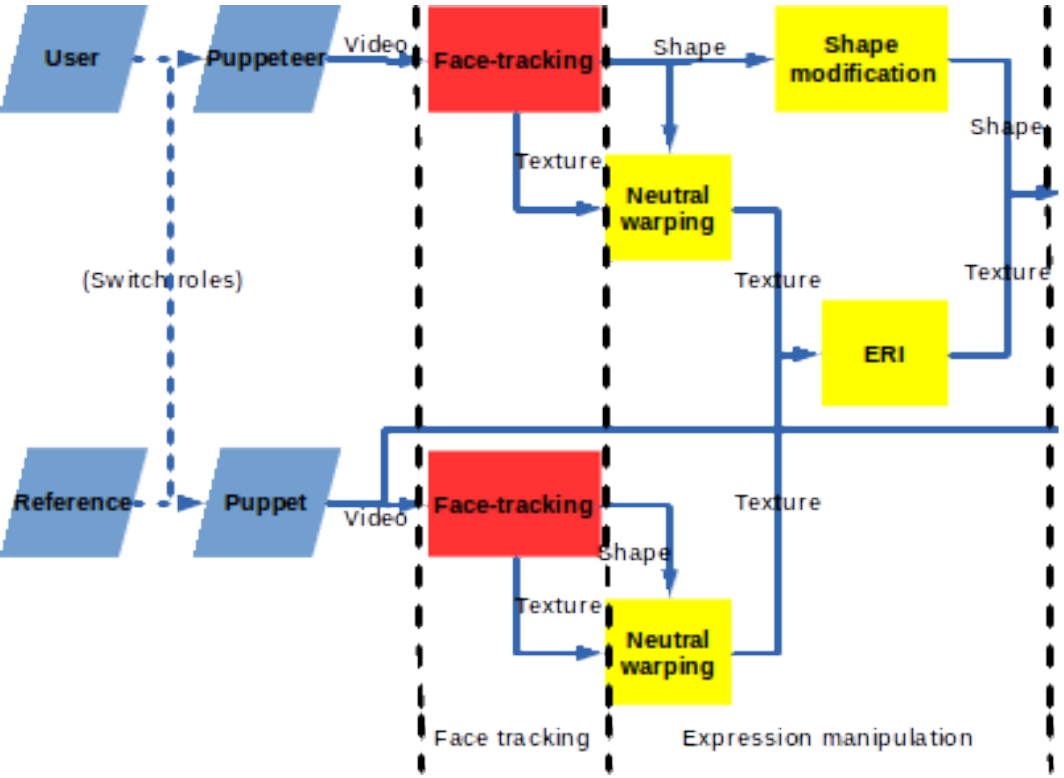


Face Tracking

Face Tracking

- Constrained Local Neural Field (CLNF), an instance of a Constrained Local Model (CLM)
- System is robust to changes in the face tracking, in method and number/position of points
- [Baltrušaitis et al., 2013]

Expression Manipulation

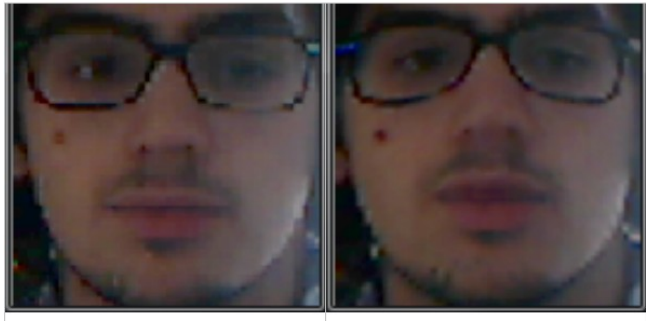


Expression Manipulation

- Separate expression into shape and texture
- Transform the face texture into a neutral shape
- Modify the texture - ERI
- Project the face texture into the desired shape

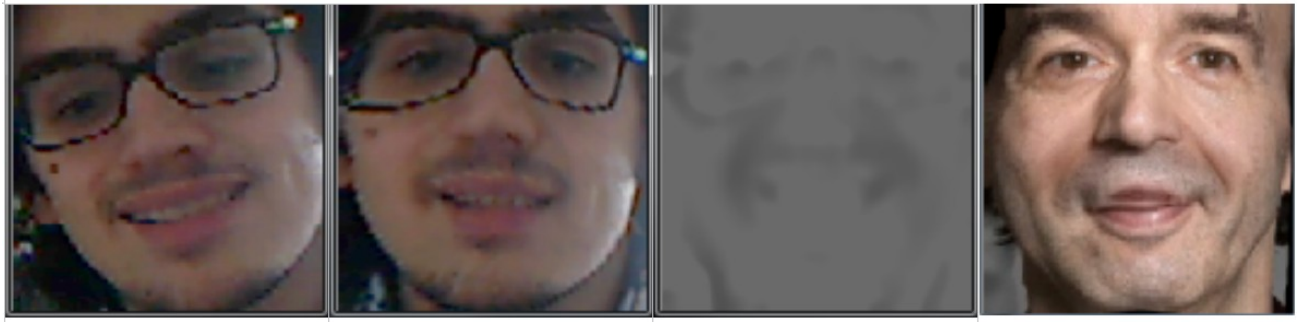
Expression Manipulation

Neutral

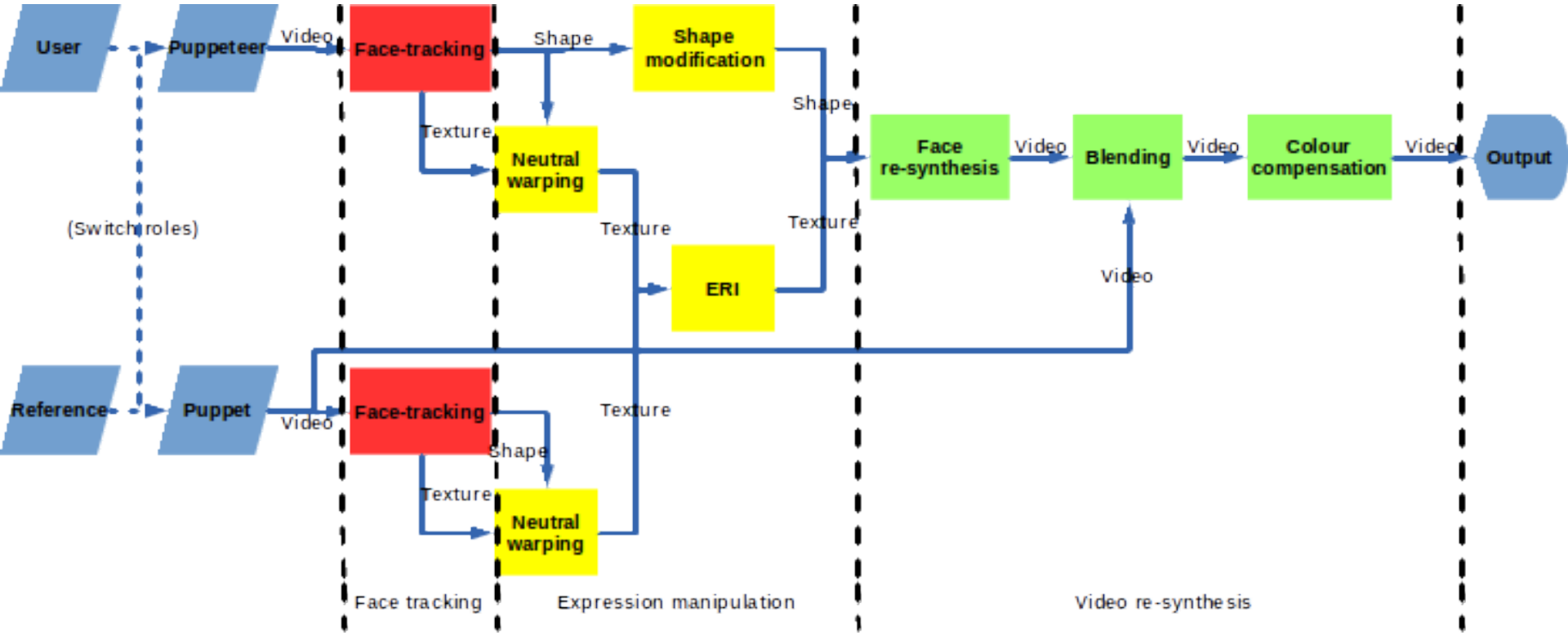


Source Warped Ratio Output

Smile



Video Re-synthesis



Video Re-synthesis: Pin the face back on the video. Blending

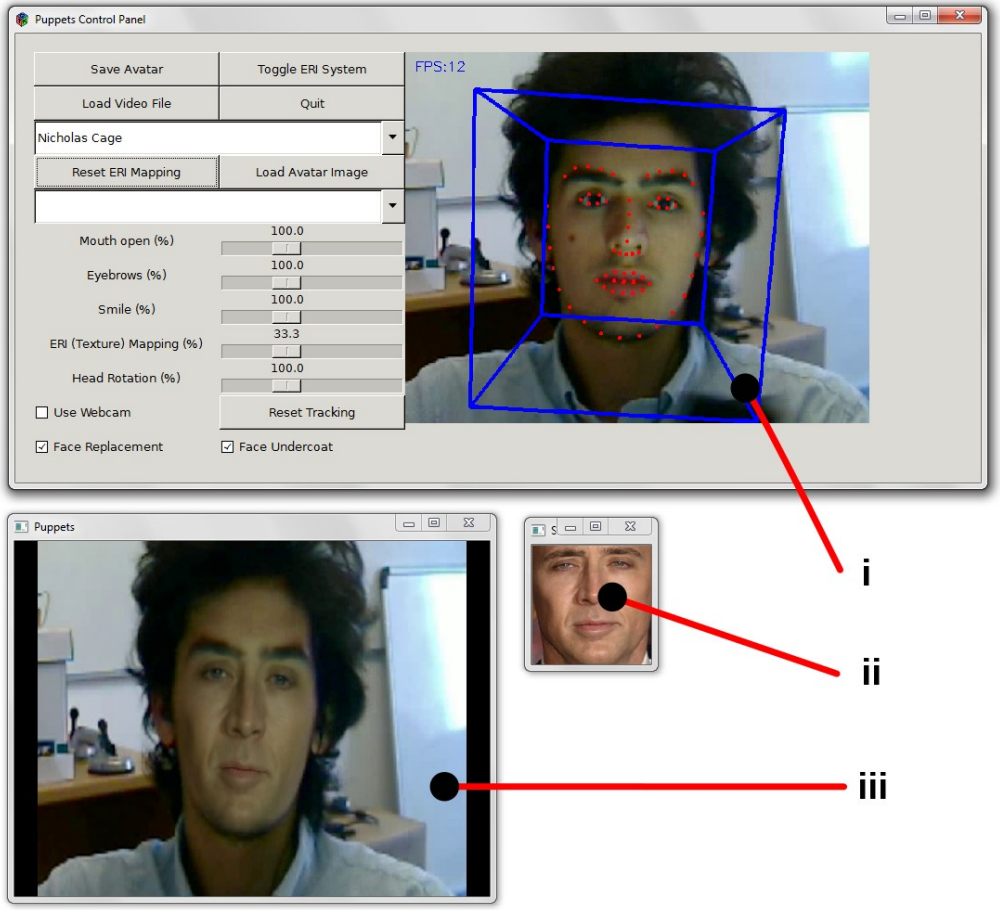
- Some techniques (eg. gradient blending, 3D relighting) discarded for computational cost.
- OpenGL hardware-accelerated blending. Also does the warping!
- Textures blended with a ‘Mickey Mouse’ transparency mask

Video Re-synthesis: Colour Correction

- Scale and shift the face's colour to match the surroundings
- Not quite enough. So we use a facial undercoat: heavily-blurred version of the original face, onto which we blend the puppet

Video Re-synthesis: Colour Correction

Prototype



i. Source Video

ii. Reference Avatar

iii. Output

Results – Colour Correction

Failure Cases

- Occlusion (hands, glasses)
- Colour Compensation across very different skin tones
- Very fast head movement
- Tracking ambiguity: multiple people in the video

Applications, Further Work

- Helps you to associate yourself with your virtual character
- Ability to see your face performing expressions controlled by the computer: teaching expressions
- Generate a large number of videos from a restricted set
- Manipulation of expression between users

Contact Details

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