

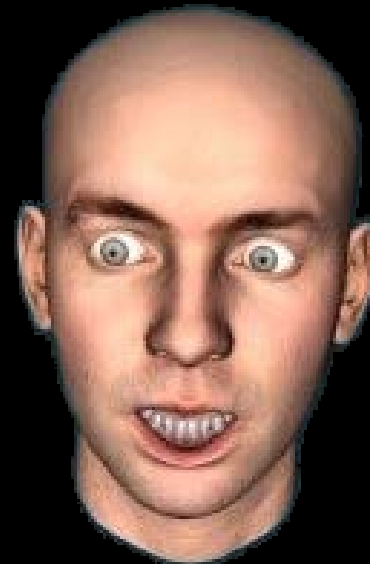
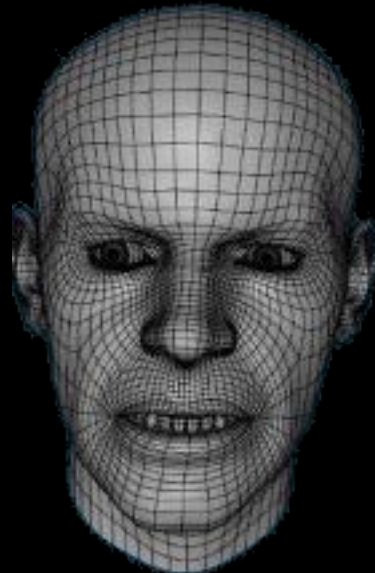
SE

3D Reconstruction for Human Faces

Final Presentation by Group 26

Real-time facial animation

Capture a face with a camera
Reconstruct 3D model





Proposed by Weise et al.

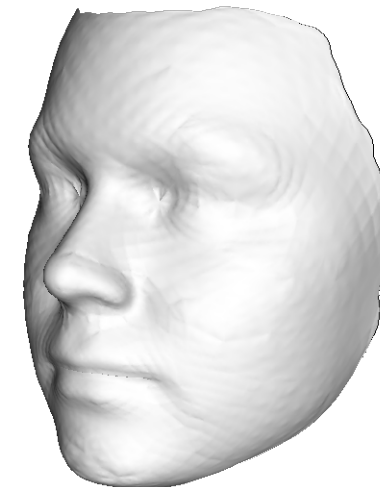
User-Specific Blendshape Model

This method has a great robustness to illumination changes, but it may fail for faces with large rotations or occlusions and it cannot recover motions of the occluded regions.

Proposed by Cao et al

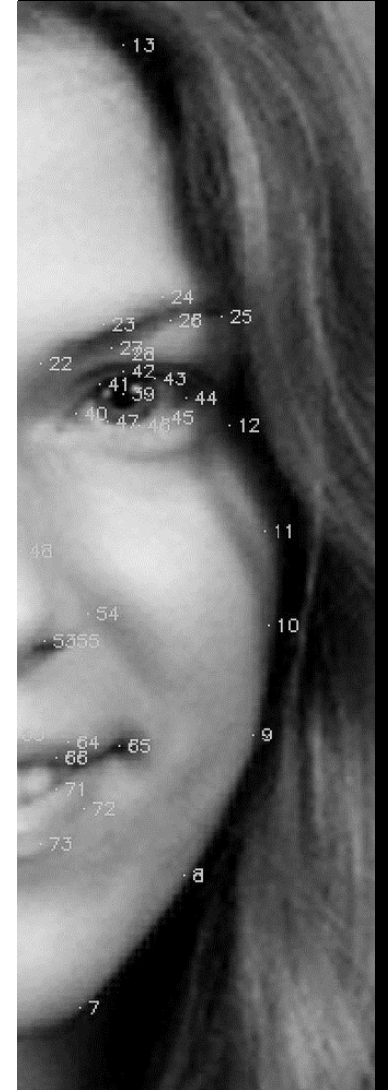
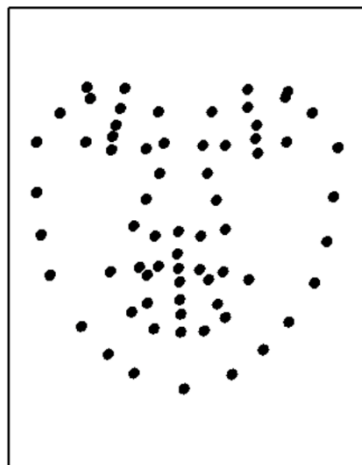
Color-Only based Model

This is a regression method but requires user-specific training and calibration

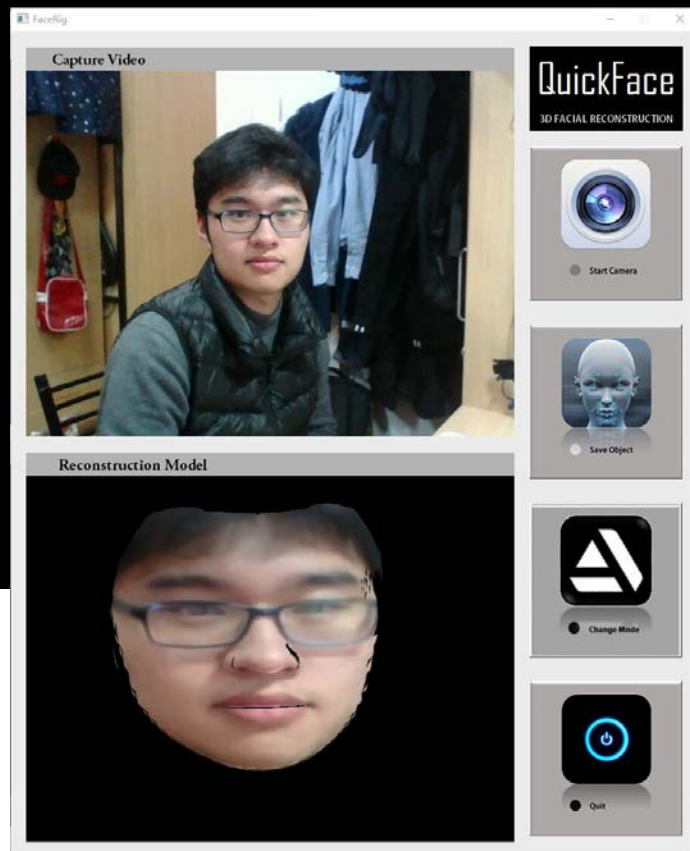


3D Reconstruction

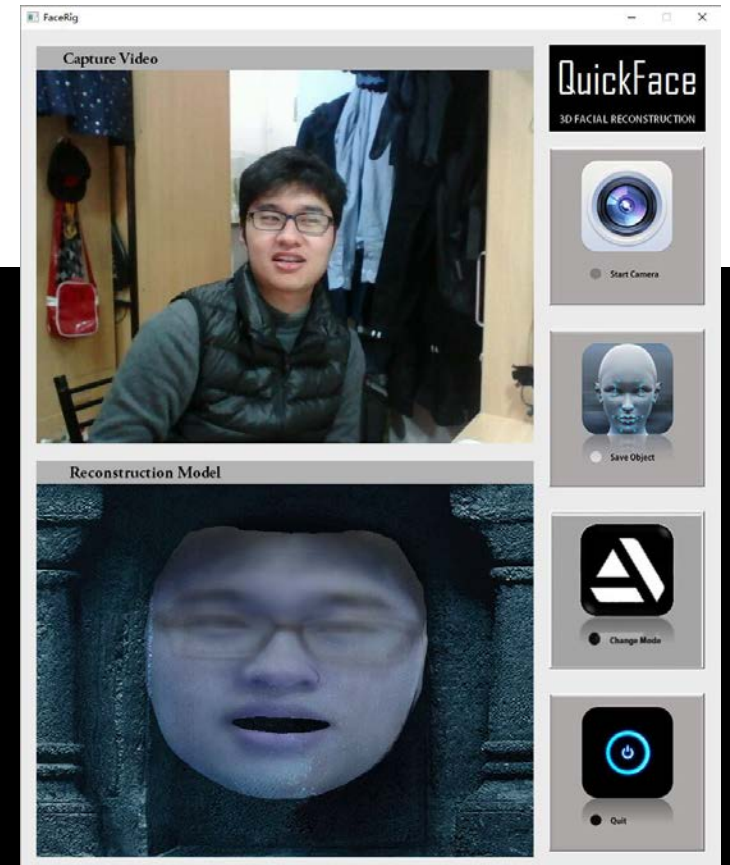
An *Active Appearance Model* (AAM) is a computer vision algorithm for matching a statistical model of object shape and appearance to a new image.



Function and UI Design



Camera capture
Save object
Change mode



Core Algorithm Implementation

ASM

- Confirm the key points
- Build training set
- Training the ASM model
- Using affine transformation to get the initial model
- Match the initial model with the input face and get the key points of the input
- Mapping the key points to the face model

AAM

- Based on ASM
- Model the texture of the 3D model intend to get a surface model
- It is a value iteration method
- Calculate the deviation between the input texture and the model texture
- Fitting the model's texture



Function and UI Design

```
165 // 1. socketA~1.0
166 void socketDisconnect(void);
167 };
168
169 class SocketMatTransmissionServer
170 {
171 public:
172     SocketMatTransmissionServer(void);
173     ~SocketMatTransmissionServer(void);
174     //int sockConn; //socket
175     int client_sockfd;
176     int server_sockfd;
177 private:
178     SocketMatTransmissionServer(void);
179     ~SocketMatTransmissionServer(void);
180     //int sockConn; //socket
181     int client_sockfd;
182     int server_sockfd;
183 public:
184     int socketConnect(int PORT);
185
186
```



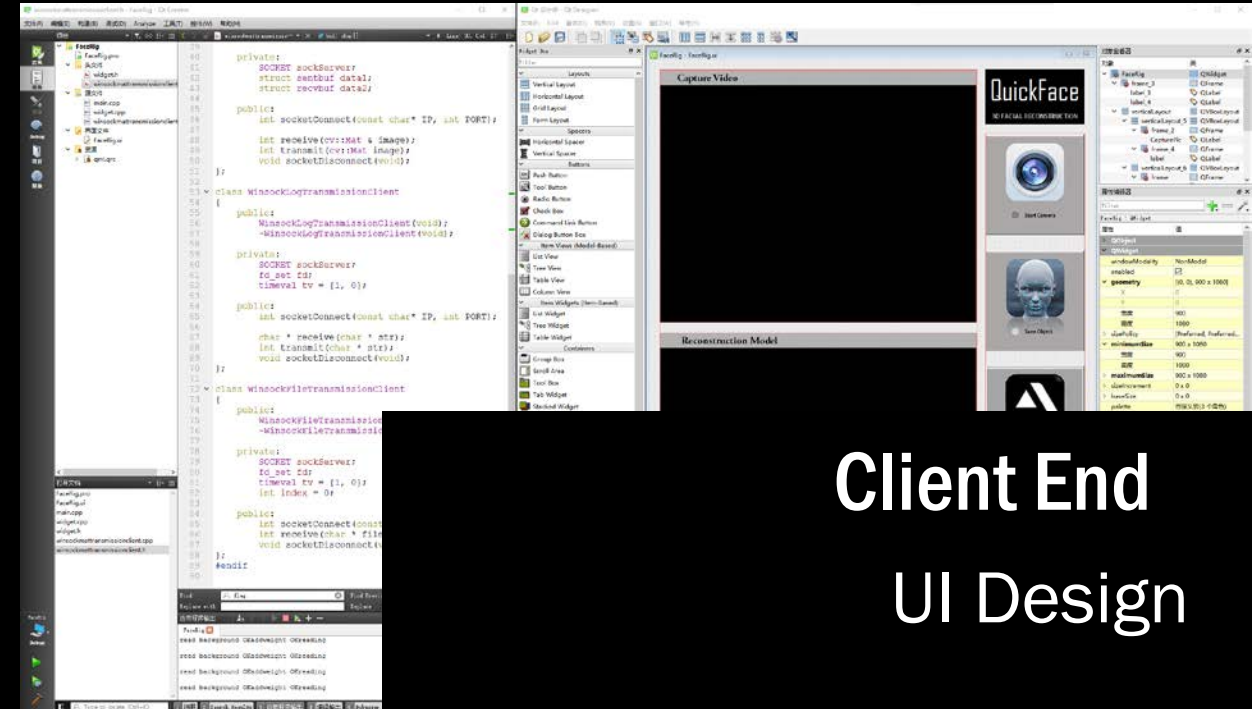
Terminal window output:

```
wmbao@ubuntu: ~/Desktop/4dface/install/bin
it2 27Transmit2 28Transmit2 29Transmit2 30Transmit2 31Transmit a Rendering!
rece1
rece2
Receiving Key: (null).
Waiting transimtion!
2
3
prepare Rendering!
entry transmit
transmit 0
transmit 1
Transmit11
Transmit2 0Transmit2 1Transmit2 2Transmit2 3Transmit2 4Transmit2 5Transmit2 6Tra
nsm2 7Transmit2 8Transmit2 9Transmit2 10Transmit2 11Transmit2 12Transmit2 13Tr
ansmit2 14Transmit2 15Transmit2 16Transmit2 17Transmit2 18Transmit2 19Transmit2
20Transmit2 21Transmit2 22Transmit2 23Transmit2 24Transmit2 25Transmit2 26Transm
Rendering!
```

Sever End

Divided into sever end and client end with high performance

Socket Based



Client End UI Design

Graphical buttons with Minimalist design make it easy to use

Function show

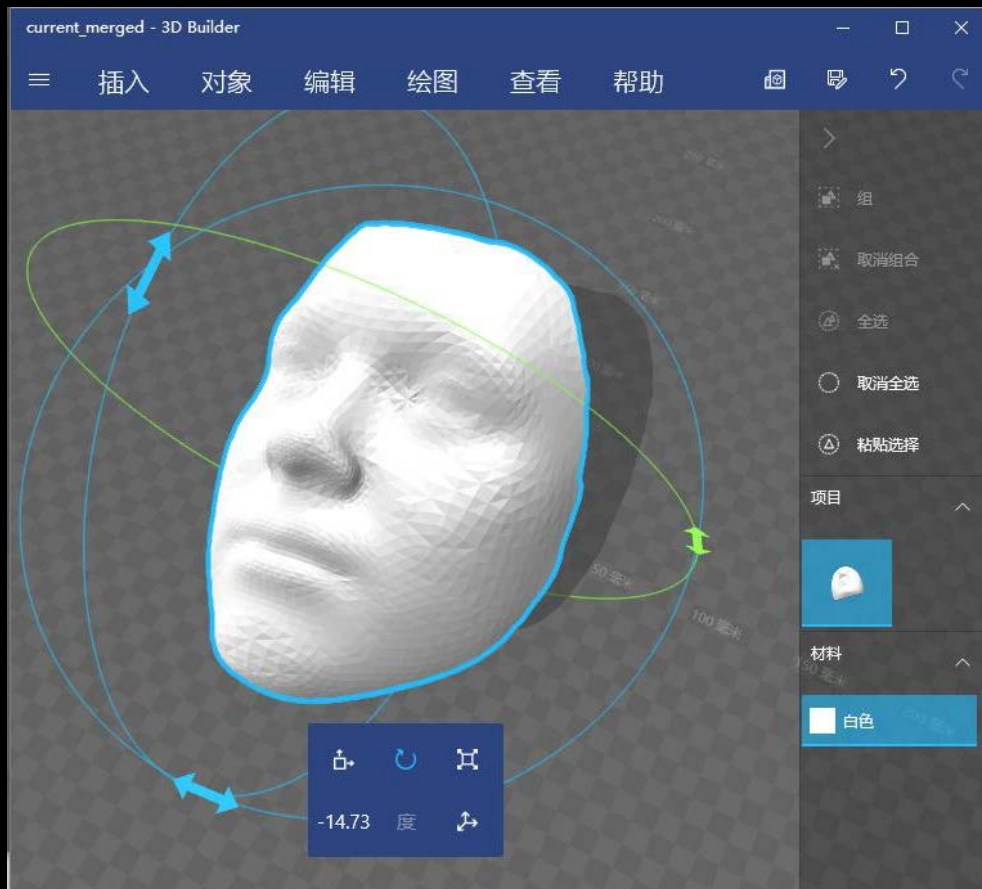
3D Reconstruction of Human Faces



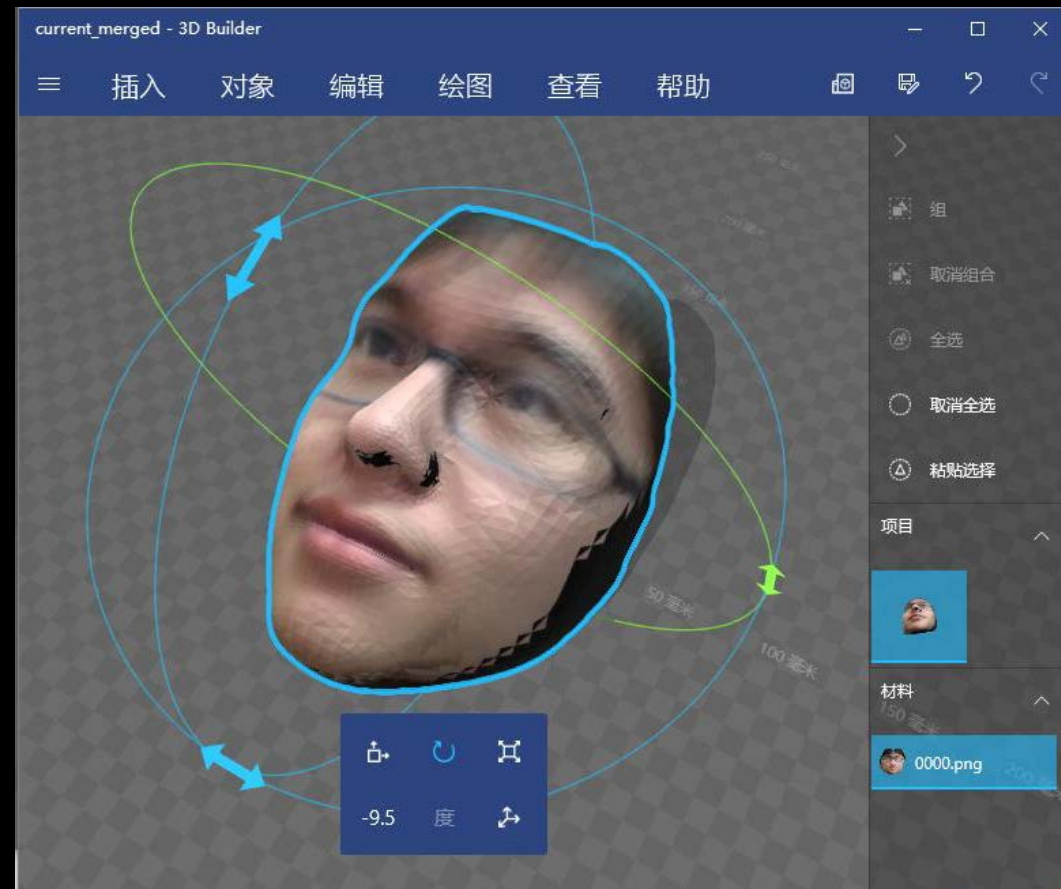
QuickFace

The logo features the word "Quick" in white, "Face" in green, and a stylized lightning bolt in orange and yellow that replaces the letter 'F'.

Save 3D facial model



3D mesh model



Mapped with Texture

Conclusion and Future Work

- **Reconstruct 3D faces automatically**
 - Without special devices
 - No manual operation
- **User-friendly interface**
 - Concise and artistic
 - Easy to use
- **More interaction with user**
 - Interesting games
- **Advanced functions**
 - Emotion recognition
 - VR applications

Reference

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- [2] CAO, C., WENG, Y., ZHOU, S., TONG, Y., AND ZHOU, K. 2014. Facewarehouse: a 3d facial expression database for visual computing. *Visualization and Computer Graphics, IEEE Transactions on* 20, 3, 413–425.
- [3] EZZAT, T., AND POGGIO, T. 2000. Visual speech synthesis by morphing visemes. *International Journal of Computer Vision* 38, 1, 45–57.
- [4] LI, H., YU, J., YE, Y., AND BREGLER, C. 2013. Realtime facial animation with on-the-fly correctives. *ACM Trans. Graph.* 32, 4, 42.
- [5] XIE, L., AND LIU, Z.-Q. 2007. A coupled hmm approach to videorealistic speech animation. *Pattern Recognition* 40, 8, 2325–2340.