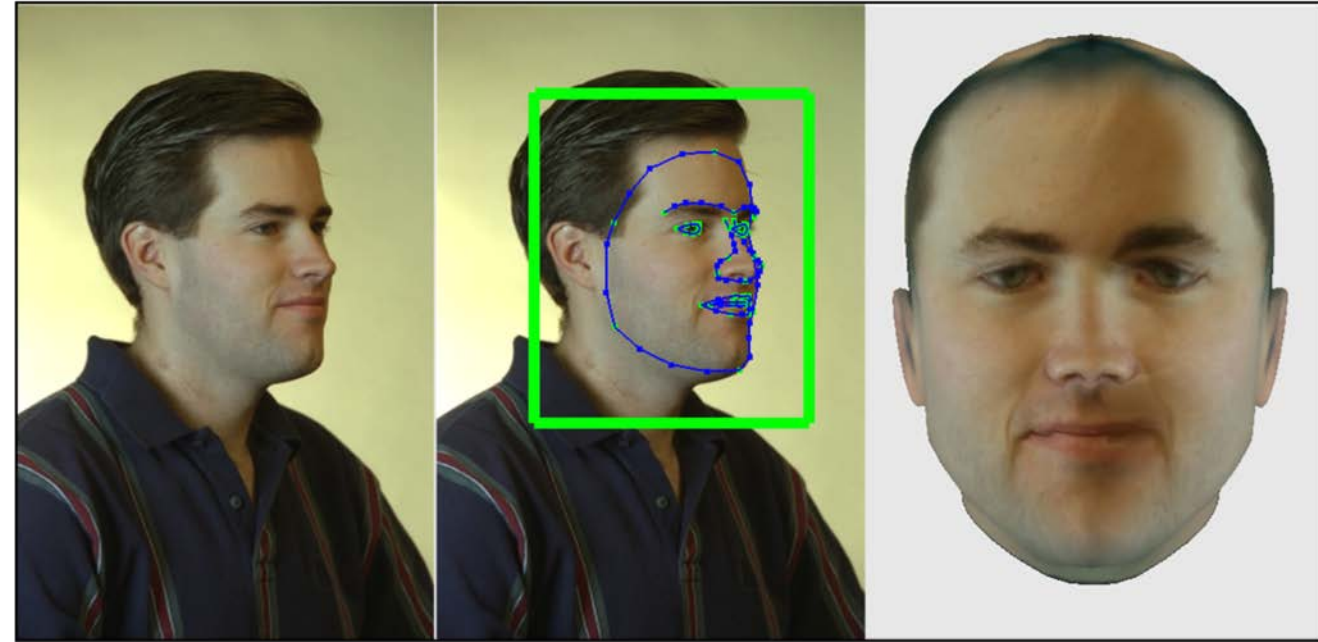# CyberExtruder

Core Strengths and Developed Capabilities

CyberExtruder has been working on the problem of accurately converting 2D face images to 3D models for more than thirteen years and holds numerous patents as a result.
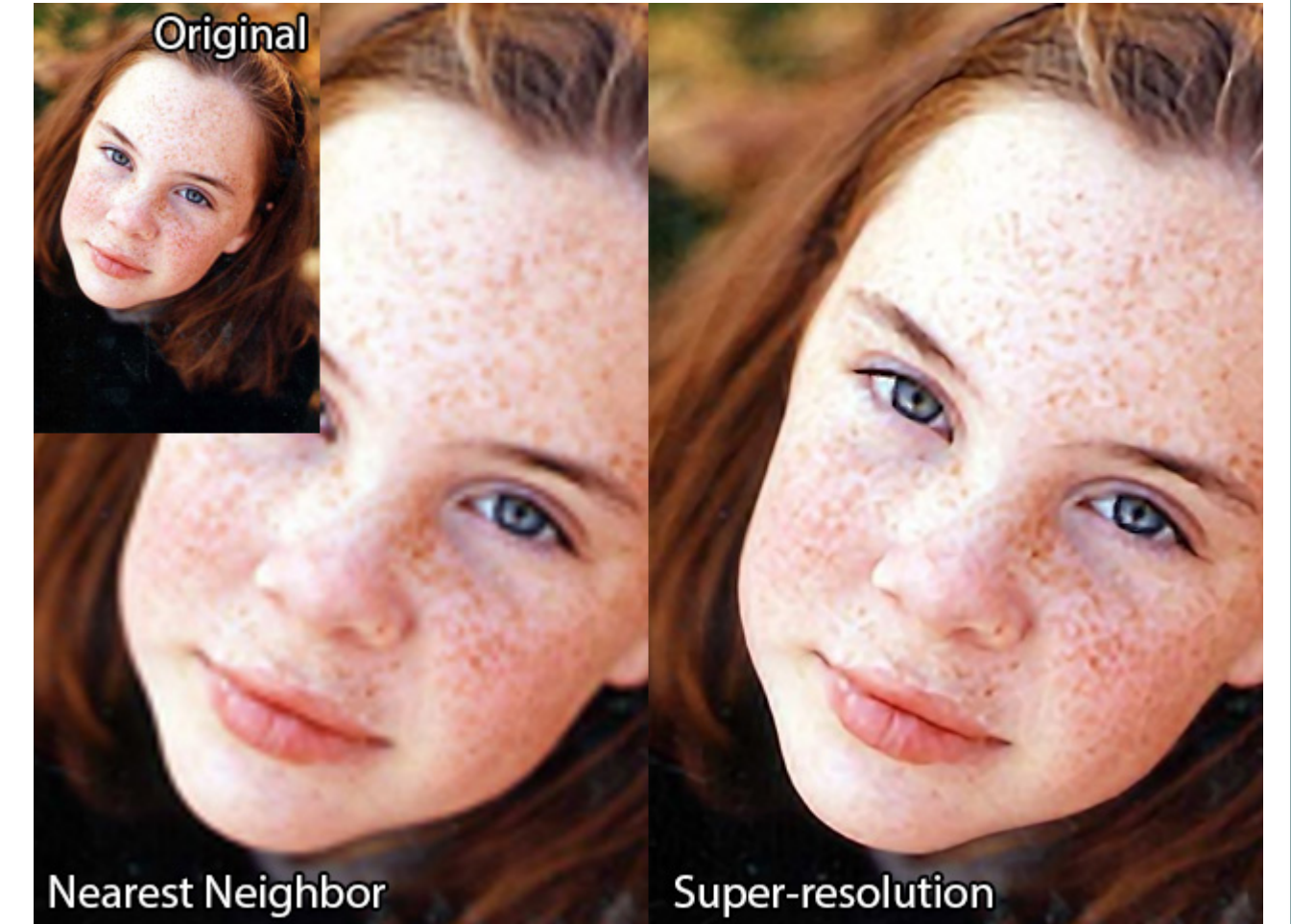
Aureus 3D® is the only fully automatic 2D to 3D solution in the world.
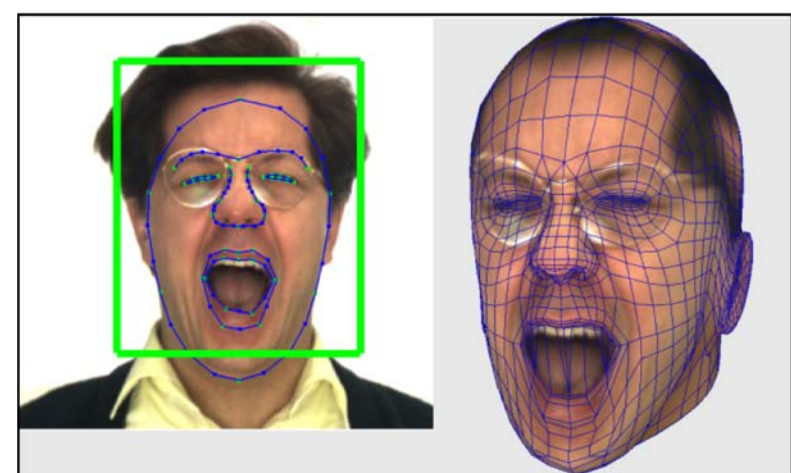
Aureus 3D not only increases Face Recognition accuracy on problem images, but make face recognition from video possible as well.

Because of the inherent understanding of the human face, our algorithms are also capable of finding faces and modeling 3D across a vast spectrum of facial expressions.

In 2004 CyberExtruder was responsible for quantifying the effects of non-neutral expressions on matching scores and led to the universal requirement for photo ID's that you can't smile when they take your picture.

Aureus 3D has very fast face finding capabilities. The average time to find a face depends on the image size and the desired min/max face proportions of people to detect. For example, if the faces in a scene are roughly 50% of image height, then the time to detect them is almost negligible. If they are 5% of the height (as in these examples) the time to detect is about 10ms per face. If one can limit the search parameters for faces to 20% - 30% of the image height then detection time drops to approximately 1.5ms per face.

Areas of Ongoing Research and Development

Super resolution is a class of techniques that enhance the resolution of an imaging system. In some SR techniques the diffraction limit of systems is transcended.
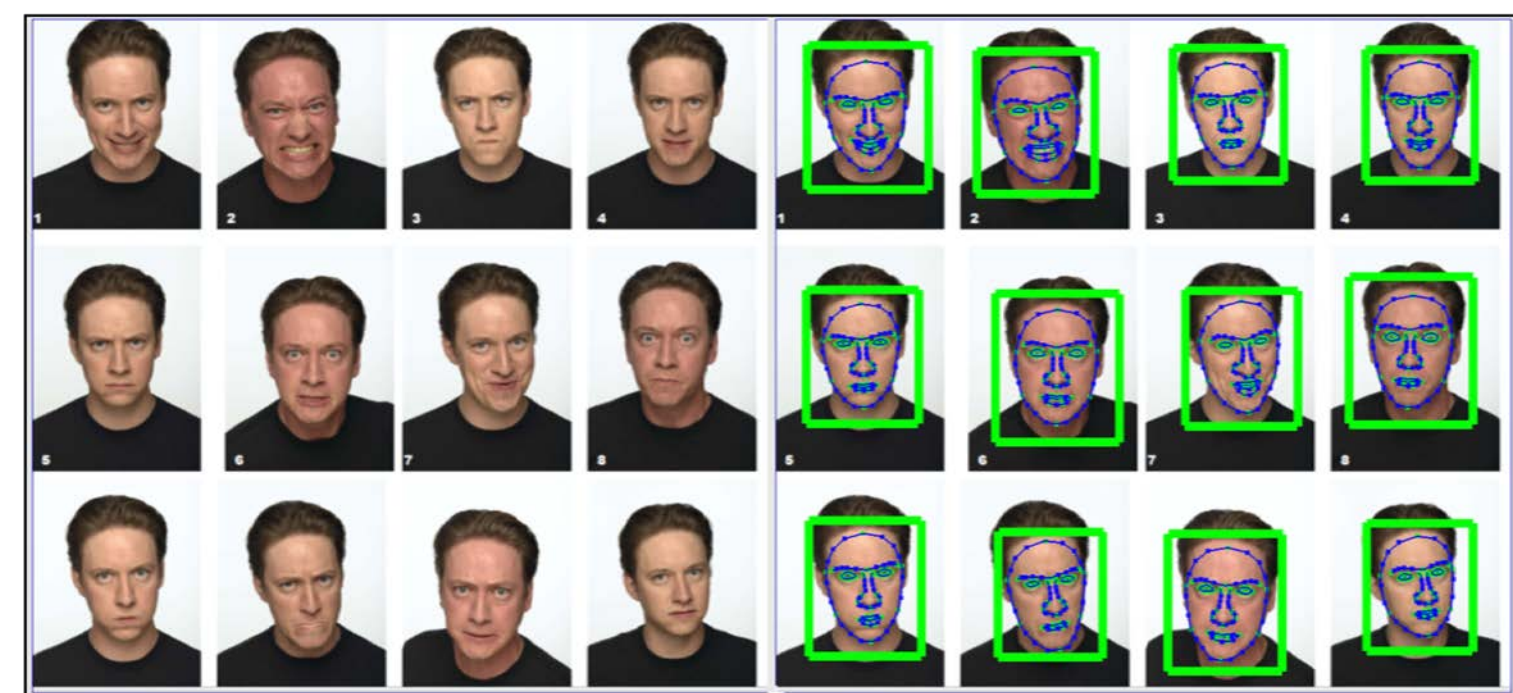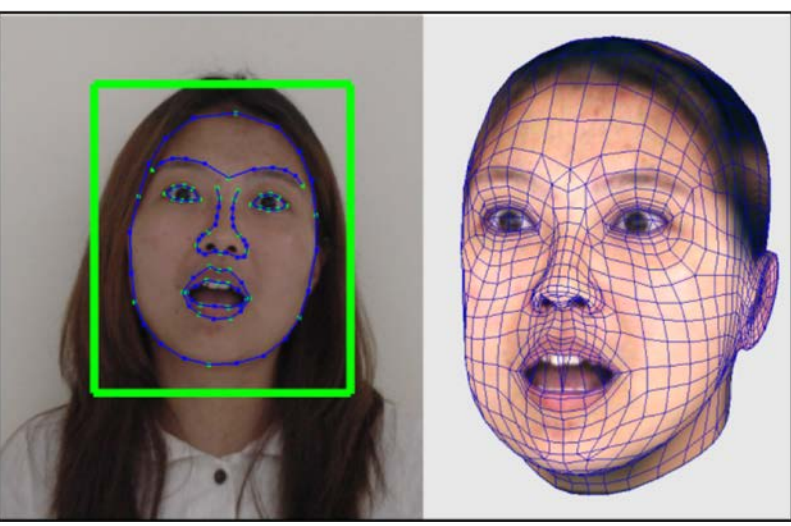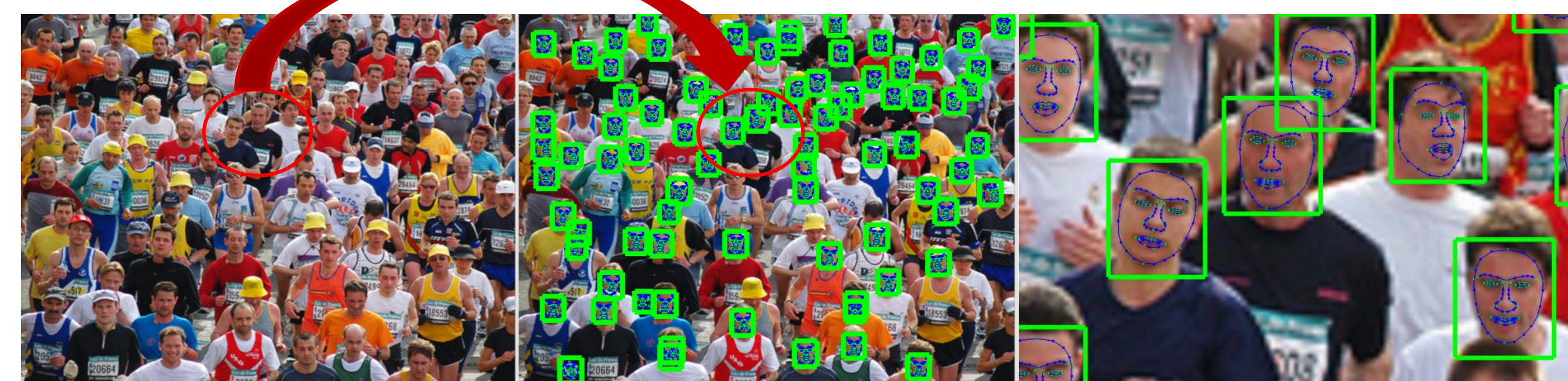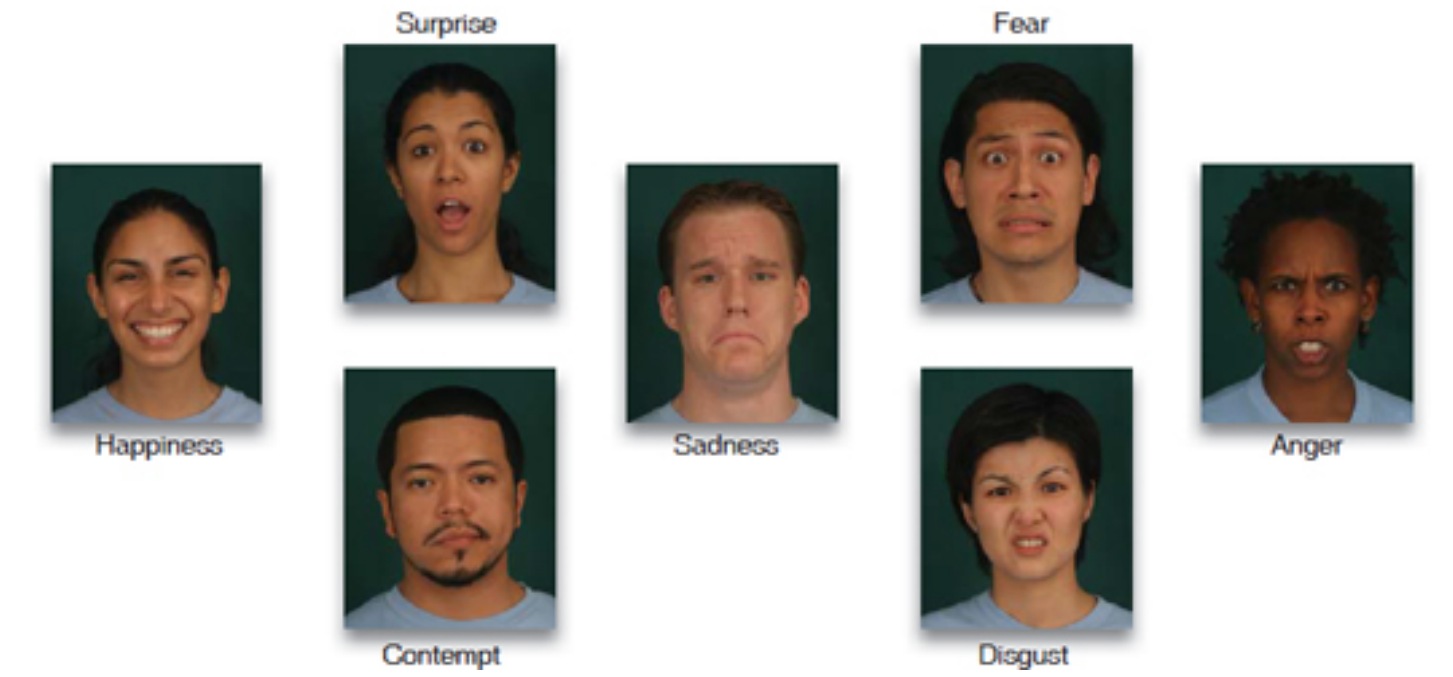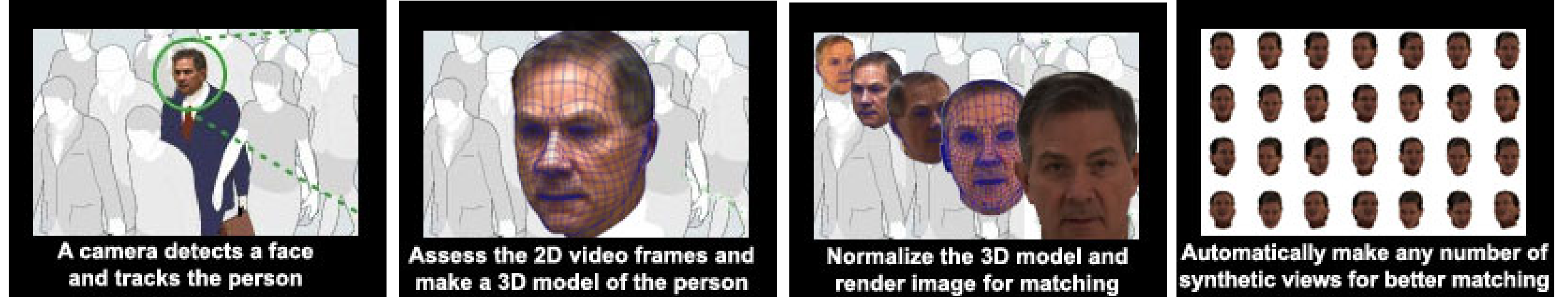
Some object features, though beyond the diffraction limit, may be known to be associated with other object features that are within the limits and hence contained in the image. Then conclusions can be drawn, using statistical methods, from the available image data about the presence of the full object and as such is an area if intense interest for us.

Original
Nearest Neighbor
Super-resolution

The facial action coding system (FACS) allows human coders to manually code nearly any anatomically possible facial expression. Due to Aureus 3D's ability to quantify 3D shape, recognizing facial expressions is well within reach and another area of ongoing research.

The Seven Universal Facial Expressions of Emotion

Surprise — Fear — Happiness — Sadness — Anger — Contempt — Disgust

3D face recognition is a modality of facial recognition in which the three-dimensional geometry of the human face is used. It has been shown that 3D face recognition methods can achieve significantly higher accuracy than their 2D counterparts.

3D face recognition has the potential to achieve better accuracy than its 2D counterpart by measuring geometry of rigid features on the face. This avoids such pitfalls of 2D face recognition algorithms as change in lighting, different facial expressions, make-up and head orientation. Another approach is to use the 3D model to improve accuracy of traditional image based recognition by transforming the head into a known view. Additionally, most range scanners acquire both a 3D mesh and the corresponding texture. This allows combining the output of pure 3D matchers with the more traditional 2D face recognition algorithms, thus yielding better performance (as shown in FRVT 2006).

The main technological limitation of 3D face recognition methods is the acquisition of 3D images, which usually requires a range camera. Aureus 3D has the capacity to supply both range information and texture (2D information) in an inherently fused manner which we believe will produce superior matching accuracy.

A camera detects a face and tracks the person — Assess the 2D video frames and make a 3D model of the person — Normalize the 3D model and render image for matching — Automatically make any number of synthetic views for better matching

Do you have what we need?

CyberExtruder is actively seeking partnerships which can result in the advancement of our 3D face recognition, super resolution and expression identification efforts.

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