ELECTRONIC SUPPLEMENTARY MATERIAL

Distortion algorithm for the generation of stimuli

Manipulation of the faces was achieved by a non-linear transformation of the masked template of each face, Figure S1. This transformation is like looking at the image in an convex or concave mirror. The transformation acts in one axis of the image (either row or column) at a time and is achieved line by line. Figure S2 shows how one line of the original image is bent to achieve the corresponding line in the generated image. The bending degree is shown as θ_ρ for $\theta_\rho = [0 \cdot\cdot 90]$. The bending radius (r) is therefore calculated as below

$$\rho = 2 \times 180 \times r \times (2\theta_\rho/(2 \times 180)) = 2r\theta_\rho \tag{1}$$

$\therefore r = \rho/2\theta_\rho$

in which ρ is the length of the transformed line. This leads to a generated line with length $d = 2rsin(\theta_\rho)$. Subsequently d is scaled to achieve the same length as the original line (ρ).

To achieve a transformation equation to map the points in the original image to the generated image we used the distance between points. Assume θ_0 is a unit angle between two points that sweep the image in trigonometric angle $\alpha = [90 - \theta_\rho \cdot\cdot 90 + \theta_\rho - \theta_0]$. The distance between the two points x_1 and x_2 can be calculated as below,

$$d(x_1, x_2) = rcos(\alpha) - rcos(\alpha + \theta_0). \tag{2}$$

The transformation equation is therefore achieved by integrating $d(x_1, x_2)$ between $90 - \theta_\rho$ and α.

$$\begin{aligned} d_{int}(\alpha) &= \int_{90-\theta_\rho}^{\alpha} d(x_1, x2)d_\alpha \\ &= r(sin(\alpha + \theta_0)) - sin(\alpha + \theta_0)) + r(cos(\theta_\rho - \theta_0) - cos(\theta_\rho)) \end{aligned} \tag{3}$$

Transformation equation (d_{int}) showed above is for convex transformation. For concave transformation the d_{int} is flipped over the diagonal axis (reversing the positions for original and generated image). The convex transformation is shown as positive numbers $(k > 0)$ and concave transformation is shown as negative numbers $(k < 0)$. Figure S3 shows the transformation equation for θ_ρ equal to $+90(k = +6), +60(k = +3), 0(k = 0)$ and $-90(k = -6)$ with $\theta_0 \to 0$ and $\rho = d = 500$.

FIGURE LEGENDS

Figure S1

Figure 5. Image distortion. (A) The original face, (B) the original masked face in which the area surrounding the face is masked by a green patch, (C) the manipulated face (k = +6)

Figure S2

Figure 6. The conversion from original image (blue curve) to the generated image (red line). The generated image is what will be seen from a flat surface while the original image is bent. The bending degree is shown as θ_ρ.

Figure S3

Figure 7. The conversion curves from the original image (horizontal axis) to the generated image (vertical axis) for k = +6 (blue curve), k = +3 (red curve), k = *original* (green curve) and k = −6 (cyan curve).