**Appendix C: Compositing Technique**

The technique of compositing the stimuli is described here, including definitions of the features sampled.

# Contents

# Definition of features

Six feature conditions were used for the purpose of selecting and compositing for each of the experimental phases and were defined as follows (see Figure 1);

A)	Eyes: Included the whole orbital area around the eye fissure. Did not include the space between the eyes.

B)	Eyebrows: Included the eyebrow hair section on the edge of the supra-orbital border and bordering the 'eye' selection. Also included the space between the eyebrows.

C)	Nose: Included the whole of the protruding nose portion, superiorly bordering the lower border of the eyebrow selection, laterally bordering the eye selections and extending down to where the curve of the bridge of the nose meets the cheek area. Included alae and the initial portion of the naso-labial crease (naso area) where present. The lower border extended to just below the columella.

D)	Mouth: Included the whole commissure line and lips. Superiorly bordered the lower border of the nose selection. Extended down to just below the lower lip and any lip bulging. Laterally extended to include corners of the mouth and any naso-labial creases, where present, to ensure a natural expression and appearance when composited.

E)	Hair: Included all hair and extended down to the top of the ears. Where ears were obscured, other ears were sampled from an average face. Hair selection included the tops of any sideburns and extended up to include the whole of the forehead so that the hairline remained natural.

F)	Facial outline: Included all areas that haven't already been selected, covering the whole cheek area, the whole of the chin and jawline, extending up to laterally border the

ears and superiorly border the inferio-lateral portion of the hair selection. Where beards were present an estimate was made as to the jawline and adjusted to include any beard hair length to give a more natural appearance.
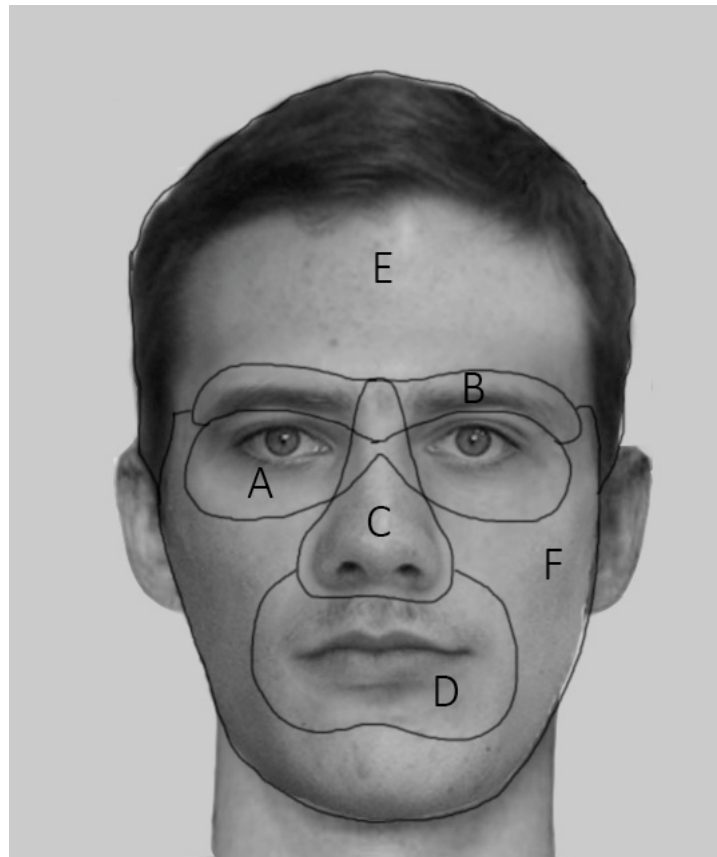


Figure 1: Feature boundaries

The necks on the unique composite images were utilised from an average face (generated using www.faceresearch.org) and were constant. The necks and ears of the target face remained constant throughout so that only the six features listed were changed. Hairstyles sometimes covered the neck and ears and where the neck or ears were covered, average ears and necks were added to the base image.

# Compositing

Features were sampled from the unique composite face and laid onto the target image and resized to roughly fit the dimensions and position of the existing feature. This was to try and maintain the integrity of the configuration of the target face so that only shape changes were being manipulated and, therefore, tested:

- the position of the eyes was matched by the pupils. The eye fissure width was used as a guide for dimensions, but not the fissure height.
- The position of the eyebrows was matched by the overall height, but not the angle. The width was used as a guide for dimensions, but not the thickness.
- nose position was matched by the height of the tip and base of the columella. The nose base width and nose height were used as a guide for dimensions.
- the mouth was positioned using the commissure line. The mouth width was used as a guide for dimensions, but not the lip thickness.
- the hair was positioned using the ears and forehead
- the facial outline was positioned using the top of the cheek as reference. The overall width and height were used as guides for dimensions.

The dimensions of the facial outline were adjusted to not differ drastically from the original outline so as not to alter relative configuration, however, a change in facial outline will have undoubtedly involved some inadvertent alterations to the spacings of the internal features relative to the external outline. The two external features (hair and outline) were subject to more manipulation than the internal features (eyes, eyebrows, nose and mouth) in order to maintain a natural, plausible face. Their position and size were difficult to keep consistent with the target face, however, literature suggests external features are less important for familiar face recognition (Jarudi and Sinha, 2003, Young et al., 1985).

Adobe Photoshop CC 2014 was utilised to select features from the unique composites and composite them onto the target images to generate the stimulus set. In order to maintain a natural, plausible composite, features were sampled by including a surrounding area around the feature itself and using the 'feather' edges tool in Photoshop that blurs the edges of the selection. Once the feature had been sampled, it was laid onto the target face and the edges blurred and blended between feature sample

and the underlying target face to form a natural plausible face. Photoshop's lighten and darken tools were used to keep shadows and highlights consistent between the features sampled and target face.

The contrast and luminance of sampled features were slightly adjusted to match the surrounding target face using the luminance/contrast function in Adobe Photoshop CC 2014. Due to the nature of the face database images not always being of high quality or completely in focus, the resulting unique composite images appeared a little lower quality than the target faces which were mostly paparazzi images for the celebrity targets or taken with a high quality SLR camera for the lecturer targets. Because of this, a Gaussian blur of 0.5 was filtered over all target images, prior to compositing (*all phases*), to be consistent with the unique composite image quality. This ensured that when features were swapped, there were no inconsistencies between the feature sample quality and the target face.

# References

JARUDI, I. N. & SINHA, P. 2003. Relative Contributions of Internal and External Features to Face Recognition. Massachusetts Institute of Technology, Tech.Rep.

YOUNG, A. W., HAY, D. C., MCWEENY, K. H., FLUDE, B. M. & ELLIS, A. W. 1985. Matching familiar and unfamiliar faces on internal and external features. *Perception,* 14**,** 737-46.