Ear Biometrics:
Mapping the Human Auricle in Asians Residing in the Sydney Region

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Background

• Need for a quick yet comprehensive supplementary system for personal and positive human identification.

• Next to DNA and fingerprints, the human auricle or ear, constitutes the most characteristic features and design for the purpose of positive identification.

• If person cannot be identified using known biometric (DNA and fingerprints) like in Figure 1, ear biometric analysis can be used.

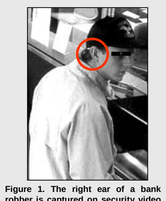

Figure 1. The right ear of a bank robber is captured on security video footage. The ear is at the correct perspective to perform biometric analysis.

Objectives

• Collect ear biometric data from the Mongoloid racial population residing in Sydney using a manual ear biometric system created by Joan De Winne.

• Examine for any trends between the biometric points on the ear according to sex and Mongoloid sub-groups, such as the Chinese and Japanese.

• Assess overall potential of human ear to be a biometric identifier in human identification.

Method

• 90 volunteers from a range of Mongoloid sub-groups were sampled (47 females and 42 males).

• A questionnaire was filled out where subject declared their sex and ethnicity.

• Subjects heads were positioned accordingly and then had both ears photographed under controlled conditions.

• Ear biometric analysis occurred on the image taken. Images were made to fit accordingly onto a pre-defined easel and grid.

• Measurements were obtained where the grid intersected the major features of the ear such as the helix, lobe and conchae. This is seen in Figure 2.

• Each analysis produced 25 measurements, labelled A-J, which allowed for the application of certain statistical tests.

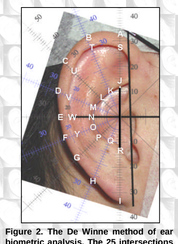

Figure 2. The De Winne method of ear biometric analysis. The 25 intersections between the grid and the main ear features are labelled A-Y. Point A would equal 32 mm.

Results

• The 4180 measurements collected and catalogued showed each sampled Mongoloid person had a unique set of biometric measurements for each ear.

• Statistical tests showed that ear biometric analysis was not a powerful tool for the determination of a person Mongoloid sub-group.

• Statistical tests showed that sex could be differentiated using De Winne's ear biometric method with a high degree of probability

Conclusions

• No strong patterns existed amongst different Mongoloid racial subgroups sampled in this study. This indicated the constraints of the dataset.

• Each Mongoloid sub-group should have a substantial and equivalent number of subjects for stronger and valid patterns to be detected.

• Study showed the ear did have the potential to identify a person, their sex (illustrated in Figure 3) and possibly, with further research in the future, their racial sub-group.

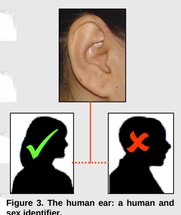

Figure 3. The human ear: a human and sex identifier.