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CRANIO-FACIAL SUPERIMPOSITION TECHNIQUES: A REVIEW

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ABSTRACT

'Face ID' for unlocking cell phones and 'Photo review' in Facebook are the most common technology we are using in our day to day life. How these technologies are useful in Forensic science. Face of an individual has several different types of exclusive features and thus important in identification. Identification may be of two types; i.e. 'Complete identification' or 'Partial identification'. For establishment of identity several points are considered out of which facial identification is most important and easy method. But in cases where face is destroyed by animals or in cases of mutilated bodies or advance decomposed bodies, facial identification is not possible; In these cases Skull Superimposition is proved to be helpful. Superimposition technique was first used in 1937 in 'Buck Ruxton Case'.

Superimposition is done by three methods; out of which computer aided superimposition is most advanced and accurate. Accuracy of skull superimposition is up to 99.4% in combined superimposition. Also superimposition is proved to be helpful in many cases; therefore this topic is selected for review.

KEYWORDS: Skull Superimposition, Cranio facial Superimposition, Facial Identification, Photographic Superimposition, Videographic Superimposition.

INTRODUCTION

'Face ID' for unlocking cell phones and 'Photo review' in Facebook are the most common technology we are using in our day to day life.

How these technology works?

Are these technologies useful in forensic science?

Face of an individual has several different types of exclusive features and thus important in identification and recognition of a person. Identification means determination of individuality of a person based on certain physical characteristics i.e. exact fixation of personality.[1]

Types of identification[2]

Complete identification - also called as absolute identification and refers to the perfect fixation of individuality of a person.

Partial identification - also called as incomplete identification and it implies ascertainment of only some characteristics regarding the identity.

For establishment of identity following points are considered:-[3]

Race

Religion

Sex

Age

General development

Congenital features, viz. Personal appearance, anthropometric measurement, fingerprints, footprints, birth marks etc.

Acquired peculiarities, viz. Occupational marks, tattoo marks, scars etc.

Miscellaneous data.

Obliteration of identity

From all the above characters; facial identification is an easy and most important forensic tool which may lead to positive identification. But, sometimes facial identification is not so easy as face is destructed by an animal, mutilated bodies, fractured skull, advance decomposed body etc. in such type of cases superimposition technique is useful.

The facial identification can be classified into three types on the basis of techniques used :-

1. Cranio facial superimposition techniques.
2. Cranio facial restoration techniques

3. Cranio facial reconstruction techniques

In this article we are going to review Skull superimposition (Cranio facial superimposition).

DEFINATION[4]

The Method of laying one picture or image over top of the another is called superimposition
It is a method of comparative identification.

In this method skull of a person is compared with the photograph of deceased person by the way of superimposition (laying one picture or image over top of the another).

Thus, superimposition is a technique applied to determine whether the skull is that of a person in the said photograph or not.

HISTORY[5]

Buck Ruxton Case (Jigsaw Murders Case)

Skull superimposition was first applied by Glaister and Brash in (1937) The Buck Ruxton "Jigsaw Murders" case.

On September 14, 1935, Buck Ruxton, an Indian-born physician who lived in Lancashire, near the English-Scottish border, his wife Isabella and her maid Mary Rogerson's mutilated bodies found under a bridge in Scotland.

After a passerby discovered some remains under a bridge in Scotland, a team of forensic experts was assembled.

Using an array of scientific methods, the experts identified the victims and unmasked the perpetrator.

The painstaking reconstruction of the bodies of Isabella Ruxton and Mary Rogerson and pioneering use of photographic superimpositions was the key evidence that led to Dr. Ruxton's conviction and execution.

ANATOMICAL LANDMARKS TO BE COMPARED IN SUPERIMPOSITION[6]

The eyes within orbital plate
The nasion
The prosthion in the central line

The nasal spine in the centre which is little above the tip of nose

The lower border of upper jaw

The zygomas below the eyes

Supraorbital ridges

Angle of jaw

External auditory meatus

Teeth

TYPES OF SUPERIMPOSITION[7]

Superimposition is broadly divided into three types

1. Photographic superimposition
2. Video graphic superimposition
3. Computer aided superimposition

Photographic superimposition

Photographic superimposition technique was introduced by Glaister & Brash (1937).

In this method the photograph of person is taken and the negative is prepared of it.

The skull photograph's negative is also taken.

The both negatives i.e. the skull and that of photograph are superimposed by aligning and the photograph is developed.

The resulting superimposed photograph brings out the details revealing the similarity or dissimilarity.

Video-Graphic Superimposition

Video-Graphic Superimposition in India, was first tried by Chandra Shekharan in 1988.

In this method the skull is mounted on support that allows moving the skull in three directions. Photograph to be tested is also mounted similarly.

Video cameras are placed to record the photograph and skull separately on each side.

The individual video signals from each camera are compared by blending and sweeping method.

Computer Aided Video Skull/Face Superimposition

This is new technique for personal identification.

In this method, facial photographs are taken and a radiograph (X-ray) of the skull in question is taken. The skull radiograph is then photographed.

Both photographs (i.e. the face and skull) are stored in computer database. The photographic images of the faces and radiographs of the skull are then drafted with common photographic software such as Adobe photo Deluxe, Microsoft PhotoDraw etc.

The images are displayed over monitor and the anatomical landmarks are compared.

With advancement in science, instead of skull radiograph photograph, the skull is fixed over craniophore and was recorded in video camera.

With the development of CASS (computer aided superimposition software, written in C language and developed at Forensic Science Laboratory, Ahmedabad, Gujarat) the accuracy has increased further.

SHEENA BORA MURDER CASE[8]

On 24th april 2012 Sheena bora was killed by her mother indrani mukharjee and her step father sanjeev khanna.

On 23rd may 2012 a decomposed body discovered from the forest of raigad distric.

On august 2015 the skull of the body found and sheena's photo matched with the help of digital superimposition.

Positive results revealed the identification of skull that it is of Sheena bora's.

Source4- https://www.indiatoday.in/india/story/sheena-bora-murder-digital-superimposition-of-profile-matches-skull-261291-2015-09-04

CONCLUSION

Everyone has right to recognition everywhere as a person before the law

-Universal Declaration of human right

In positive identification, facial identification is most easy and important forensic tool.

In cases where face is destroyed by animal or in mutilated bodies or in advance decomposed bodies, Skull superimposition is proved to be an effective tool.

The method of laying one picture or image over the top of another is called superimposition.

Skull superimposition is a method of comparative identification.

This technique was first used in 'Buck Roxton case' by Glaister & Brash in 1937.

Skull superimposition is proved to be useful in many cases.

Accuracy study conducted by Austin & Smith proved that chances of false positive using lateral view are 9.6% & by using anterior view is 8.5%. In combined lateral & anterior view it is reduced to 0.6%.[9]

Skull superimposition is reliable and an accurate technique for identification and recognition in forensic anthropology.

This method has been developed to try to speed up and automate the traditional method used by forensic doctors making possible the comparison of a large number of photos with a skull with little user intervention.

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