Facial Reconstruction

Forensic Science

Bell-Ringer

- Forensic Science
- Bell-Ringer and Journal Entry are due @ the end of class.
- Question: Why might facial reconstruction be a necessary component regarding forensic identification of human remains?

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Introduction

- Uncovering skeletons used to mean very little could be done to determine who the victim was and if appropriate, who the murderer was. However, with growing technology and experience of years, facial reconstruction now provides an answer to such mysteries.

Reconstruction In Clay

- Once the skin and flesh has rotted away from the skull of a corpse, their character and physical appearance disappear along with it. It then becomes the job of forensic anthropologists, sculptors and creative artists, to reconstruct a life like form of what the person looked like from the skeleton and sometimes, remaining parts of a skeleton. Clay is a common form of reconstruction.

Beginning the Reconstruction

- In order to reconstruct a life-like face, sculptors need to know the depth of skin that overlays the skull. Sculptors usually begin sculpting with 20 to 35 tissue layers, scattered all over the face. The main heavily concentrated depths are situated around the mouth and in between the eyes. Facial depth measurements are available for male and female, certain ages, racial groups, thin people and obese people. Small pegs are used as facial depth indicators and are fixed into the skull or otherwise into a cast of the skull. Strips of clay that have been made to match the height of the pegs are then placed between them and once the strips are in place, clay is used to fill the gaps between each peg.

Facial Features

- The sculptor is then able to start work on the eyes, mouth, ears, nose, chin, jaw and cheeks, as these are the aspects of the face that give the most character, but are also the parts that perish most quickly as the body decays. Sculptors rely on certain rules during the reconstruction of a face, for example, the width of the nose is the same as the distance between the inner corner of the eyes and the corners of a person's mouth lie below the inner boarders of the iris. Ears are seen as being roughly the same length as the nose, though elderly people usually have longer ears. Once the facial features are complete, the sculptor makes a mould from the clay head using a plaster of Paris silicone rubber.

The Face

- Now, the reconstruction of the face involves the task of building the muscles around it. Sculptors must approximate the muscle structures by noting the shape and size of certain facial bones, as these will directly affect the shape of the muscles previously attached to them. Using their experience, the sculptors are able to build the face by shaping each of the muscles and then fixing each one in its place on the skull. The final step is to cover the clay muscles with a layer of clay skin, which is smoothed over so that it resembles real skin.

Limitations

- However experienced the sculptor is, there are certain accuracy limits that occur during the reconstruction of a face. Sculptors can only guess hairstyles and cannot create the expressions on a persons face that make the sculpture completely life like. However, a sculpture is successful if it aids in jogging someone's memory or can narrow down a search by excluding anyone whose face does not resemble the reconstructed face.

Computer Facial Reconstruction

- Computer facial reconstruction has developed far enough to allow a virtual form of reconstructing the face from a skull, making it easy and efficient to travel from computer to computer. Such software allows for a 3D image/structure of the finished face to be rotated and moved around on a monitor.

Acquiring The Skeletal Structure

- Using computer facial reconstruction does not require artistic skill, but it does require skills of a different sort. There is no standard method of computer facial reconstruction but the initial data and facial shape comes from a 3D scan of the skull. This process is non-destructive to the skull and involves the skull rotating on a turning table whilst a laser scanner lights up a thin perpendicular strip. Mirrors located on either side of the turning table reflect the images from the lit up area to sensors. The data that the scan produces allows a controlling program to determine the distances of each point located on the skull. This then creates a digitalized model of the skull that is easily and freely rotated on the computer screen.

Muscle and Skin

- Applying muscle and skin to the bone requires computer tomography (CT) scans of actual living people, which acquire images showing where bones cast shadows onto the skull and record hard/soft tissue (bones and flesh) in a 3 dimensional, view. Using CT scans, data files record the shape of the skull as well as the tissue depth. Forensic anthropologist's knowledge is also utilized in choosing an appropriate form of CT scan. Any clothing found with the bones can provide a clothing size, which is useful, as it allows scientists to adjust any tissue depth measurements to account for obesity or thinness. Merging the two scans, the CT scan is applied to the digital scan of the skull, becoming two skulls on top of each other. At this stage of the process, the two skulls are different shapes. The computer program distorts the skulls' marks on both so they match each other and at the same time, distorting the facial tissue properties, creating a facial shape that resembles the victim.

Color

- CT scans cannot record vital surface detail such as hair, skin and eye color, so these aspects of persons face must be added. This involves borrowing the physical features of a living person in order to paint these features onto the 3D model. A person who has similar age, racial qualities, and build as the modeled skull is used in a 3D rendering process called 'color mapping'. This process involves photographing the face of the person with similar qualities and using software to merge the three views into one strip that is put onto the computer to complete the reconstruction. The final result can be viewed and turned on the screen. Like clay facial reconstruction, the method does have its accuracy limitation. Nose, mouth and ear shape are largely down to guessing, however, lighting conditions and the ability to view the face from any angle makes computer facial reconstruction very lifelike and helpful during investigations.