

Haptic Technology and Freeform+ in Facial Identification at Face Lab

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Overview

Facial identification in forensic investigations has evolved rapidly with advancements in digital modelling and haptic technology. One notable application of this technology can be found at **Face Lab**, a craniofacial identification lab based at **Liverpool John Moores University**. Spearheaded by Professor Caroline Wilkinson, Face Lab has been instrumental in assisting investigations by using advanced technology purchased from OR3D, specifically **Geomagic's Haptic Touch X** and **Freeform+** software.

This case study explores how **Face Lab** utilises this technology in forensic and heritage contexts, the impact of its work in high-profile cases, and its contributions to both academic and criminal investigation fields.

Technology and Application

Face Lab employs **Geomagic's Freeform+** software and haptic technology to create highly accurate 3D facial reconstructions. The **Freeform+** software by **Geomagic** is a powerful tool that enables users to manipulate digital models with a sculptural, freeform approach, emphasising precision and intricate detail. Coupled with haptic feedback technology, this setup allows forensic artists to "feel" the surface of a virtual face, offering an enhanced sense of control and precision in reconstructing complex facial structures. This approach provides an experience much closer to traditional sculpting, but with the accuracy and flexibility that digital technology allows.

OR3D, a UK-based distributor of **3D scanning** measurement solutions and **platinum partner** to Oqton, supplied Face Lab with the haptic device and **Freeform+** software. This combination has proven invaluable in helping Professor Wilkinson's team reconstruct the faces of unidentified murder victims, aiding police investigations and, in some cases, leading to successful identifications.



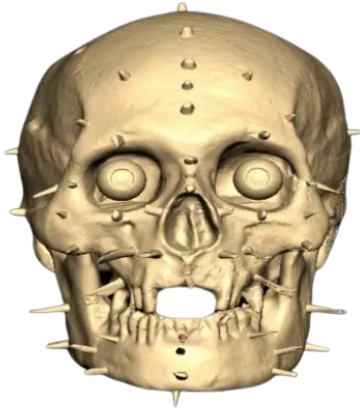
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Case Application - Robert The Bruce

One of Face Lab's significant contributions outside of modern forensic cases is the identification of historical figures. Professor Wilkinson and her team famously reconstructed the face of **Robert the Bruce**, the 14th-century Scottish King, using the same technology. This system featured on the **BBC series Expert Witness**, showcasing the capability of digital reconstruction technology for the identification of human remains.

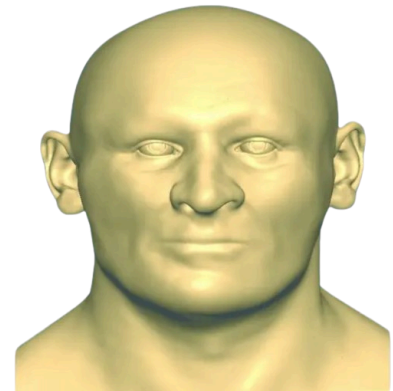


Facial Reconstruction Process

The facial reconstruction process at Face Lab begins with the acquisition of skull data, typically obtained through high-resolution 3D scans or CT scans. For the case of Robert the Bruce, Face Lab worked with casts of what is believed to be the king's skull, ensuring a scientifically accurate foundation for the reconstruction.

Data Imported into Freeform

Face Lab used Freeform+ to input the data of Robert the Bruce's skull, creating a highly detailed 3D facial reconstruction. By digitally sculpting over casts of the king's skull, Face Lab's team carefully applied forensic techniques to determine the facial features, including soft tissue depth and facial structure.



Haptic Feedback

Using haptic feedback, Face Lab carefully layer virtual "flesh" onto the bone structure, following forensic standards for facial reconstruction.

The 3D model was then exported into a CGI application for the addition of all of the texture/colours (Maya and Z-Brush).

Digital 3D Model

The final output is a digital model that resembles a realistic face. The 3D image not only offered a visual representation of Robert the Bruce but also contributed to ongoing research in digital human representation and forensic facial reconstruction.



Applications in Forensic and Academic Research

Face Lab's innovative use of this technology has proven valuable in both forensic and historical contexts. In modern **forensic applications**, the lab's reconstructions have provided essential visual leads to help identify unknown victims in murder investigations. By producing a detailed digital representation of an unidentified individual, **Face Lab** supports law enforcement efforts, often offering the public a face to recognise, which can be crucial in cold case investigations.

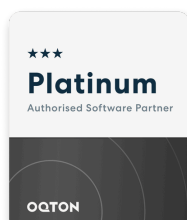


In the realm of historical research, **Face Lab's** reconstructions have brought renewed interest to historical figures and influenced the development of **3D facial avatars** in digital humanities and entertainment fields. Through their work, they are at the forefront of advancing digital human representation, providing insights that inform the development of **facial recognition** and avatar technologies. The techniques used by **Face Lab** are not only advancing forensic science but are also shaping the future of human representation in digital environments.

Public Engagement and Media Recognition

Face Lab's work has gained widespread recognition, partly due to media features such as their appearance in the BBC series *Expert Witness*. Through such exposure, Face Lab has highlighted the critical role of forensic facial reconstruction in solving real-life criminal cases. By showcasing their process on a public platform, Face Lab has raised awareness of the science behind forensic facial depiction and the ways in which it contributes to the justice system.

Their portrayal of historical figures like Robert the Bruce and Ta-Kush further emphasises the cultural importance of Face Lab's work, connecting the public to history through meticulously crafted 3D portraits.



"I have been utilising this technology since 2000 and it has been critical to the development of our research and impact activity. The haptic interface enables a touch-based experience similar to sculpture and this directly influenced our choice of equipment."

PROFESSOR CAROLINE WILKINSON
Face Lab