Glyptics Portrait Generator
3D Facial Reconstruction and Optical Effects in Gems

Introduction

Glyptics Portrait Generator is a piece of software that creates virtual 3D models of one’s face in a glyptic art style. Glyptics, or glyptic art, is an ancient art technique that produces engraved (carved) portraits or other images in precious and semi-precious stones. While originally appearing in the Near East, this technique achieved its greatest form in Ancient Greece and the Roman Empire. These engraved gems were mostly considered as counterfeit-resilient signatures in the ancient cultures, as well as just expensive pieces of jewellery.

Facial Reconstruction

Facial reconstruction is divided into several steps. First, 68 landmarks are detected on the input frame. These landmarks are passed to the FacialMorpher module, which fits the predefined 3DMM (3D morphable model) face to that data. The model, used for this step, is a Surrey Face Model (SFM) of medium resolution, as a perfect balance between quality and performance.

Gem Effects

The real engraved gems often do not possess any interesting optical effects due to the nature of the materials used. However, the advantage of computer graphics in this case is that they can be added in, to assess how much do they affect (and, hopefully, improve) the result. To do that, 8 optical gem effects were researched and their implementations reviewed.

Motivation

University of Tartu Art Museum opens an exhibition dedicated to engraved gems in summer. To provide more interactivity and memorable things for the visitors, the Museum requested the creation of such an exhibit. The result is the Glyptics Portrait Generator.

Algorithm

The Glyptics Portrait Generator consists of several modules, connected as a «chain», where the output of the previous module serves as the input for the next one. In general, the algorithm can be divided into two parts - facial reconstruction (FacialDetector and FacialMorpher modules) and rendering (i.e. visualizing) (OgreApp). The FrameCapturer module is responsible for communication with video devices and providing the next modules with inputs.

Conclusions

The Glyptics Portrait Generator will be the perfect addition to the upcoming engraved gems exhibition in the Art Museum in June.

Project’s source code can be found at https://github.com/AllysanderStark/glypticsgenerator