Researchers develop new physical face cloning method

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Left: photograph and scanned 3D geometry of a human face. We use a physics-based optimization process to design the geometry of a synthetic skin in order to best match given target expressions. Right: ?nal animatronic ?gure with fabricated skin.

Animatronics aims at creating physical robots that move and look like real humans. Many impressive characters have been created in this spirit, like those in the Hall of Presidents attraction at Walt Disney World. Until now, creating animatronic copies of real human individuals is a difficult and labor-intensive process requiring the manual work of skilled animators, material designers and mechanical engineers. Researchers at Disney Research, Zürich, ETH Zürich, and Walt Disney Imagineering R&D have developed a new computational design process for cloning human faces that could greatly simplify the creation of synthetic skin for animatronic characters.

Due to its expressive power, replicating the human face presents huge challenges. To deliver compelling and realistic performances, an animatronic character must produce a vast range of facial expressions, each having different deformations and wrinkles. Manually designing the shape and material properties of a single skin that is able to achieve all of these targets is a formidable task. The Zürich researchers, however, invented a computational method for automatically designing synthetic skin to match real individuals.

The process starts by scanning 3D facial expressions from a human subject. Then, a novel optimization scheme determines the shape of the synthetic skin as well as control parameters for the robotic head that provide the best match to the human subject. This processing increases the realism of the resulting character, resulting in an animatronic face that closely resembles the human subject.

"With our method, we can simply create a robotic clone of a real person," said Dr. Bernd Bickel, researcher at Disney Research, Zürich. "The custom digitally designed skin can be fabricated using injection molding and modern rapid prototyping technology. We 3D print a mold and use elastic silicon with properties similar to human skin as base material". Their findings were presented at ACM SIGGRAPH 2012, the International Conference on Computer Graphics and Interactive Techniques.

"Our research focuses on the creation of the silicone skin," explained Dr. Peter Kaufmann, researcher at Disney Research, Zürich. "We use computation to carefully modify the thickness of the skin across the face, leading to deformations that closely match those of the real human."

Prof. Markus Gross, director of Disney Research, Zürich, applauded the results, stating, "This innovative research builds upon our heritage in 'Audio-Animatronics' pioneered by Walt Disney himself. Physical face cloning enables us to create personalized animatronic figures based on real individuals with a level of fidelity and realism never before possible."

More information: For more information, please visit the web site at www.disneyresearch.com/researc … lFaceCloning_drz.htm

Provided by Disney Research