Mirror Mirror: An On-Body Clothing Design System

Daniel Saakes* Hui-Shyong Yeo** Seung-Tak Noh** Gyeol Han* Woontack Woo**

My Design Lab* and UVR Lab** , KAIST, Daejeon, South Korea

Figure 1: *Mirror Mirror is a design system that combines spatial augmented reality with a mirror display (a). Virtual garments are visualized and designed both on the body (b) as well as in the mirror reflection (c) before being fabricated (d) with a fabric printer.*

When choosing what to wear, people often use mirrors to try clothing items and see the fit on their body. What if we can not only evaluate items in front of the mirror but also design items and have them fabricated on the spot?

We propose a personal clothing design system, called Mirror Mirror. Virtual garments are projected directly on users bodies as if the clothes are really "worn". With on-body and mid-air gestures users make new or customize existing designs. When ready, designs are exported as PDF to be fabricated into real garments using transfer printing or alike.

In retail, magic mirrors for virtual garment fitting employ a camera to capture the user, and a display that acts as a mirror surface. They so achieve a slim form factor but the reflection image is 2D, on the display surface. Other systems such as the [Microsoft Research 2012] employ half-silvered mirrors and position the display behind the mirror surface and optically combine reflected image with virtual content to achieve a high fidelity 3D experience. However, in these systems, the augmented image is only visible in the reflection.

We combine spatial augmented reality with a mirror. In that way we obtain a similar high fidelity 3D experience as the half-mirror based systems, but the augmented graphics not only visible in the reflection from a third person perspective, but also directly on the body. This setup makes possible several novel interaction scenarios such as drawing on the body and collaborative scenarios such as designing together or tailor and client design.

*e-mail:{saakes, hsyeo, stnoh, hgyeols, wwoo}@kaist.ac.kr

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The Mirror Mirror system is implemented with a Kinect v2 depth sensor and a short throw projector, calibrated to the depth sensor. We employ standard skeleton tracking to capture a user's pose and project textures on a cylindrical shaped proxy mesh rigged to the upper body. In that way, graphics are registered to the body and allow dynamic posing for up to 4 persons.

We support two ways of designing: collaging and patterning with existing images and painting with brushes. By using mid-air gestures and the on-mirror UI, users can select images, manipulate and edit properties of patterns, color, density and layering. The body also doubles as a canvas for drawing with a tracked brush [Bandyopadhyay et al. 2001] and thanks to the in-place visualization, and unlike DressUp [Wibowo et al. 2012], users can be their own mannequins. An additional background image is projected behind the user to support evaluating designs in simulated environments such as office, forest or beach. This novel, but seemingly complicated optical setup that combines a projector and a mirror-TV results in a system that is easy to use and versatile due to the multiple interaction layers: on the body, on the mirror surface, on the reflected body and on the background behind the user.

Mirror Mirror reacts on the contemporary fast fashion trend of disposable clothing and anticipates the rise of personal fabrication technologies and possible futures of flexible color changing e-ink garments and sharing designs over the Internet.

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