

## Computer-generated imagery Fabricating fabric

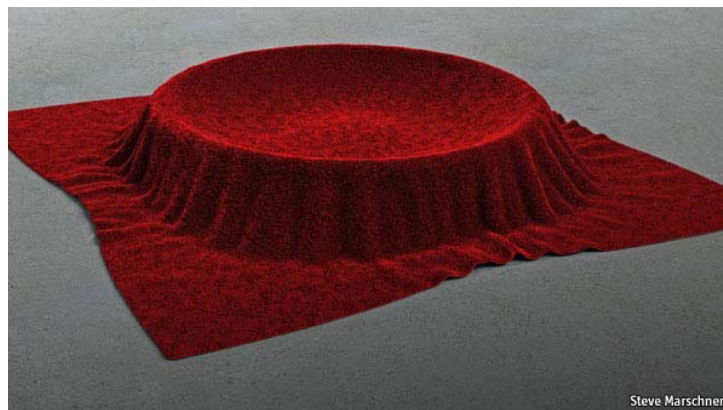
### How to generate more realistic images of clothes

Aug 13th 2011 | from the print edition

Like [13](#)

0

FILMS like “Captain America”, “Tron Legacy” and “The Curious Case of Benjamin Button” have shown that it is possible to use computer-generated imagery (CGI) to make actors look younger, older or wimpier than they actually are, in a surprisingly realistic manner. At least, it is possible if those altered actors are kept at a suitable distance from the viewer. The difficulty of recreating the textures of both skin and fabric means the effect is less convincing when seen close up.



Velvet dreams

Steve Marschner

The reason is that, whereas it is possible to simulate realistically the forces which make virtual skin and fabric hang, bend, flap and stretch, recreating the subtle ways they reflect light has so far proved extremely tricky. The shimmer and sheen of both fabric and skin depend on the geometry of their internal structures—the exact arrangement of threads or protein fibres. This is hard to model accurately. Steve Marschner and his colleagues at Cornell University have, though, come up with a way to get round that problem. Instead of modelling, they are copying. They are using computerised tomography (CT) to analyse the structures of fabrics at high resolution and then plugging the results into CGI. That, allied to the laws of optics and some heavy-duty computer power, seems to do the trick.

Computerised tomography is most familiar as a medical technique for examining people’s insides. Like classical radiology it uses X-rays. But because the image is constructed inside a computer using shots taken from many different directions, rather than being a single exposure recorded on photographic film, CT can capture fine detail and record soft tissues that are invisible to classical radiology.

Dr Marschner and his colleagues used a benchtop version of CT, developed for looking at the structure of materials rather than at human bodies, for their experiment. Employing doses of X-rays many times stronger than those used to study people, they obtained high-resolution information about small pieces of fabric. Computerised tomography allows the three-dimensional structure of the fibres in such scraps to be recorded, with all their kinks and imperfections. A number of small pieces can then be patched together into an entire garment inside a computer, in the same way that a handful of actors are turned into a CGI crowd. But because the internal structure of each bit of the garment matches that of a real piece of cloth, the way light will play on it can be calculated far more realistically than if it were just a

computer model of what the interior of cloth is thought to look like.

Demonstrating the results of their technique at the SIGGRAPH computer-graphics conference in Vancouver this week, Dr Marschner and his colleagues showed realistic renderings of felt, gaberdine, silk and velvet. Moreover, their renderings remain realistic even when viewed close up. Sadly, skin is still beyond them. The high intensity of the X-rays involved would be too damaging for use on a living human being, and a corpse would probably not produce the right results. But once the rendering technique has been speeded up (at the moment it is still a bit slow and clunky), the swish of a virtual cloak or the doffing of a computerised hat should look far more realistic than it does now.

In the meantime, according to Dr Marschner's colleague Kavita Bala, the technology might have an application in online retailing. At the moment, people buying clothes over the internet have only standard photographs to help them choose their purchases. Using CT-based computer graphics might, paradoxically, give a better idea of what the material an item of clothing is made from is really like than can be garnered from a boring, old photograph of the original.

from the print edition | Science and Technology