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Digital Manufacturing of Fine Art Reproductions for Appearance

Elkhuizen, W.S.; Doubrovski, E.L.; van Apeldoorn, N.; Essers, T.T.W.; Geraedts, J.P.M.

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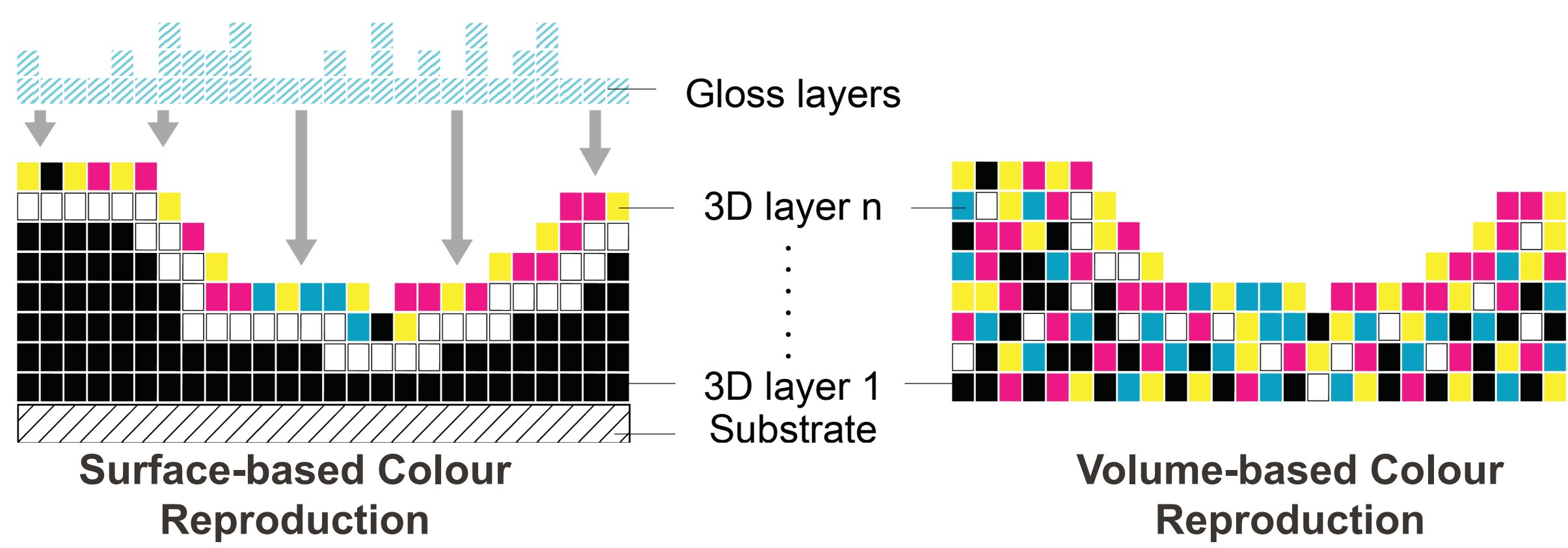
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3D scanning and printing provide new opportunities for digital fine art reproduction. Different appearance modalities of the artefact need to be scanned to create meaningful reproductions [1] [2], such as colour, relief, gloss and translucency. A limited number of 3D printers can now fabricate full colour objects [3], but it remains a challenge to create a life-like reproductions.



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3D Printing Methods

This work evaluates the applicability and required workflow of two different state-of-the-art material jetting systems. Two types of 3D printers are used to reproduce colour: a surface-based system (SB) and a volume-based system (VB). SB uses five opaque inks, CMYK, White and one transparent ink. This system prints on a substrate, the inner volume is built up with ink, covered by a white layer and has a coloured outer layer. Additional layers of transparent ink can be printed to vary the surface gloss [4]. VB prints with five translucent inks, CMYK and White [5]. The colour is created through consecutive layers of pixels, requiring 3D half-toning.

Reproducing Appearances

Both systems are able to accurately reproduce the shape and surface relief. SB is more accurate in terms of colour and VB reproductions show blurring of fine details, a consequence of the translucent inks. The appearance reproduction of three types of fine art artefacts are evaluated: an oil painting, a wooden-artefact, and stone bas-relief. The reproductions of the *oil painting* show a difference in gloss; there is more likeness when gloss layers are added with SB. For the painting, the SB reproduction appears most life-like. For the *wooden artefact* the limited colour gamut of VB is less of a problem and appears to be more suitable in reproducing its appearance.

The colour and relief details of the stone *bas-relief* surface can be printed accurately using SB [6].

This work is a first step towards reproducing different material appearances. However, a more systematic investigation is needed into capturing *and* fabricating all appearance modalities and linking these in the workflow.

		Original Artefact	Surface-based Colour Reproduction	Volume-based Colour Reproduction
Oil painting	Colour			
	Translucency			
	Gloss			
Wood	Colour			
Bas-relief	Colour			

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