

D•Focus

DEPTH-OF-FIELD DEFOCUSING UNIT

Background images rendered by computer tend to be very sharp, and this looks un-natural when the studio camera is focused at a depth other than that of the virtual object. This unit is used to simulate depth-of-field effects, by softening the background image by an amount depending on the depth of the virtual background and the focus setting of the studio camera. It is licensed to Radamec Broadcast Systems, who sell it under the name *D•Focus*.



Left:
An image processed to simulate the effect of the foreground being in focus and background being out of focus.



Right:
The same image as above, but processed to simulate the effect of the background being in focus.

FUTURE WORK

In its present state of development, Virtual Production allows the design and realisation of a set to be carried out using 3D modelling techniques; however the later stages of programme production, including the mixing of real and virtual elements of the scene, still happen using conventional production equipment such as vision mixers. The end result is therefore a conventional 2D programme. If ways can be found to allow the whole production process to take place in the 3D domain, the end product would be suitable for media other than just normal television, such as stereoscopic TV, VRML or MPEG-4 via the Internet. Furthermore, there may be scope for further cost savings for conventional 2D production, since tasks such as shot framing and lighting adjustment could be carried out in post-production.

To realise this long-term aim, potential collaborative projects are being investigated, bringing in partners who are expert in fields such as human motion-capture and rendering of virtual actors, MPEG-4 coding, and 3D display.



For enquiries about the use of the Virtual Studio at Television Centre, contact:

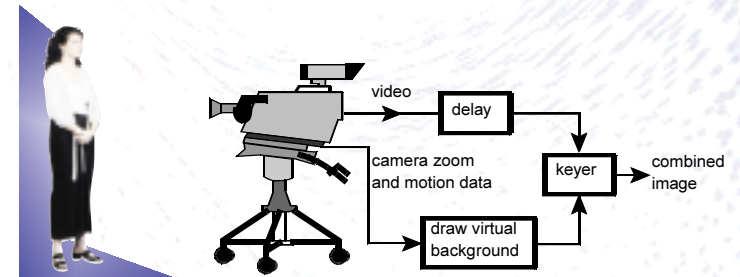
Mike Jarvie BBC Television Centre mike.jarvie@bbc.co.uk



virtual production

The aim of Virtual Production is to allow the seamless integration of "virtual" elements into a scene, whilst maintaining all the usual TV production techniques such as freedom to move the camera, change the lighting and pull focus. This can provide significant cost savings compared to the use of "real" scenery, since 60-70% of a typical design budget may be spent in the processes of making, moving, erecting, storing or refurbishing real sets. Virtual Production also offers new creative freedom, since sets that are physically impossible to build may be used.

BBC R&D has been working on virtual production since 1992. Our early work was in the EU-sponsored RACE project MONA LISA[1], which led to the first public demonstration of a virtual studio at IBC'94. Since then, we have been working to fill the technology gaps that would otherwise prevent virtual studios from reaching their full potential. All of our developments are used in the BBC's new virtual studio at Television Centre, TC0.



BBC

Research & Development

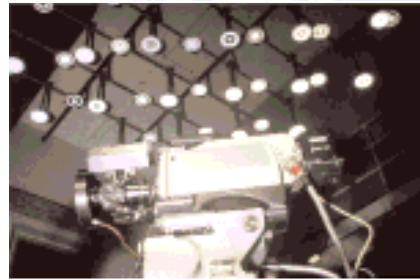
virtual production



FREE-D

CAMERA TRACKING SYSTEM

Measurement of the precise position and orientation of each studio camera is vital to ensure that the virtual background image is generated to match. BBC R&D has developed a system[3] that measures these parameters, without the need for special camera mountings or patterns in the scene. It uses markers placed on the studio ceiling, viewed by a small auxiliary camera mounted on each studio camera. A processing unit analyses the image from the auxiliary camera, and computes the camera position from the known marker positions. The system is licensed to Radamec Broadcast Systems, who sell it under the name *free-d*[™].



VIRTUAL SCENARIO

2D DVE

Many productions only require the ability to pan, tilt and zoom the camera, and do not require the pedestal to be moved whilst on-air. Thus there is no need to use an expensive graphics supercomputer to render a new view of the 3D world every frame. The virtual background can instead be represented as a flat image, which is transformed to simulate the effects of camera panning, tilting and zooming. BBC R&D has developed a specialised "DVE" for performing such transformations, on either a still or moving video image. It is used extensively by BBC Sport for programmes such as *Football Focus*, and has been used for a wide variety of other programmes including *This Multimedia Business* and *Record Breakers Gold*. It is licensed to Radamec Broadcast Systems[2], who have sold many units worldwide, under the name *Virtual Scenario*.



TRUEMATE

"NON-BLUE" KEYING SYSTEM

Conventional chroma-key techniques require the use of a brightly-lit background of a uniform colour, usually blue. It can be time-consuming to light such a background, and difficult or impossible to use subtle lighting effects on the actors. To overcome these problems, BBC R&D has developed a method using a retro-reflective cyclorama cloth, and a ring of coloured lights around the camera lens. This ensures that the background always appears brightly-lit to the camera, regardless of the setting of the studio lights, which can thus be set instead for the desired dramatic effect.



REFERENCES

1. Blondé, L. et al. 1996. A virtual studio for live broadcasting: The Mona Lisa Project. IEEE Multimedia, Vol. 3, No. 2, Summer, pp. 18-29.
2. <http://www.radamec.co.uk>
3. Thomas, G. A. et al. 1997. A versatile camera position measurement system for virtual reality TV production. IBC'97, IEE Conference Publication No. 447, pp. 284-289.