Virtual Light Projection (1 way) and Virtual Light Transporter (2 way)

A Radiance exploration by Rob Shakespeare
TCVC, Indiana University
(work initiated in 2000 revived in 2005)

4th Annual Radiance Workshop
Montreal Aug 11-12 2005
Background

The aesthetic and technical challenges of presenting an actor in front of projected scenery were defined by the renown Czech Republic scenographer, Joseph Svoboda, during the 1950’s.

More than 50 years later, many of these challenges remain unconquered and have again become prominent with the advent of virtual scenography in live theatre and television.
Joseph Svoboda and Laterna Magika
1958 World’s Fair in Brussels Czech Pavilion...
1987 production
1993 – “Laterna Magika is over 30 years old and has remained the sole example of its type. We have discovered, but we also know that we are at the very beginning.”

“..there are many sequences where the filmed image and the stage action simply stood next to each other without dramatic contact..”

“Those who work in the future… enter upon the adventure of discovering the secret network of relationships between humanity and the world around it.” Joseph Svoboda The Secret of Theatrical Space
3d VR set explorations in theatre

At the University of Kansas, a surrealistic courtroom scene is modeled in 3D Studio Max above, then, using Sense8's WorldUp software, presented in real time as the background in a scene from the play "Midsummer Night's Dream," to be performed...
Background

…the resolution of stage lighting

Overlapping Acting Areas or zones are individually lighted

2 – 3 meters
how discerning are we of source, highlight and shadow relationships? When does the illusion fail and draw attention away from the actor?

(Shakespeare, 2001)
At a glance, can you accept both of these images? Is either correct?

(Shakespeare, 2001)
Live stage illusion

...apparent direction of light on an actor

(Shakespeare, 2000)
Virtual Light Projection

Virtual light on physical actors...

VLP

Concept Sketch

by Rob Shakespeare

TCVC

©RAS  Feb 1, 2000
Update April 15, 2001
Update July 10, 2005
Theatre Application example

- Step 1 – illuminate a 3d virtual model, locate projection screen and adjust projected image for ideal vantage point
- Step 2 – capture virtual model illumination using collector “panels” within the virtual set, including a “floor plane”
- Step 3 – project luminance patterns onto real actors in front of screen

The Challenge: Automatic lighting of actor, derived from virtual scenography illumination and projected, within .1 -.2 seconds
Build a 3d virtual set and light it.
Creating a projected image from the Radiance model, adjusted for a diagonally oriented rear projection screen. (reduce foreshortening effect)
Projection screen image and actor viewed from “ideal audience seat”
Actor diffusely illuminated by screen luminance, disconnected from light sources in image.

Goal: To illuminate the actor with the global solution derived from the simulation model.
Track “panel” in simulation, at actor plane…
(clip obstructing scenery from view)
Generate a low resolution irradiance image...
Project irradiance image (captured light) onto real actor using data projector located at the panel rendering’s vantage point.
Irradiance images from 4 directions (rotate tracking panel)
As stage RP screen will block “back” lighting direction, replace with view aiming downwards, from above the screen’s center. Use floor plane irradiance image instead of a vertical plane image.
Irradiance images from 4 directions

Back (new)

Left

Front

Right
Project images onto actor standing in front of rear projection screen. Note effect of floor plane projection.
Data projectors
Other audience views are acceptable
real-time virtual TV sets

Promotional images by ORAD, RT-set and Brainstorm
Virtual Light Transporter

VLT

Virtual light on physical actors...

...Physical light on virtual sets

Concept Sketch

by Rob Shakespeare

TCVC

©RAS  Feb 1, 2000
Update March 15, 2000
Update May 2, 2004
TV Application

- Step1 – illuminate a 3d virtual model
- Step2 – capture virtual model illumination using collector “panels” within the virtual set
- Step3 – project luminance patterns onto real actors in chroma-key studio
- Step4 – sync virtual camera with studio camera

The Challenge: Automatic lighting of actor derived from virtual scenography illumination, and projected, within 2 frames (~0.07 seconds)
GOAL – seamless connection between virtual environment and actor
Light actor using 4 projectors…
Video camera image from ‘Key Light’ stage luminaire...
• Actor shadow using chroma-key mask (solution pending)
Combine actor, set and shadow
...Compare

Global solution        VLT solution
An actor walks across the stage during a night scene, carrying a lantern which lights his way... and which also lights the virtual scenic surround complete with his shadow.

-yet to be solved
Special Credits:
VLT and VLP viability experiment #1
Illumination capture and projection
May 2, 2000  Radio and Television Institute,  Blue Screen Studio
YLE (Finnish National Broadcasting Co)  Helsinki, Finland

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2005-2006
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Thank you!  

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