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

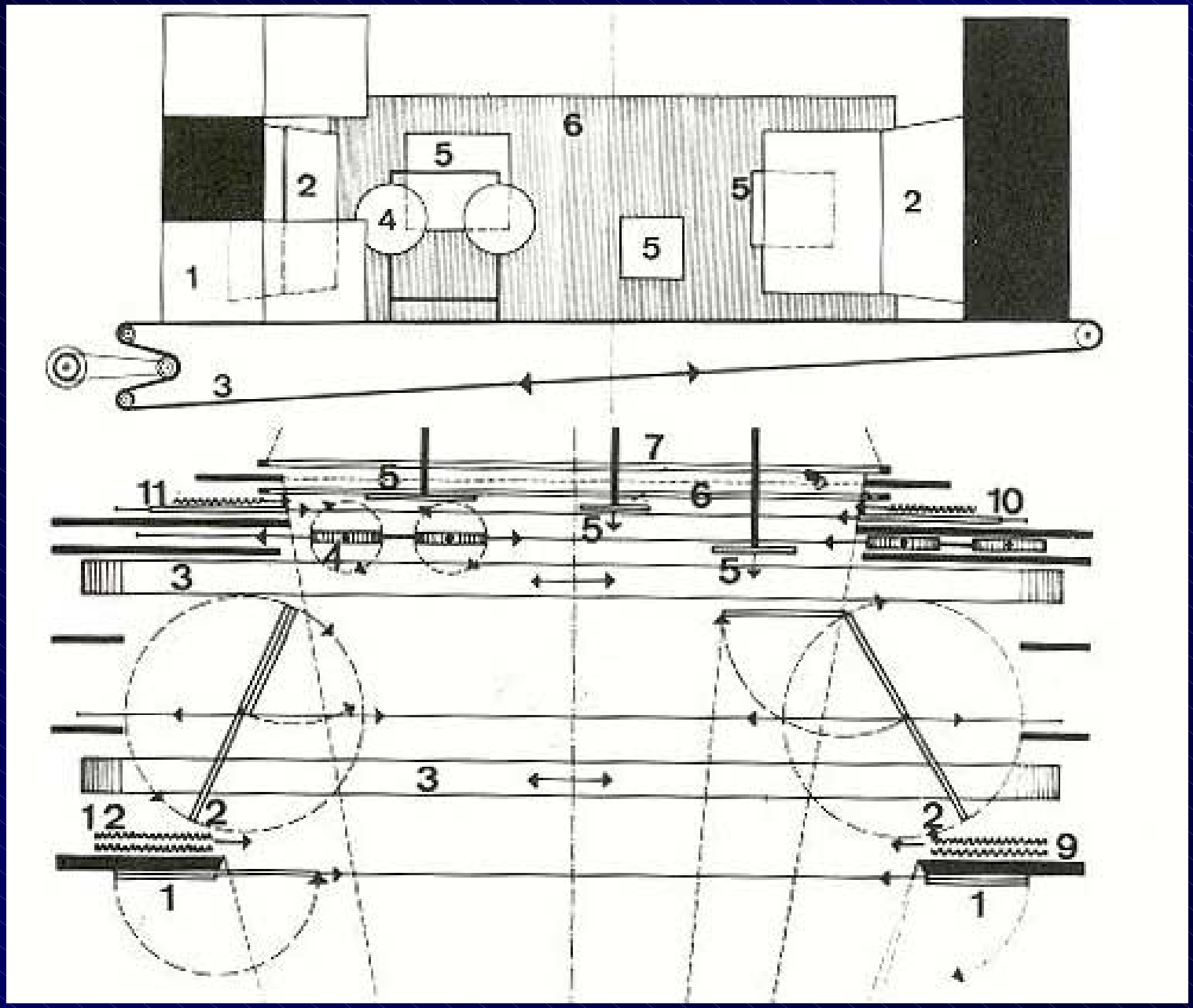
The aesthetic and technical challenges of presenting an actor in front of projected scenery were defined by the renown Czech Republic scenographer, Joseph Svoboda, during the 1950's.

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…



1958 set

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

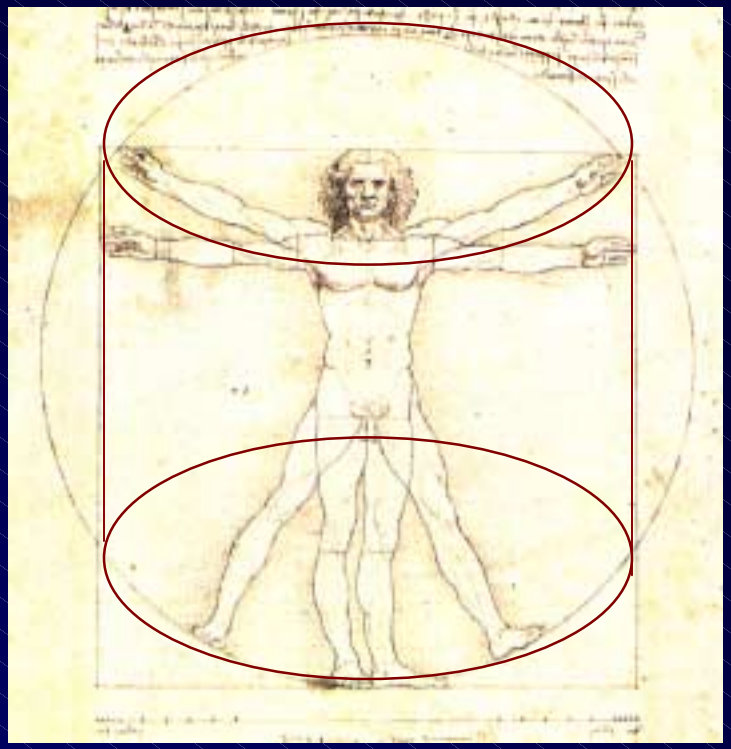
10-foot by 15-foot gray rear-project
screens that surrounded the stage
three sides. Polarized 3D glasses provi
the final stage for the audience's imm
sion into Treadwell's play.

Reaney is already working on
scenery for a "new media" version o
Midsummer's Night Dream, to be

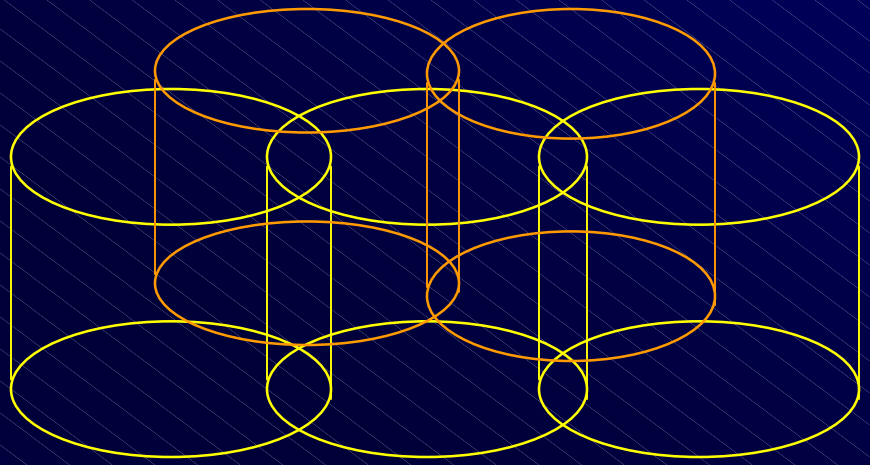
At the University of Kansas, a surrealistic courtroom scene is modeled in 3D Studio Max above, then, using Sense8's WorldUp software, presented in real time as the background in a scene from the play

Background

…the resolution of stage lighting



2 – 3 meters



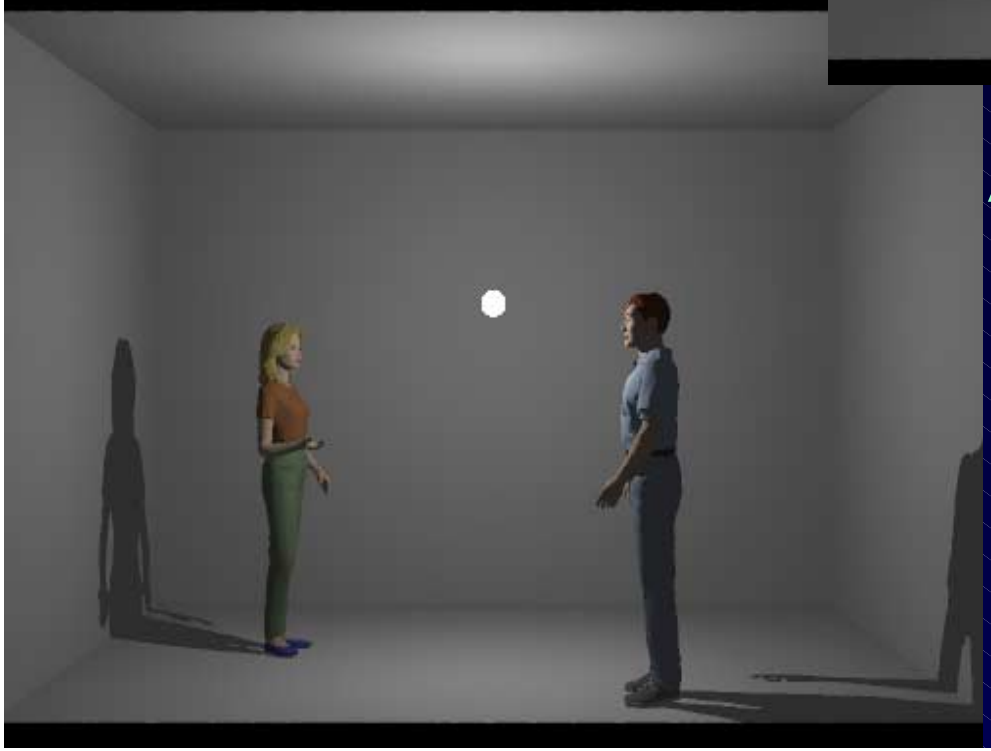
Overlapping Acting Areas or zones are individually lighted

Background

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

(Shakespeare, 2001)

Background



At a glance, can you accept both of these images?

Is either correct?

(Shakespeare, 2001)

A AB B

Stereo Frontlight

Stereo light sources

Actual Frontlight

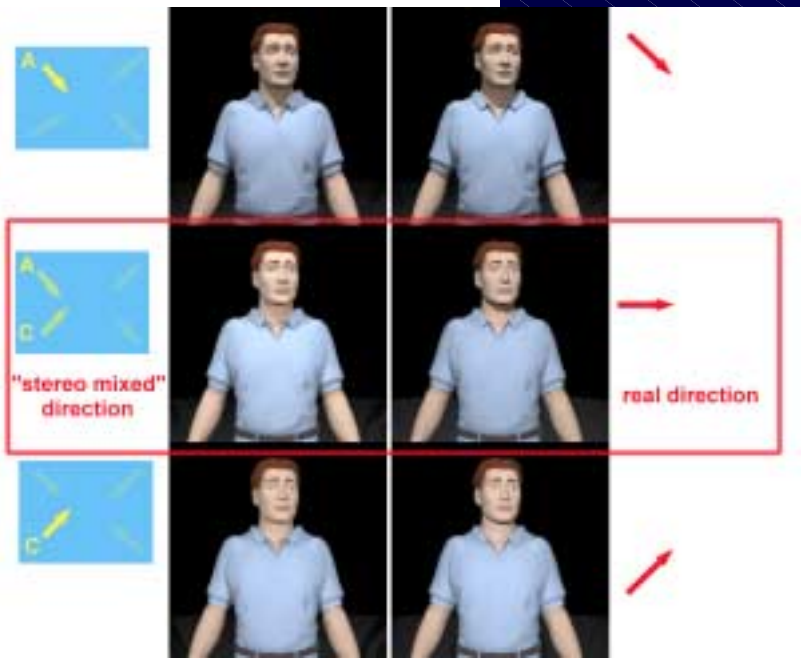
Mixing combinations of source A and B produces the effect of a lightsource moving from left to right.

Mixing video projections of light patterns should create the effect of light from a continuous panaroma

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

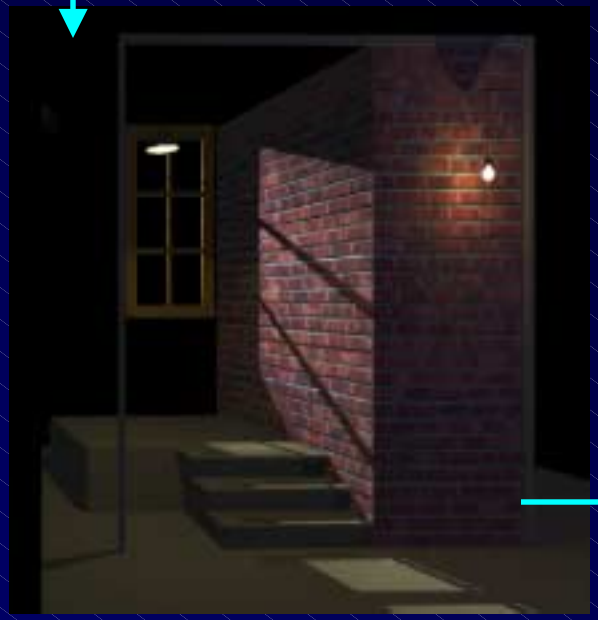
Theatre Application example

- Step1– illuminate a 3d virtual model, locate projection screen and adjust projected image for ideal vantage point
- Step2– capture virtual model illumination using collector “panels” within the virtual set, including a “floor plane”
- Step3 – 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

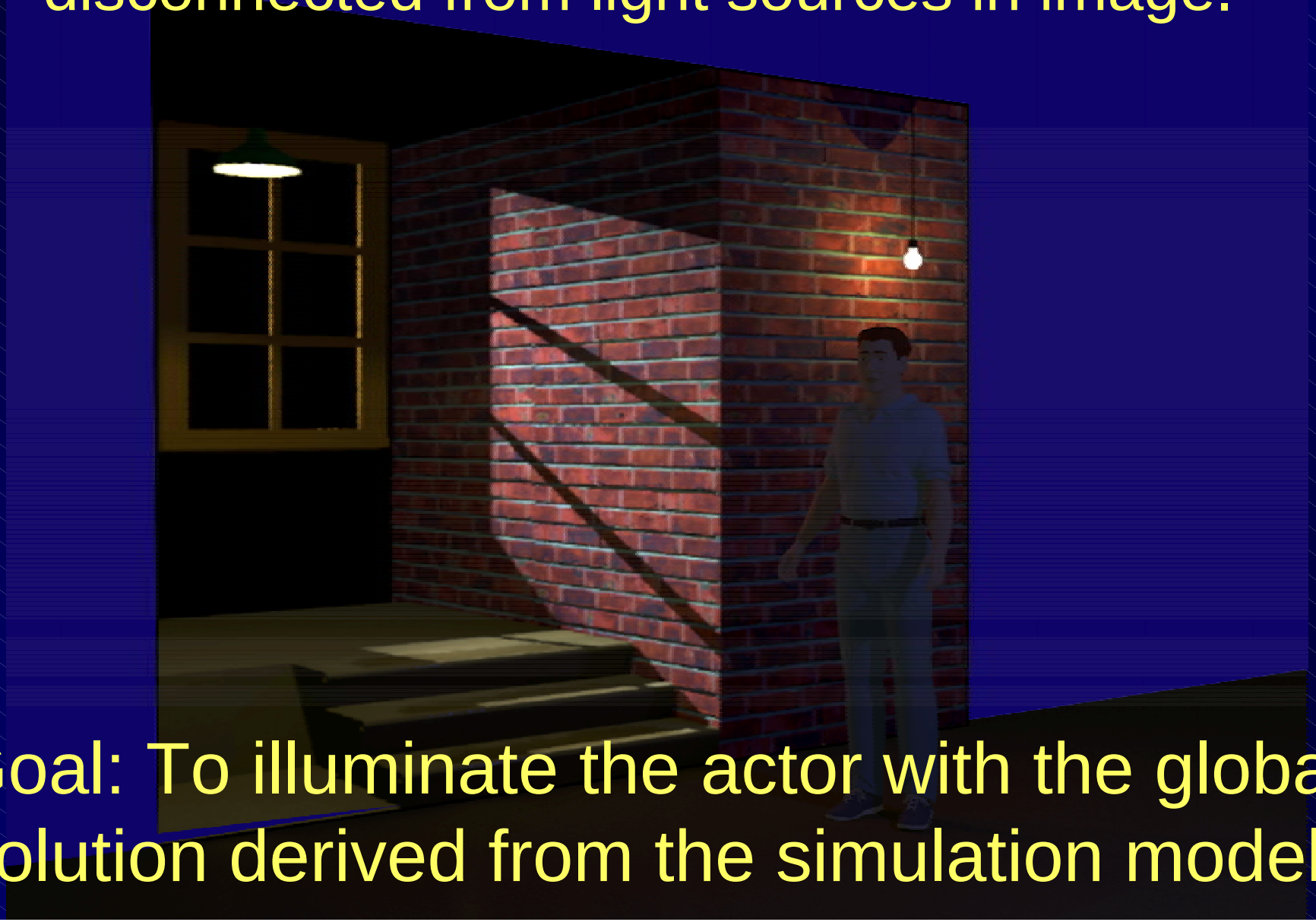
Build a 3d virtual set and light it.

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.

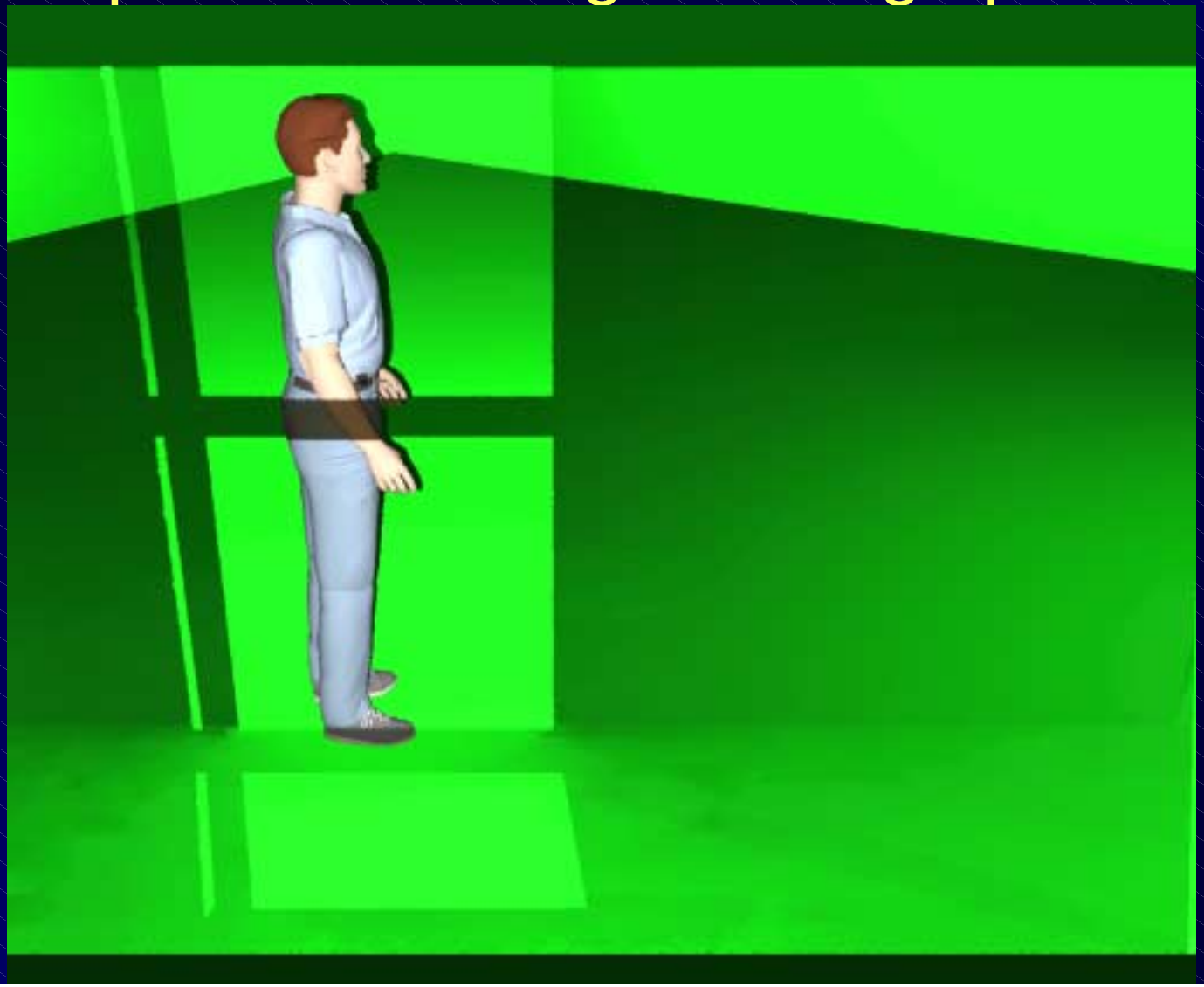


Goal: To illuminate the actor with the global solution derived from the simulation model.

Track “panel” in simulation, at actor plane… (clip obstructing scenery from view)

Generate a low resolution irradiance image…

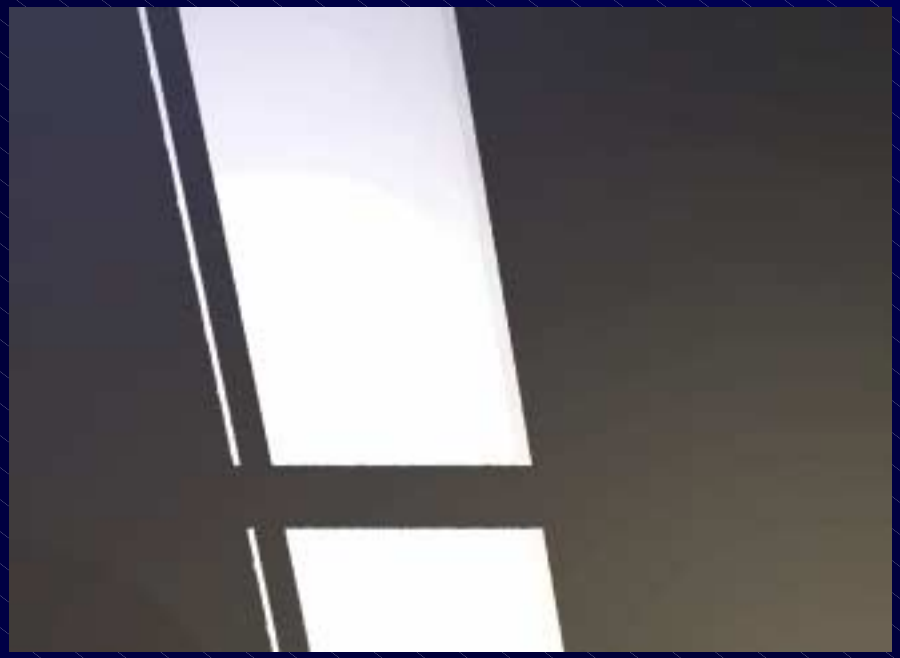
Project irradiance image (captured light) onto real actor using data projector located at the panel rendering's vantage point.



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.

Old back vertical plane image image

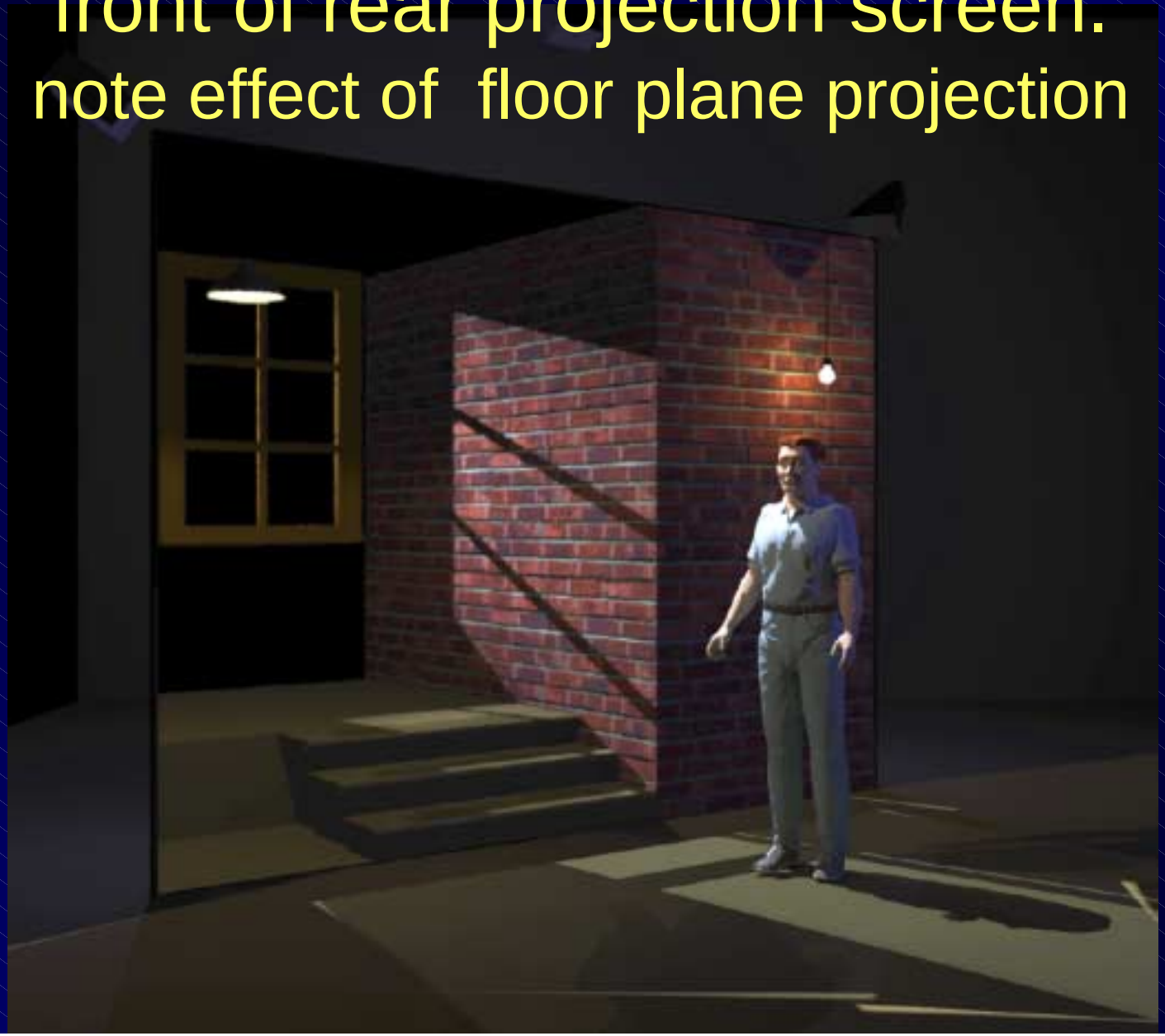


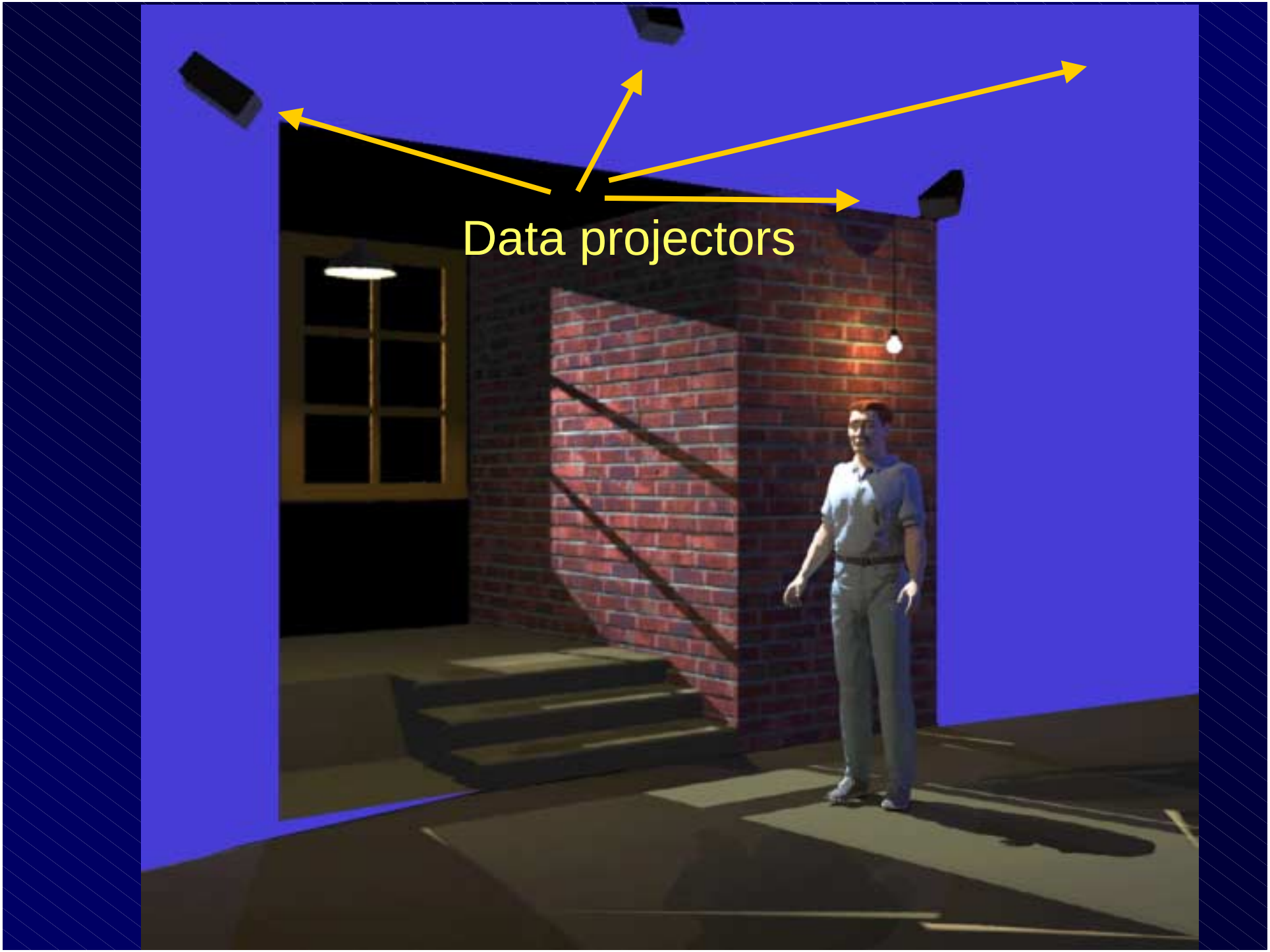
New floor plane

Irradiance images from 4 directions

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

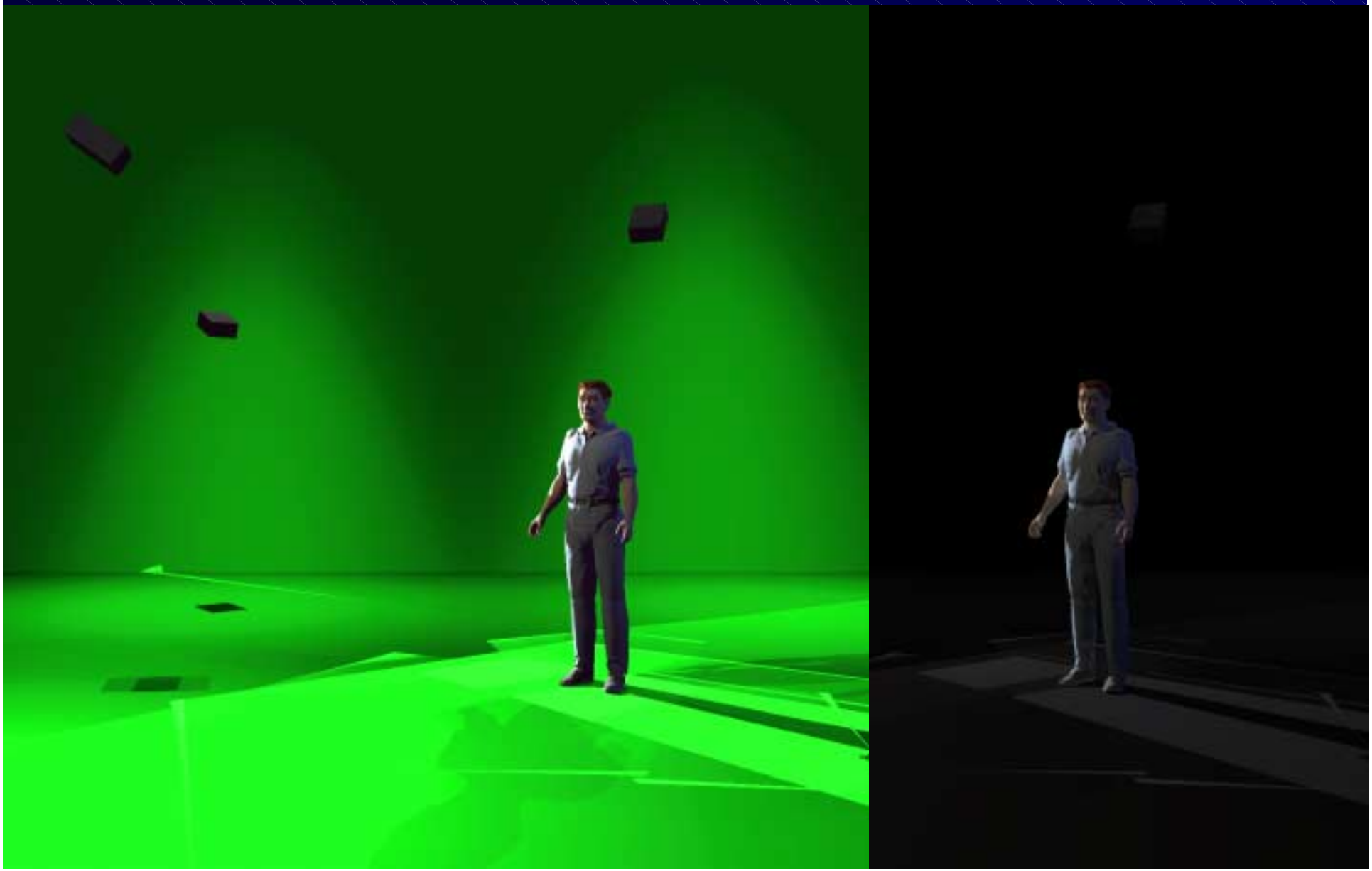
TV Application

- 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)

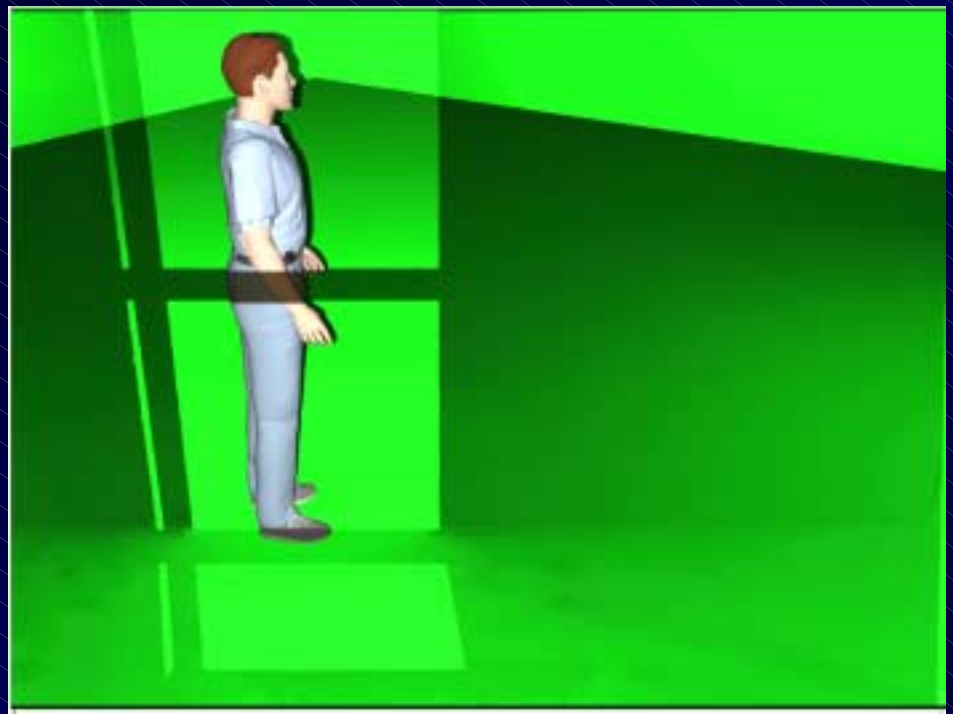
GOAL – seamless connection between virtual environment and actor

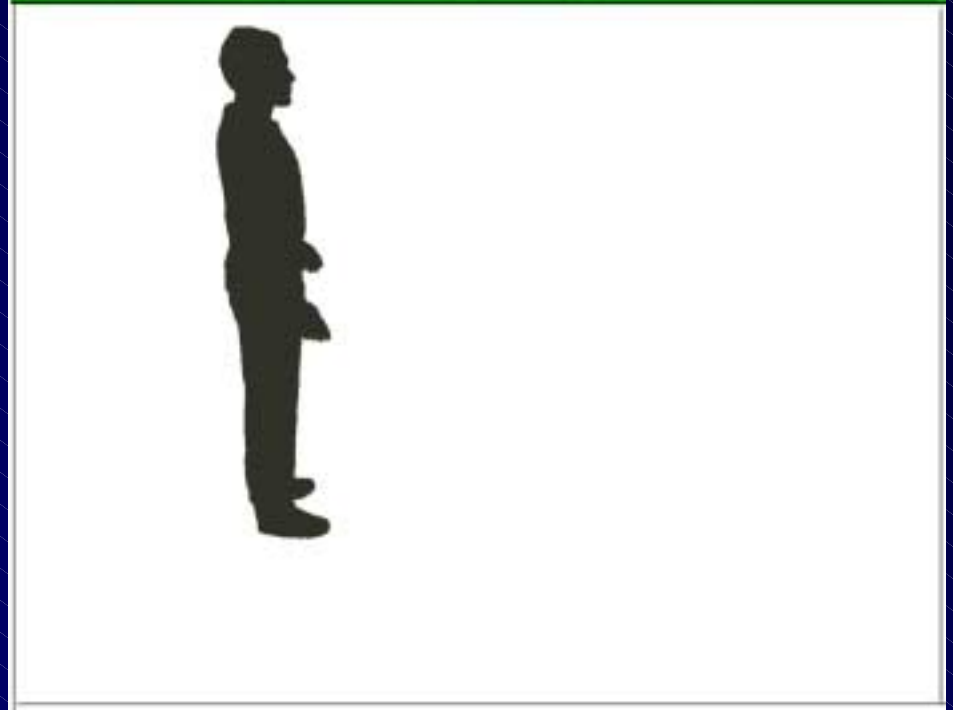
Light actor using 4 projectors…



Video camera image from ‘Key Light’ stage luminaire…

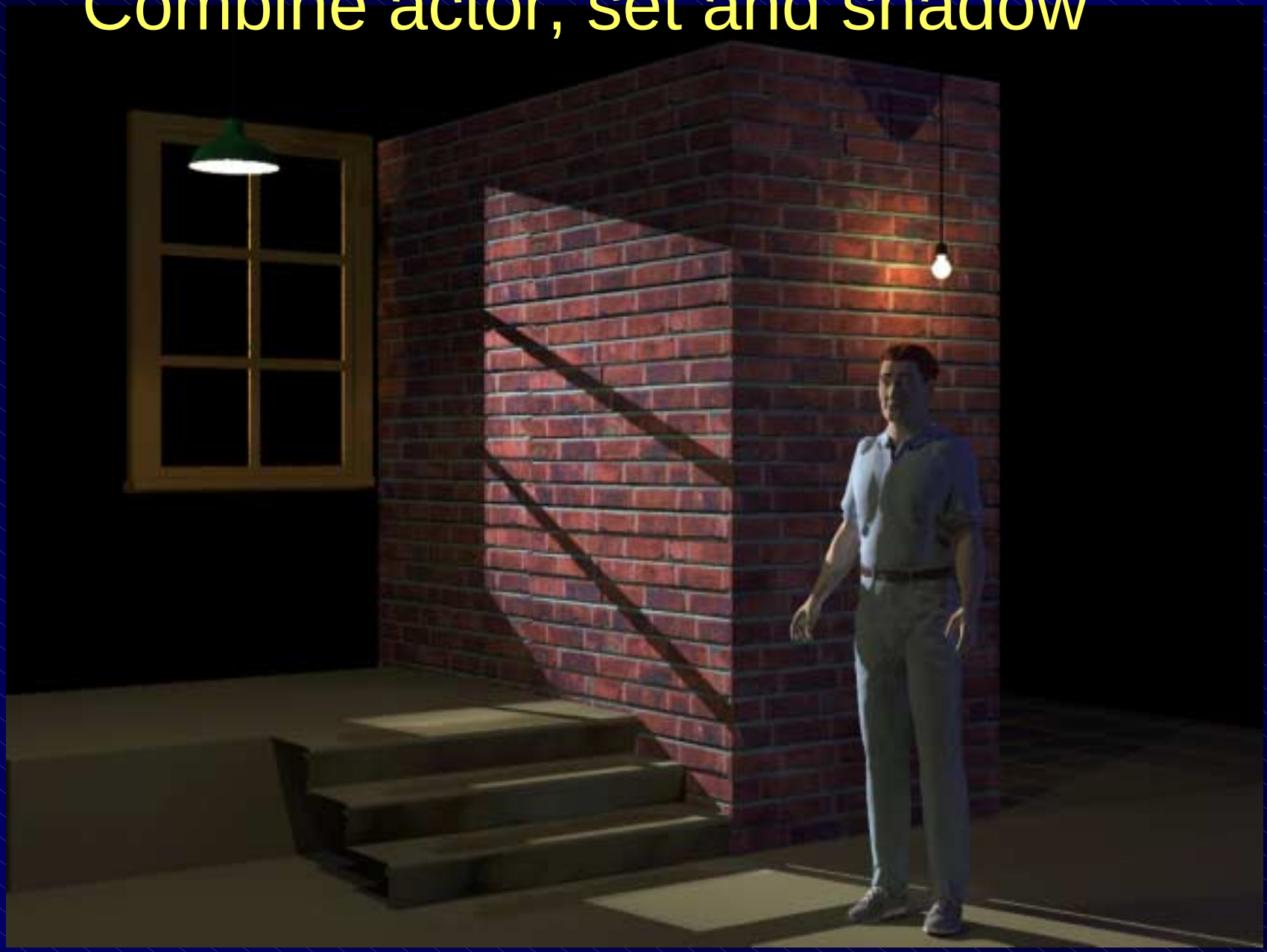
VLP shadow mask

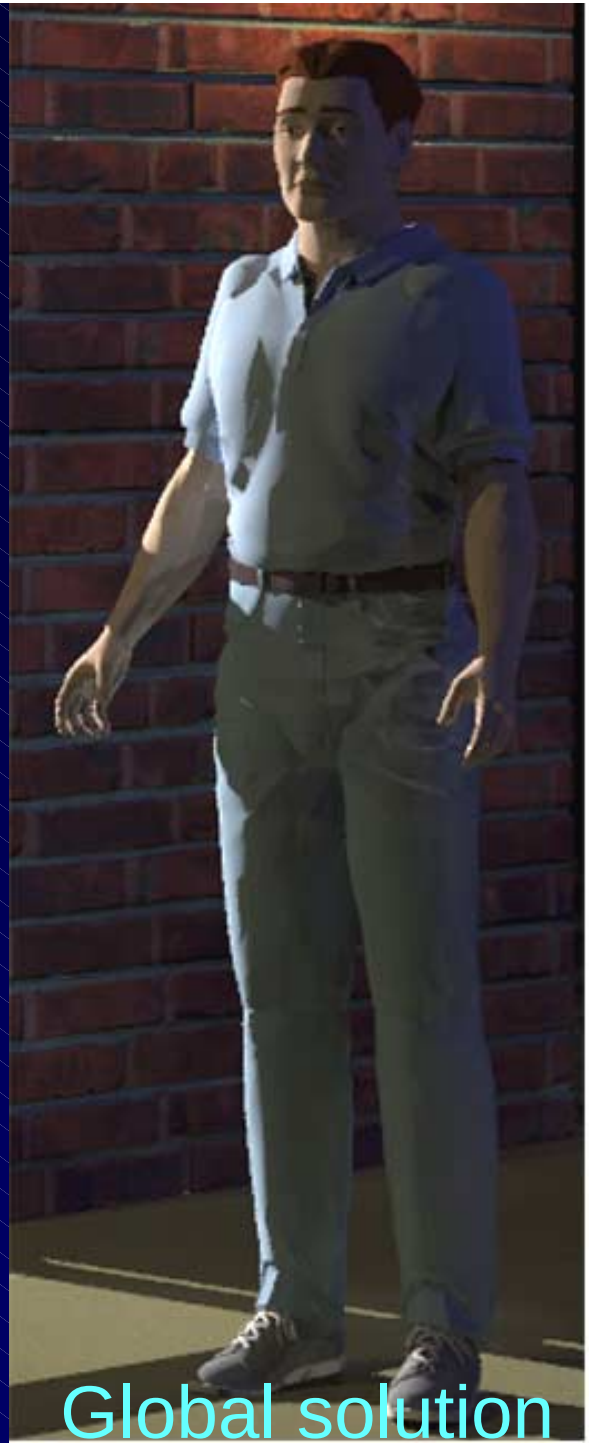




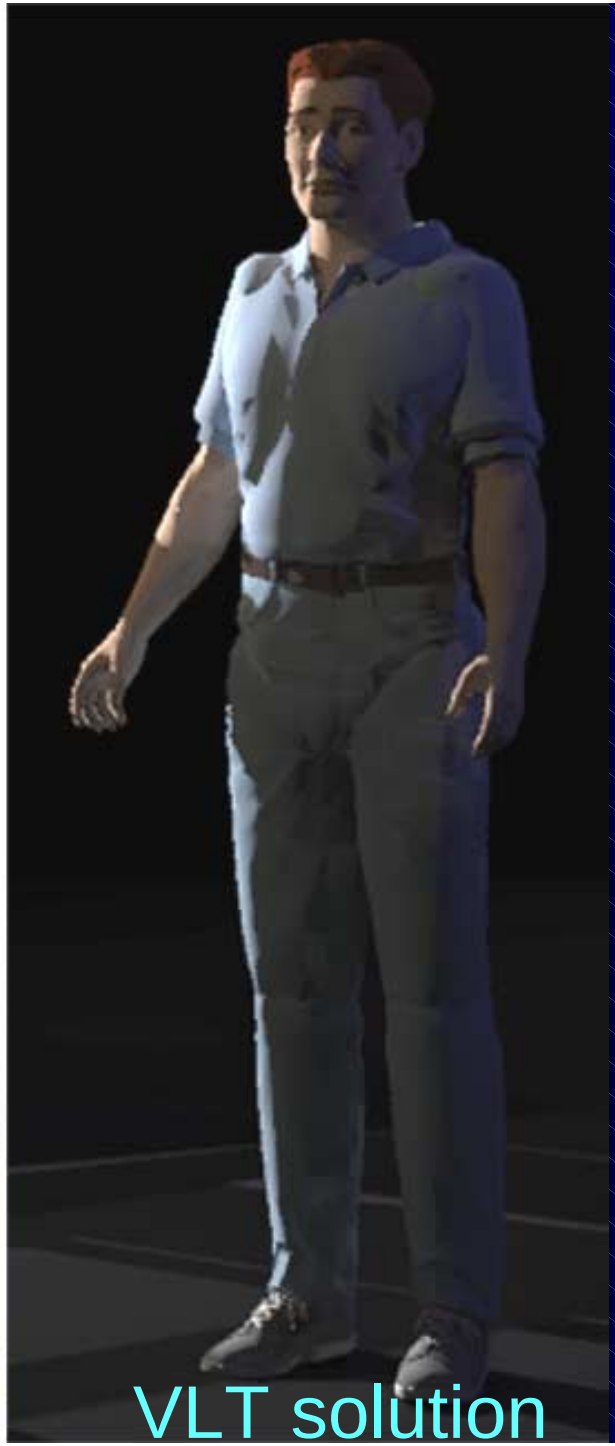
- Actor shadow using chroma-key mask (solution pending)

Combine actor, set and shadow





Global solution



VLT solution

...Compare

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 experiement #1

Illumination capture and projection

May 2, 2000 Radio and Television Institute, Blue Screen Studio

YLE (Finnish National Broadcasting Co) Helsinki, Finland

Principle participants: Rob Shakespeare, TCVC, Indiana University (Fulbright Senior Scholar Awardee 1999-2000)

Anu Maja, Head of Design, YLE

Timo Anttila, Director of Photography, YLE

Arto Kaivanto, Director of Photography, YLE

Riika Kytonen, 3d Graphic Artist, YLE

New Frontiers Grants, Lilly Foundation
2005-2006

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and
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Thank you!

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