

# Lightweight Realistic Rendering system (LR<sup>2</sup>)

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## Introduction

Shadows are a central element of the spatial perception of humans to determine the spatial relationship of objects to each other. Additionally, soft-shadows are supporting the perception of the form of an object.

## Approach

To exploit this effect, the visualization system uses self-shadowing of the geometry to create a natural shadowing of the scene. In our environment the scene is lit by an area light source, which is implemented by using a high dynamic range (HDR) environment map. This approach is adaptable and efficient enough to model the dynamic of real lighting situations.

Besides the realistic reproduction of reflectional characteristics of certain garments, another goal is the flexible definition of additional surface descriptions (Shader).

## Results

The development of the rendering system aims at lowering the workload of the CPU. For this end, the

shadow calculation methods inside the LR<sup>2</sup> system allow a processing of the surface appearance and lighting completely inside actual GPUs. This lowers the CPU workload in an effective way so that it can be used for other tasks (garment simulation, for example).

The system recalculates the shadows per frame. This offers the advantage of being independent of pre-calculations or special data structures, allowing to process generic polygon soups and deformable objects. As a result LR<sup>2</sup> is able to perform self-shadowing and soft-shadows on commonly used PC hardware with interactive real-time frame rates. Together with our real-time garment simulation, a system was created that allows an interactive working and the manipulation of garments, at the same time providing the user with a naturally looking visual feedback.

## Point of Contact

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## German Abstract

Schattenwürfe sind ein zentrales Element der räumlichen Wahrnehmung des Menschen und erlauben eine genauere räumliche Zuordnung von Objekten zueinander. Weiche Schattenwürfe unterstützen zusätzlich die Wahrnehmung der Form eines Objektes. Um diesen Effekt auszunutzen wurde von uns ein Visualisierungssystem entwickelt, welches Selbstschattierung der Geometrie zur naturgetreuen Echtzeitdarstellung der Szene verwendet. Als Beleuchtungsinformation werden hierbei Umgebungsaufnahmen verwendet. Dies vereinfacht die Erstellung von Beleuchtungsszenarien.



Figure 1: Garment simulation with self-shadowing using HDR environment maps