DEPTH OF FIELD RENDERING WITH SURFACE SPLATTING

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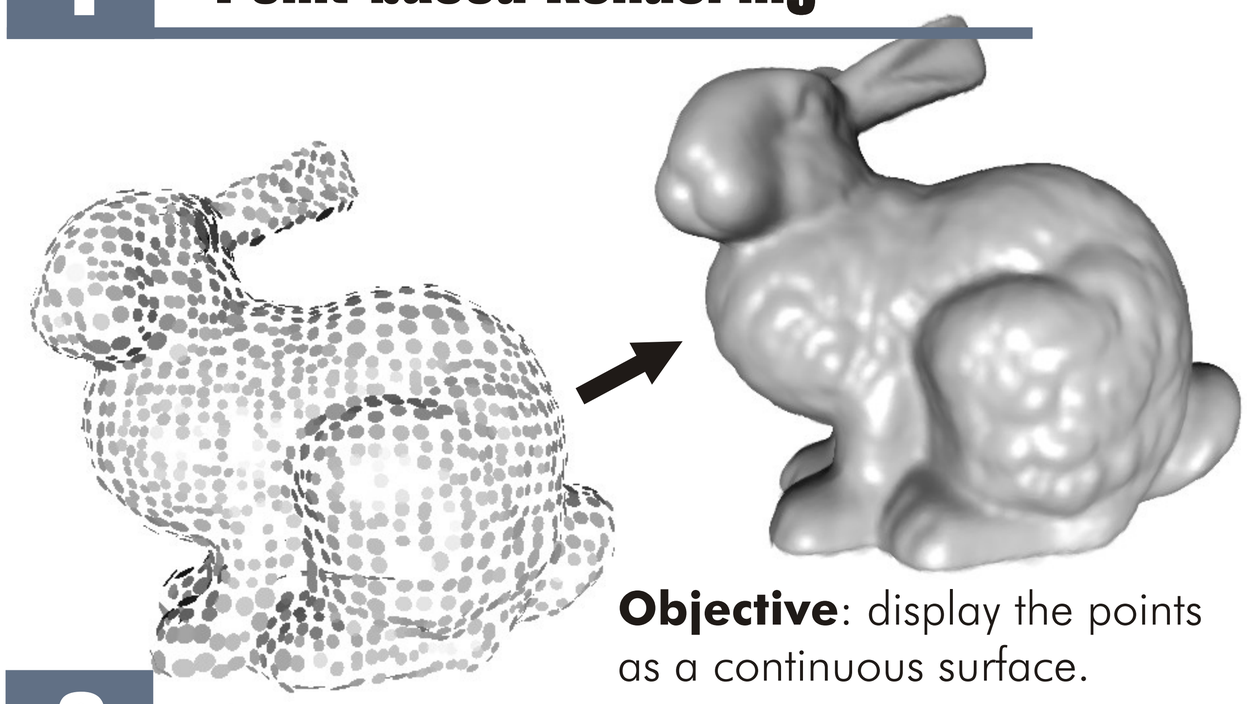
ABSTRACT

We present a new, fast algorithm for rendering the depth-of-field effect for point-based surfaces. It handles partial occlusion correctly, it does not suffer from intensity leakage and it renders depth-of-field in presence of transparent surfaces. The algorithm is new in that it exploits the level-of-detail paradigm to select the surface detail according to the amount of depth-blur applied. This makes the speed of the algorithm practically independent of the amount of depth-blur. The algorithm is an extension of the Elliptical Weighted Average (EWA) surface splatting.

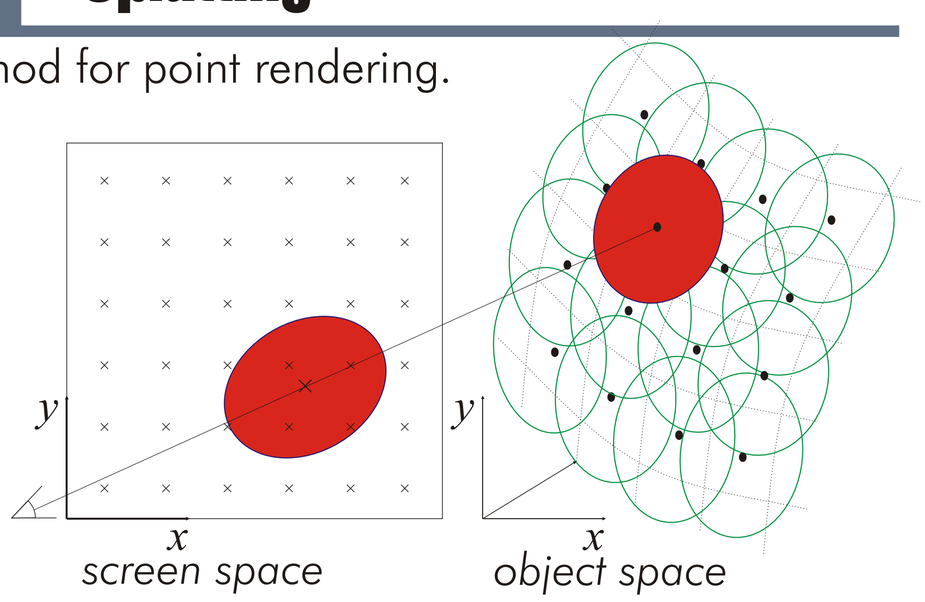
1 Point-based Rendering



Objective: display the points as a continuous surface.

2 Splatting

A method for point rendering.



B Discs are projected to screen space as ellipses.

A Objects are represented as overlapping discs around each surface sample (point).

Depth-of-Field 3

Depth blurring

- Caused by finite aperture lens.
- Out-of-focus point make a circle of confusion (CoC) in the image.
- Light intensity within the CoC described by Lommel function [1], we simplify the distribution to a Gaussian.

Depth blurring = filtering with a spatially-variant filter:

$$c^{dof}(x) \qquad {}_{R^2} c(x)\ I(x \quad ,coc(\ ))\ d$$

intensity distribution in CoC

sharp (unblurred) image

blurred image

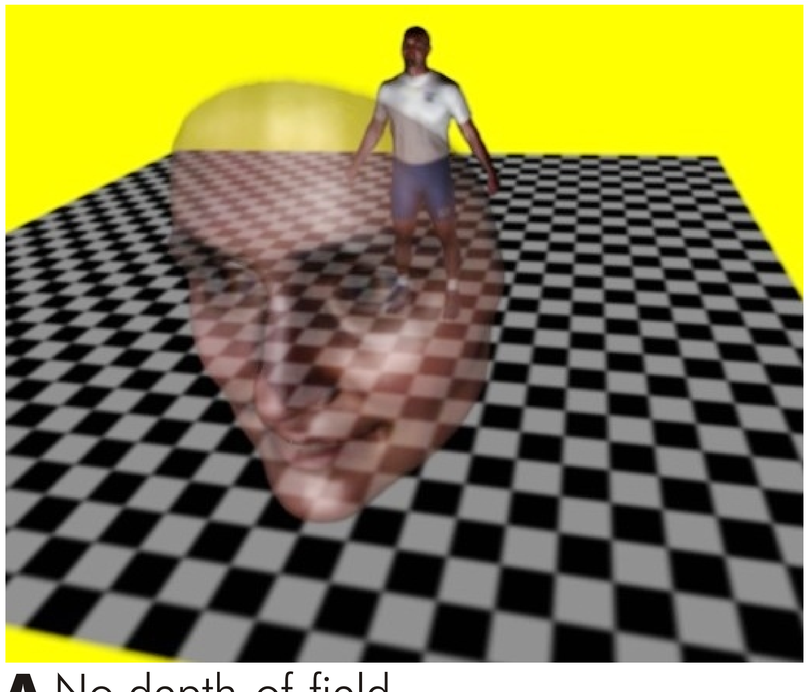
Point rendering

- apply the filter to every point *separately* and
- simplify the filtering to convolution.

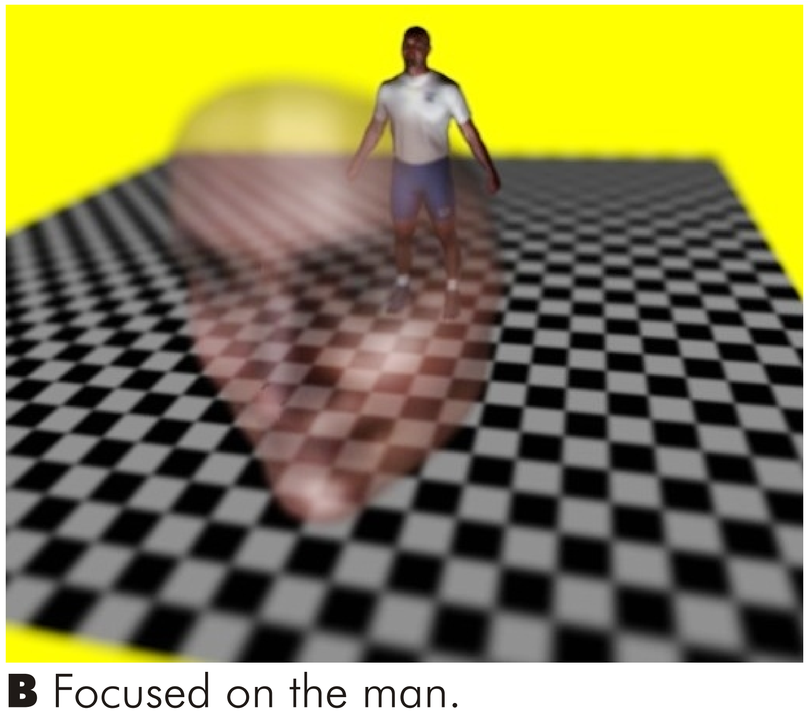
Depth-of-Field with Level of Detail 4

- Choose coarser LOD for more blurred object.
- Apply additional convolution to get the desired blur.

Results 5



A No depth-of-field.



B Focused on the man.

C Focused on the transparent mask.