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.

Objective: display the points as a continuous surface.

A method for point rendering.

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Depth-of-Field

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:

\[
c_{dof}(x) = \int_{R^2} c(x) \cdot I(x - \zeta, coc(\zeta)) \cdot d\zeta
\]

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

Depth-of-Field with Level of Detail
- Choose coarser LOD for more blurred object.
- Apply additional convolution to get the desired blur.

Results

A No depth-of-field.
B Focused on the man.
C Focused on the transparent mask.