

Simulando Profundidade de Campo em OpenGL

Cristiano Medeiros Dalbem
cmdalbem@inf.ufrgs.br

www.inf.ufrgs.br/~cmdalbem

Motivação



<http://www.flickr.com/photos/paseodelsur/51805888/>



Star Ocean 4 (Square Enix, 2009)



Relembrando:

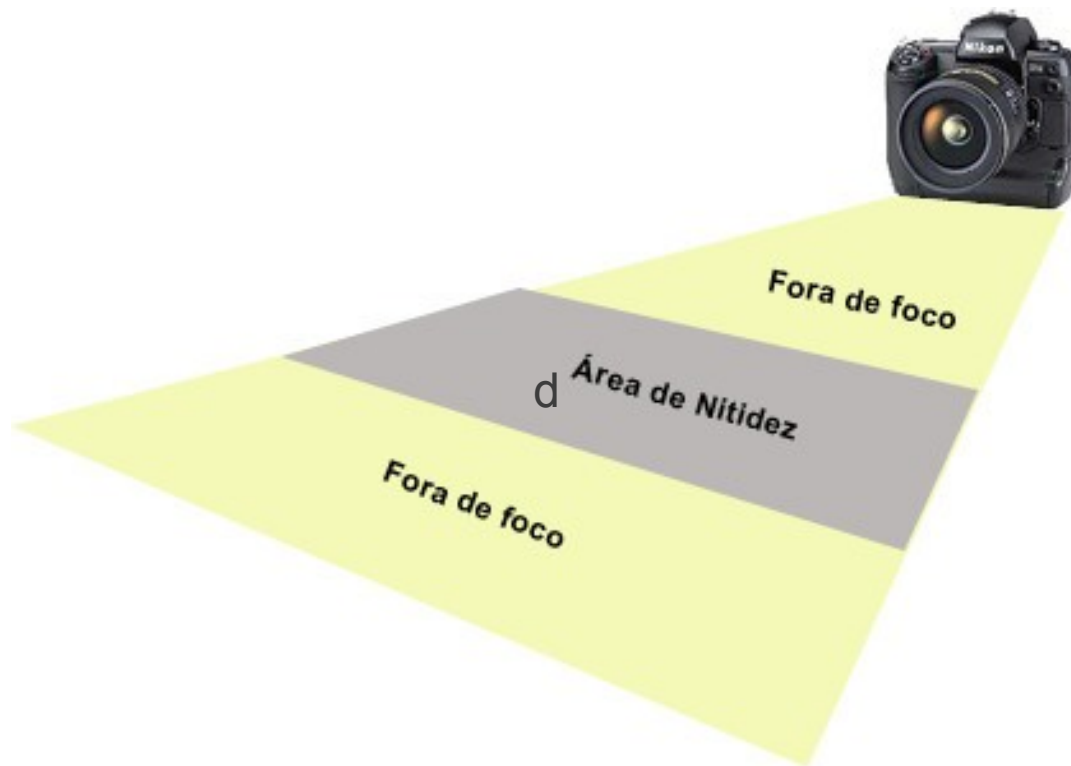
Profundidade de Campo

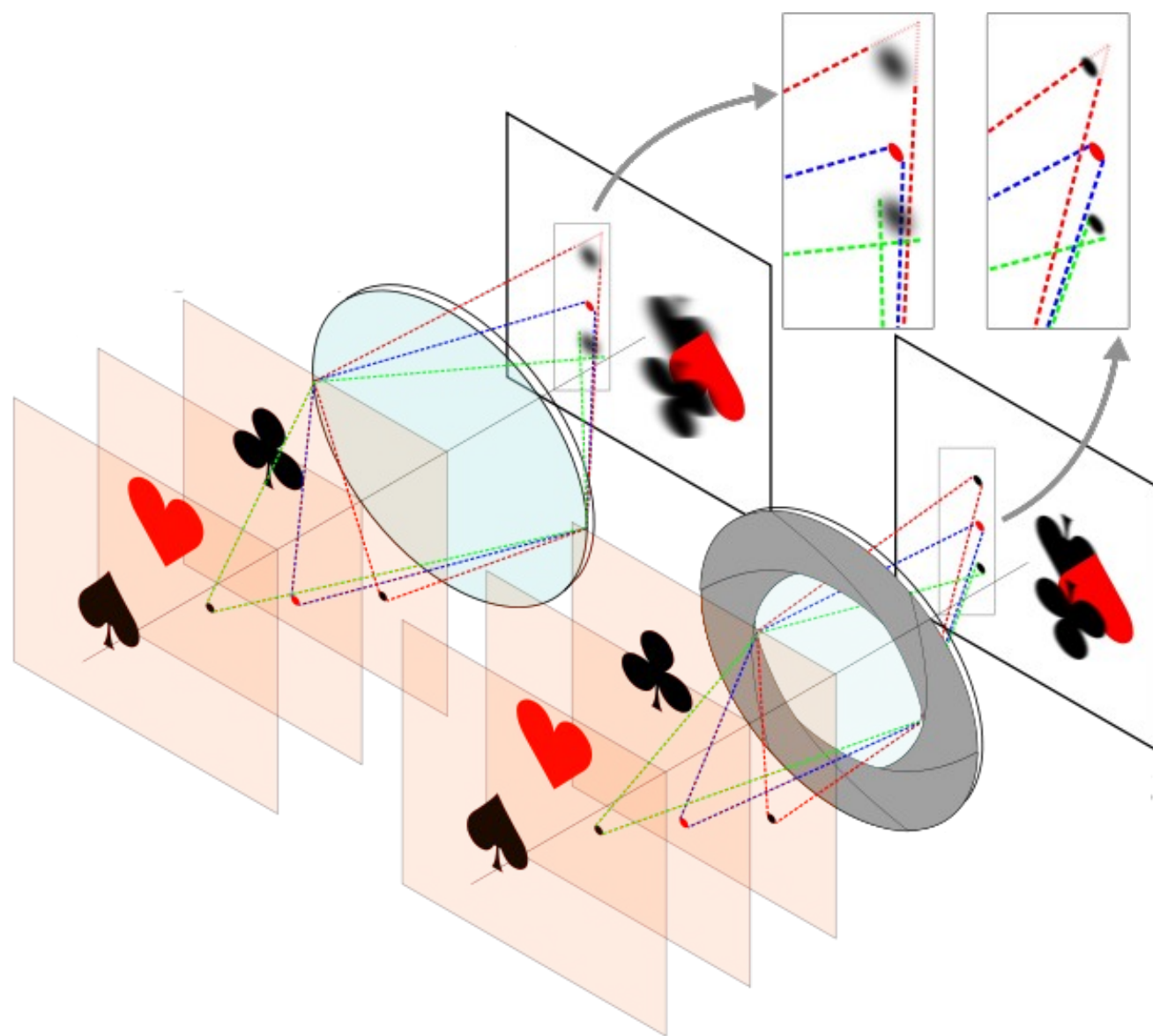


DoF grande



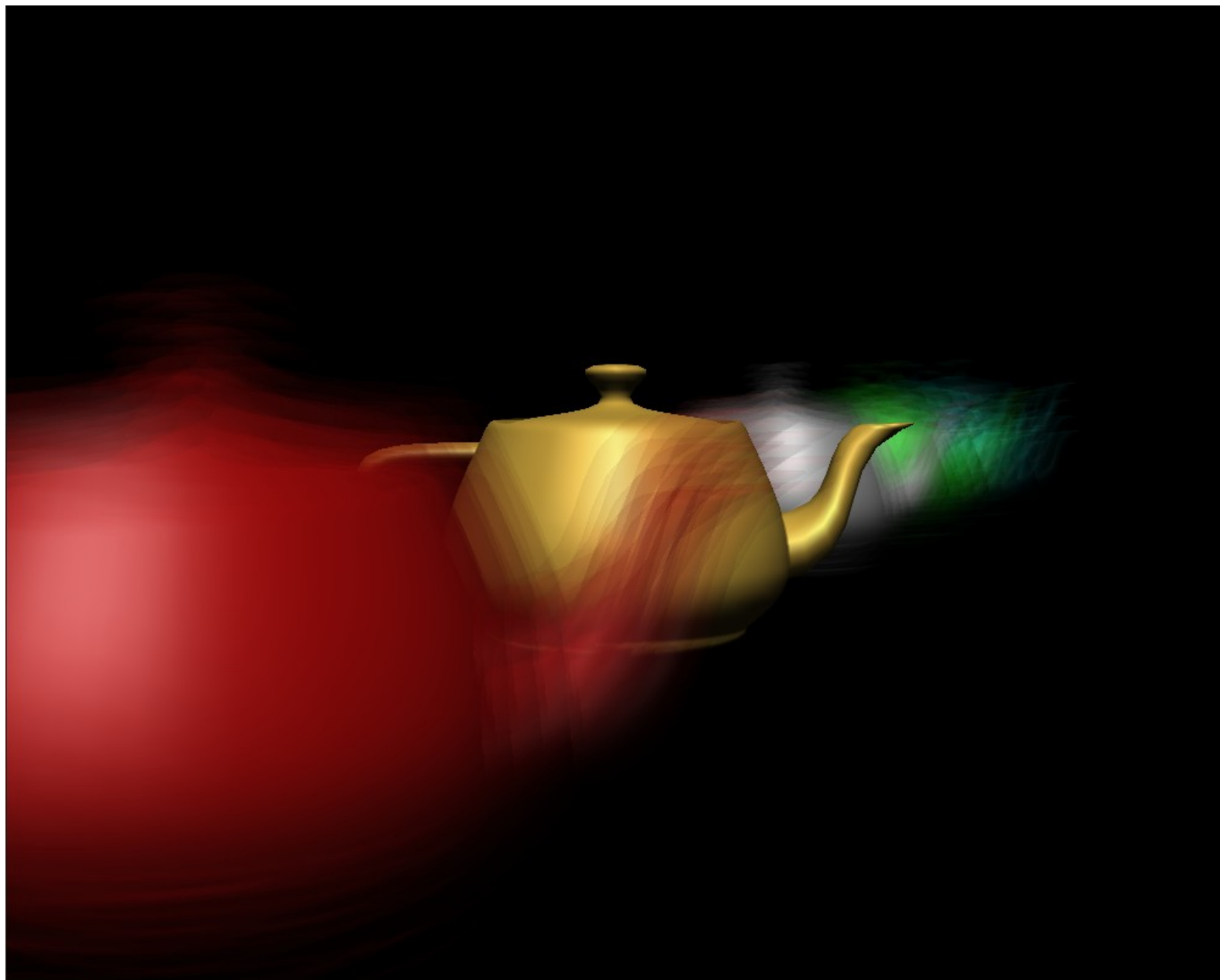
DoF pequeno



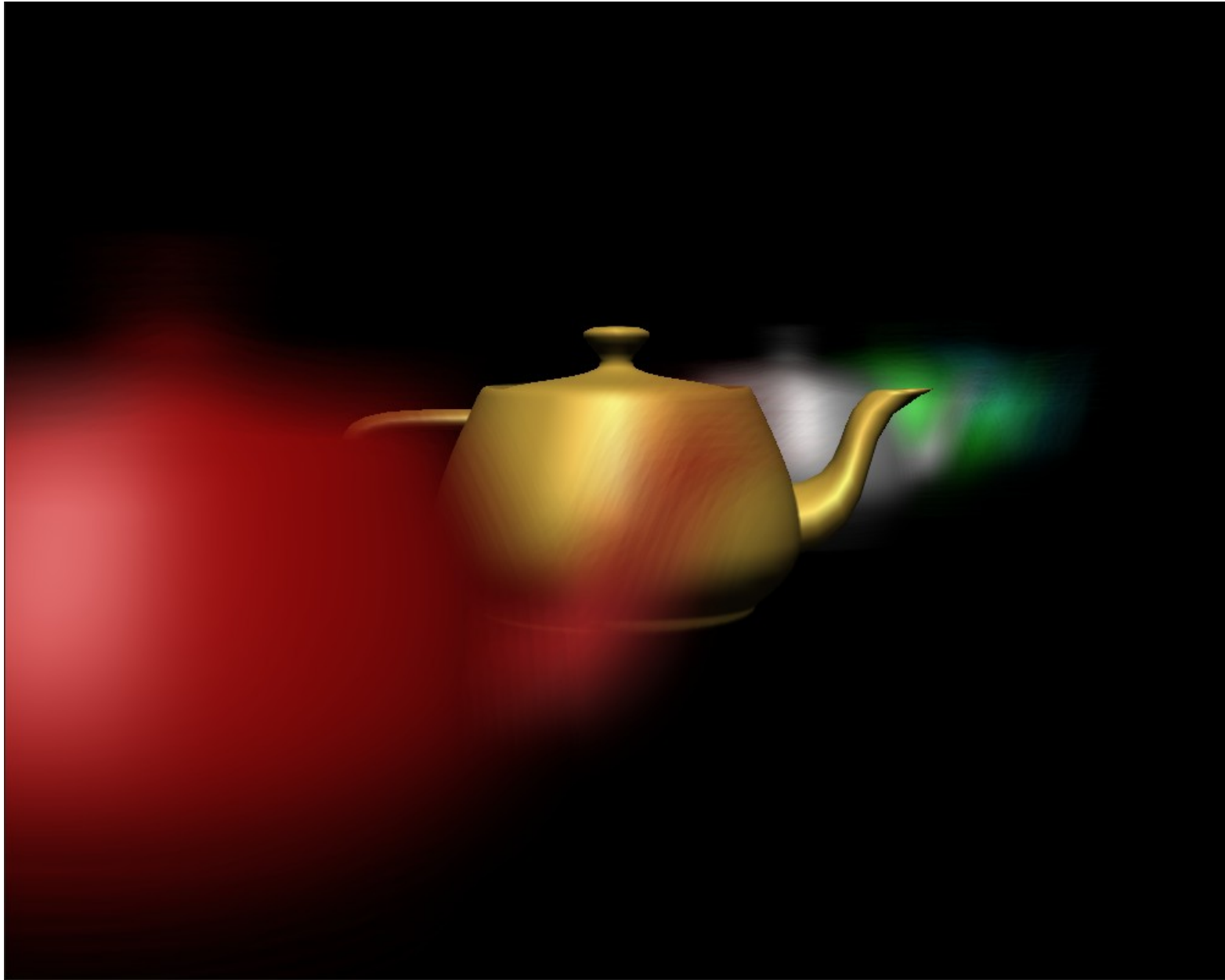


Simulação

#1: Jittered Frustum

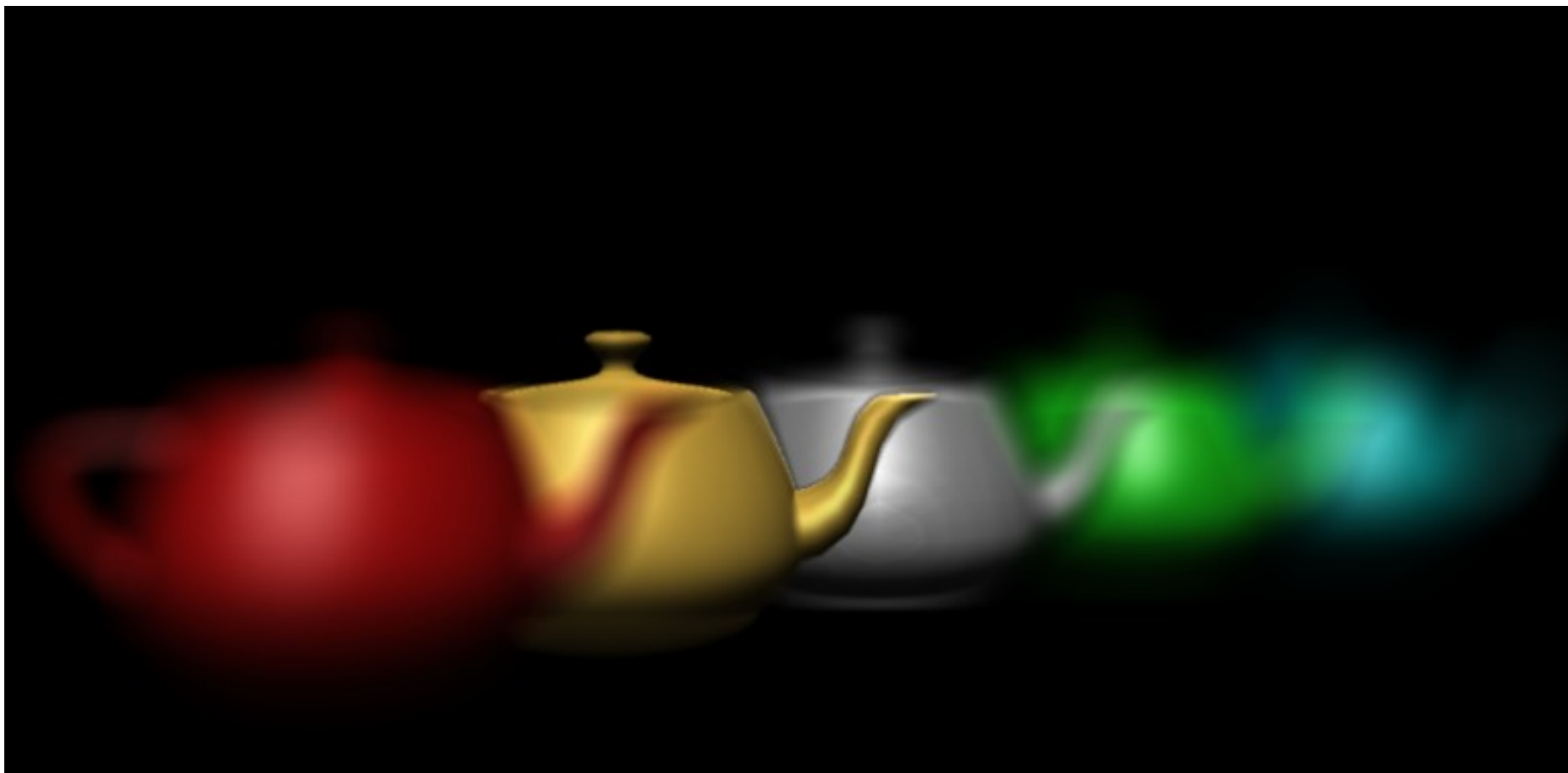


15 iterações



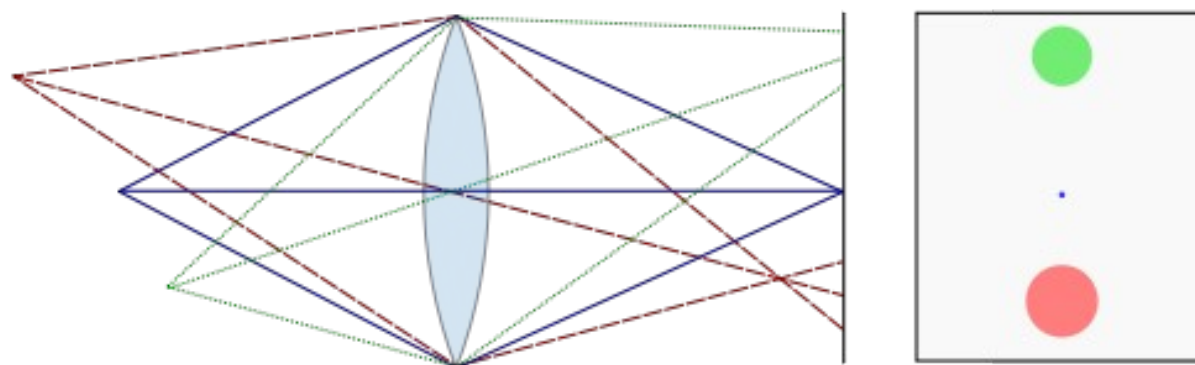
66 iterações

#2: Convolução



1 iteração

Teoria

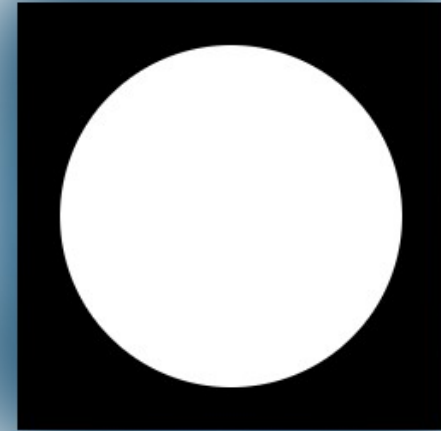
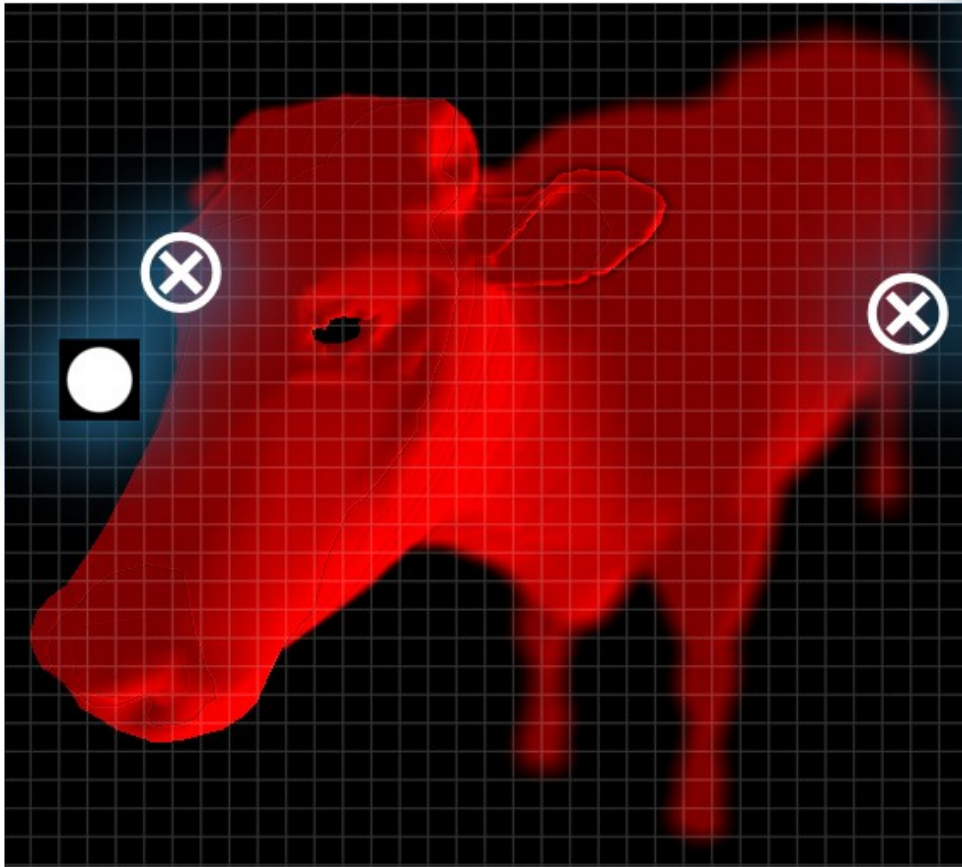


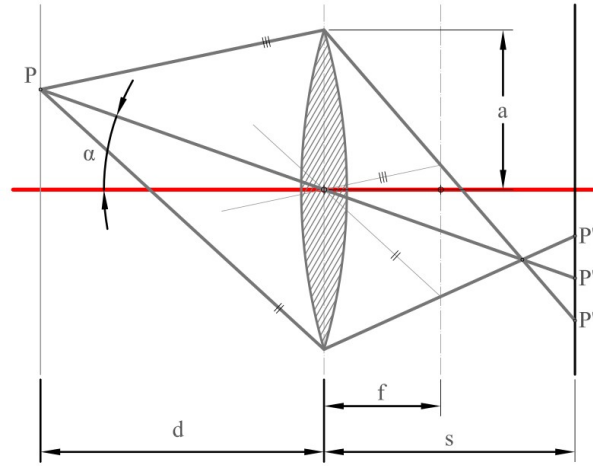
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\otimes



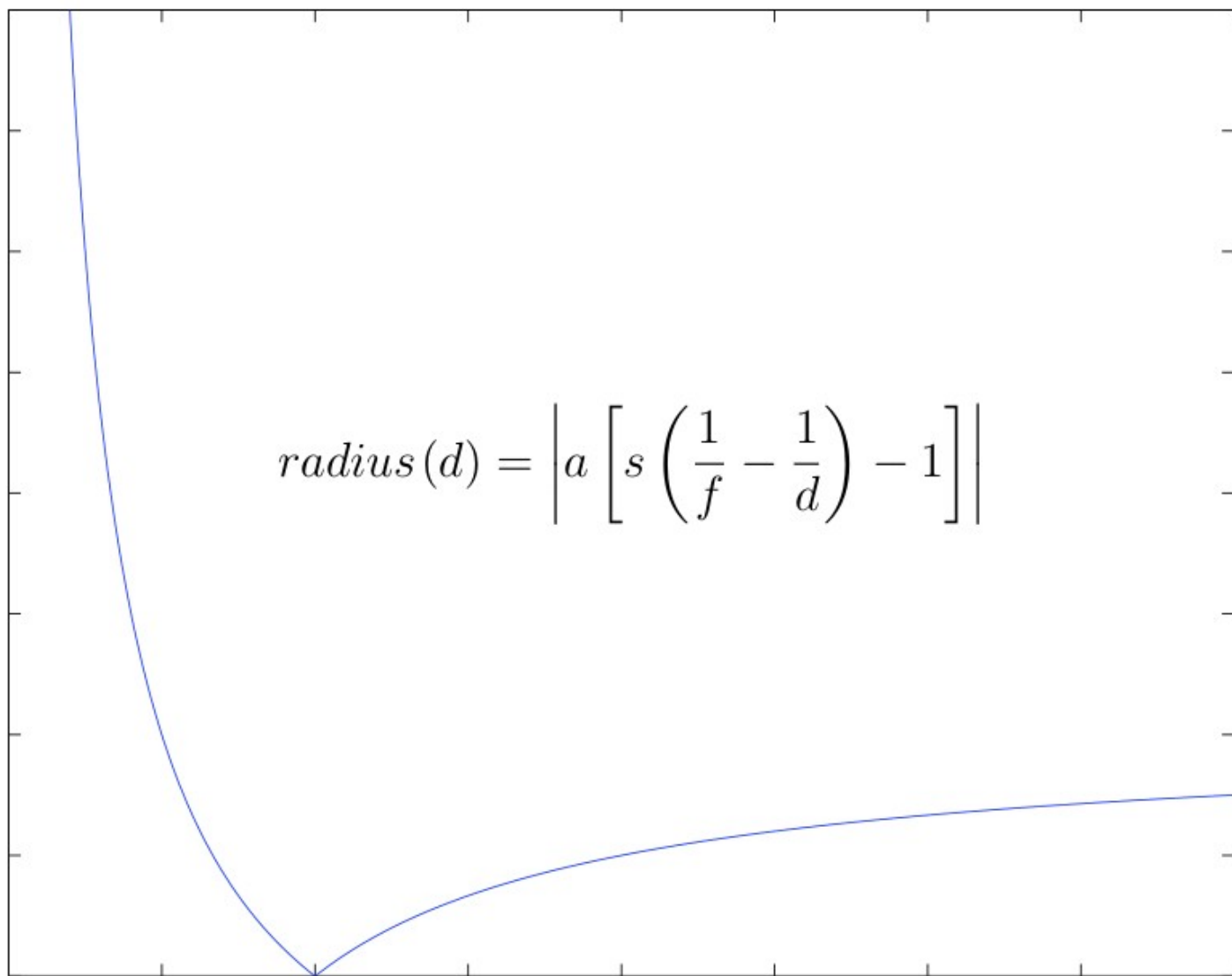




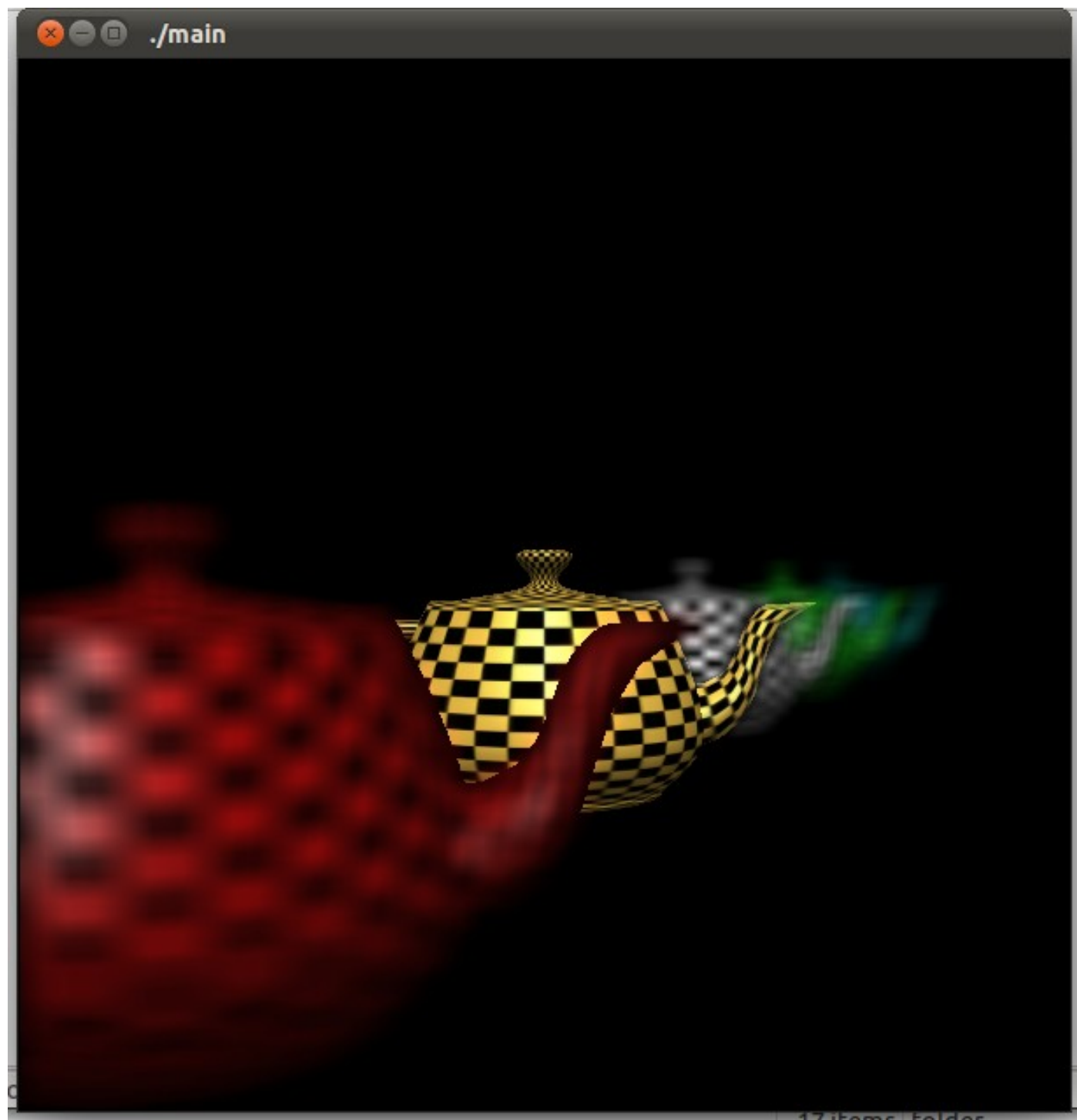
$$y_{P''} = \frac{\frac{a-d \cdot \tan(\alpha)}{d} \cdot f - a}{f} \cdot s + a$$

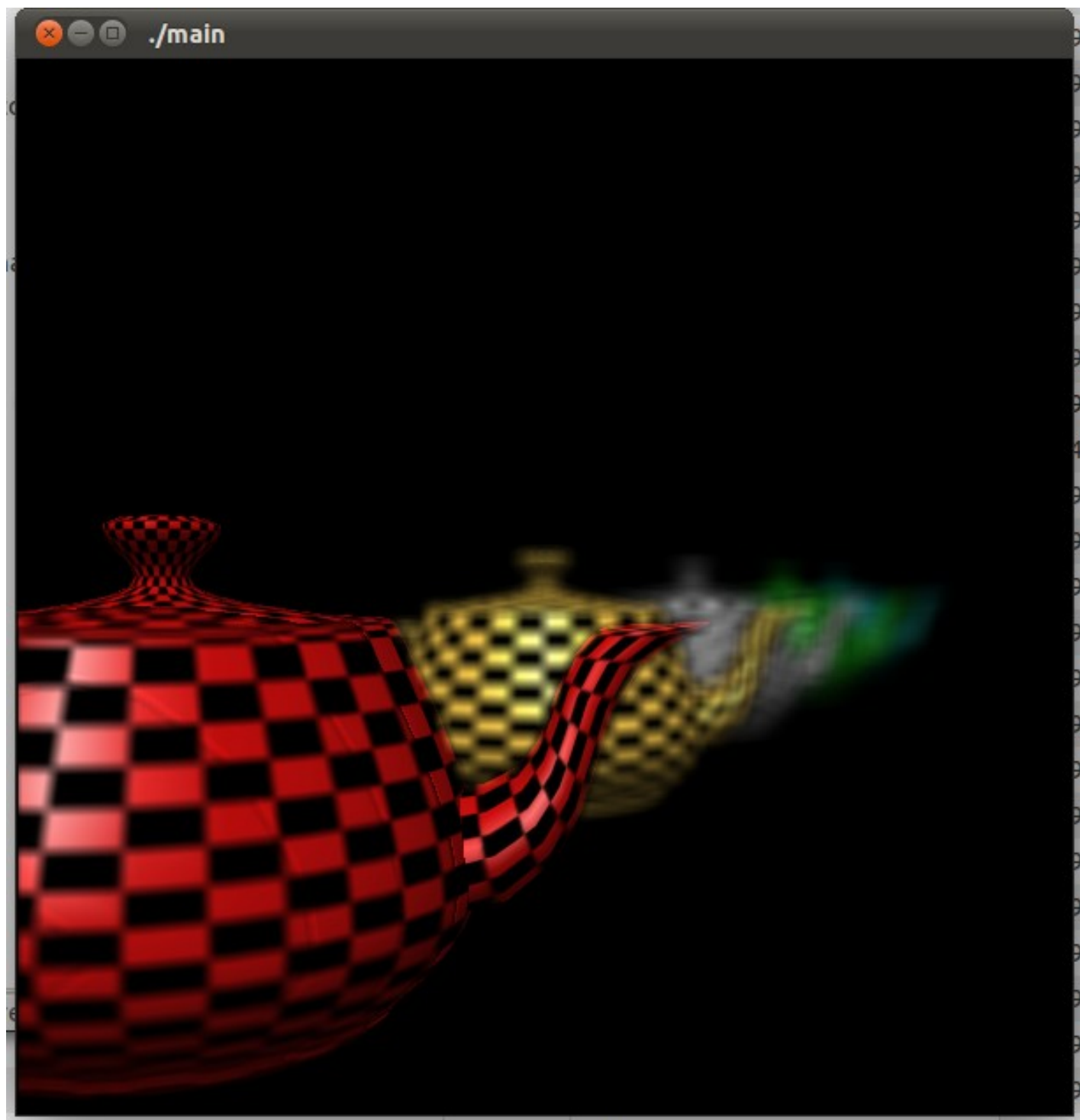
$$y_{P'''} = \frac{-\frac{a-d \cdot \tan(\alpha)}{d} \cdot f + a}{f} \cdot s - a$$

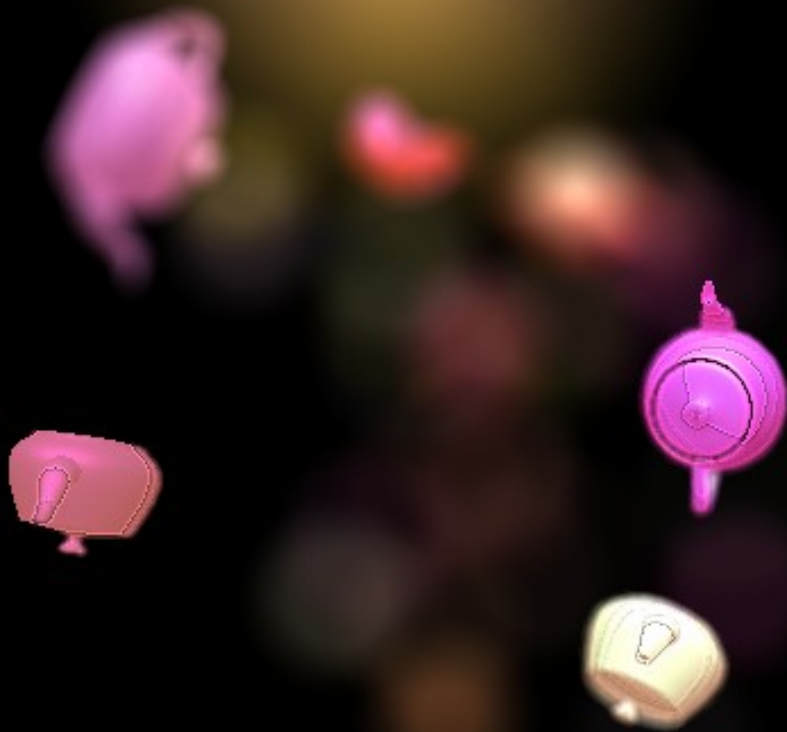
$$|y_{P'} - y_{P''}| = |y_{P'} - y_{P'''}| = |a \cdot [s \cdot (\frac{1}{f} - \frac{1}{d}) - 1]|$$



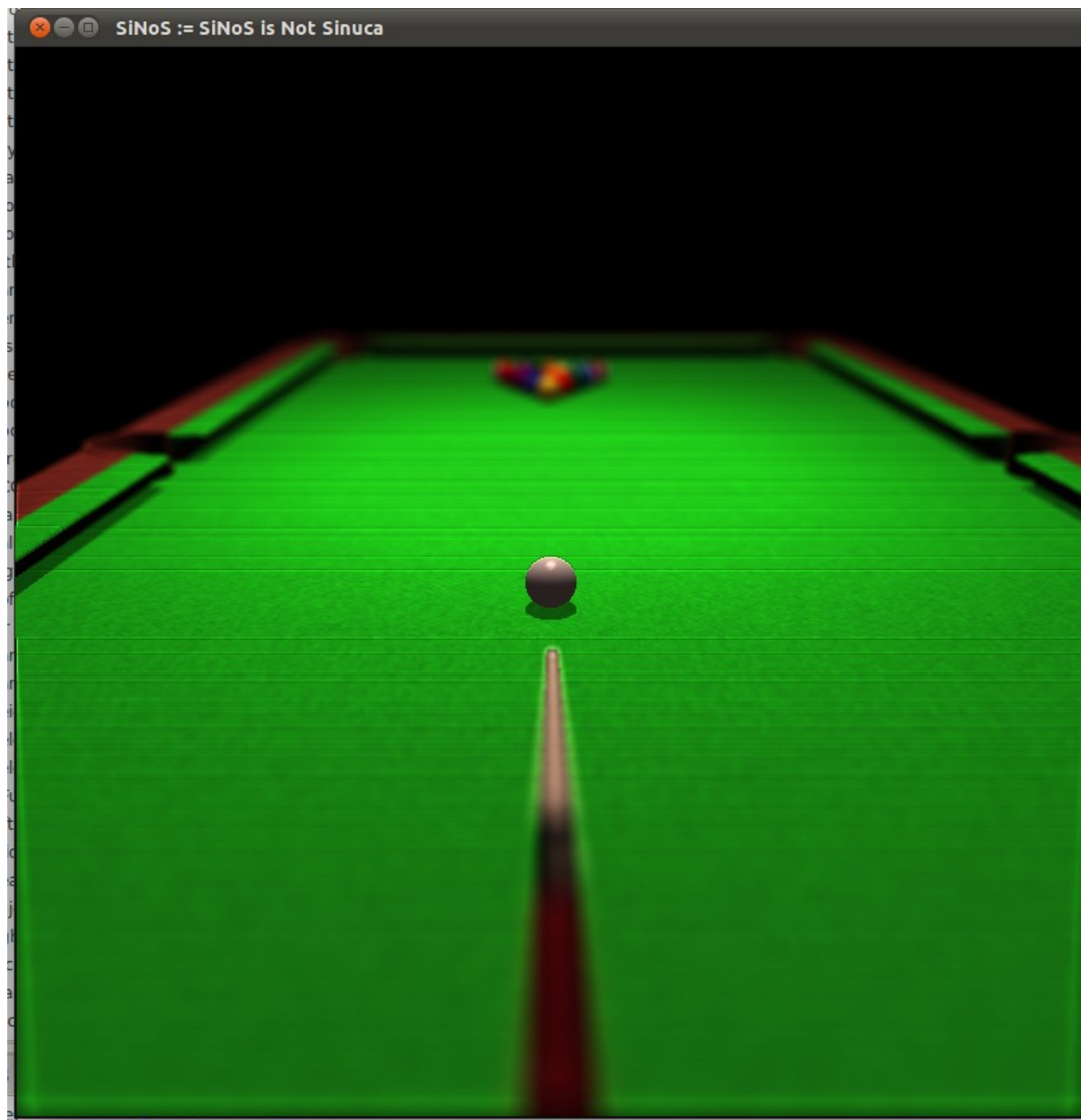
Resultados



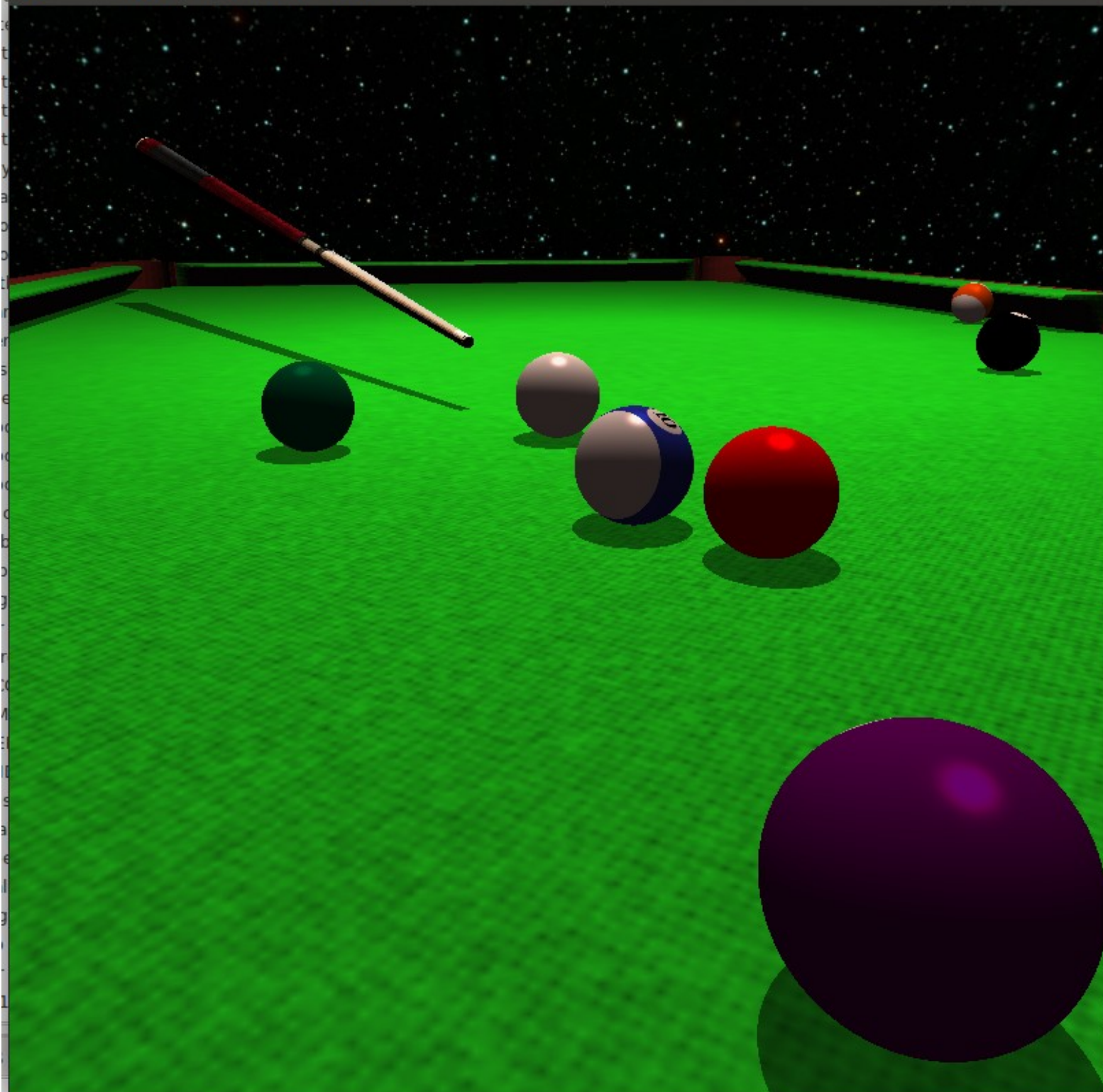




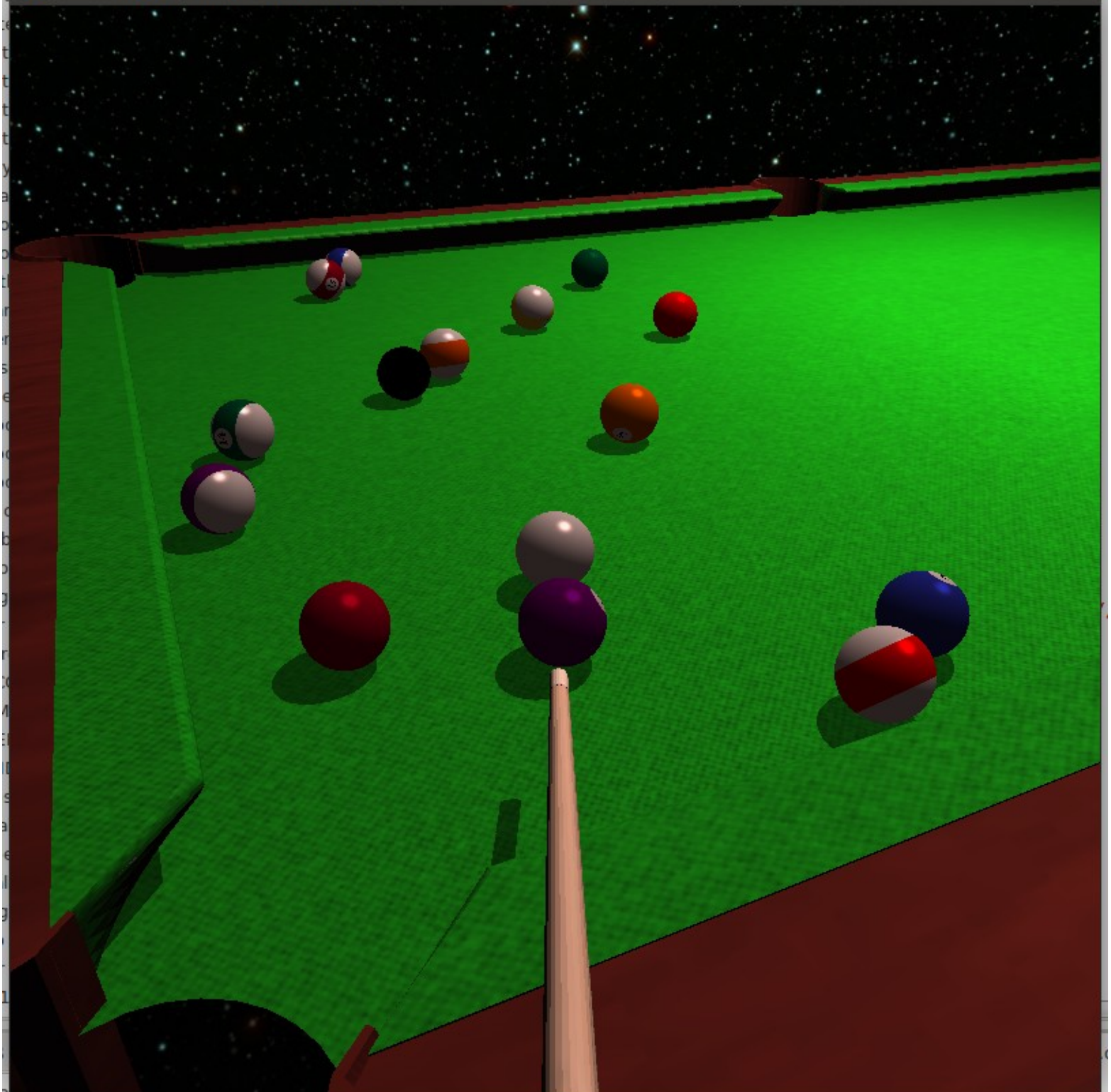
Portando o filtro



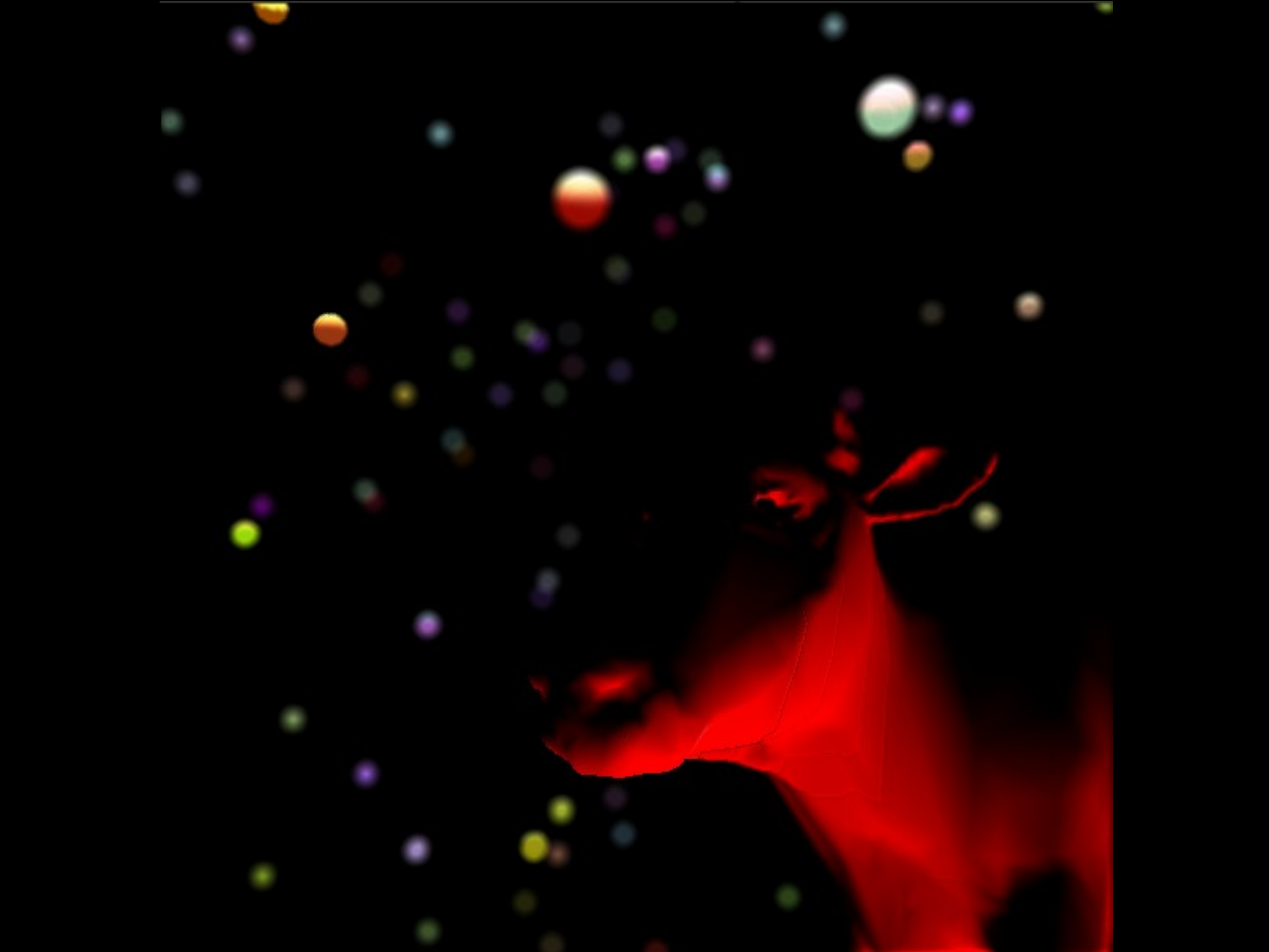
sinos.googlecode.com









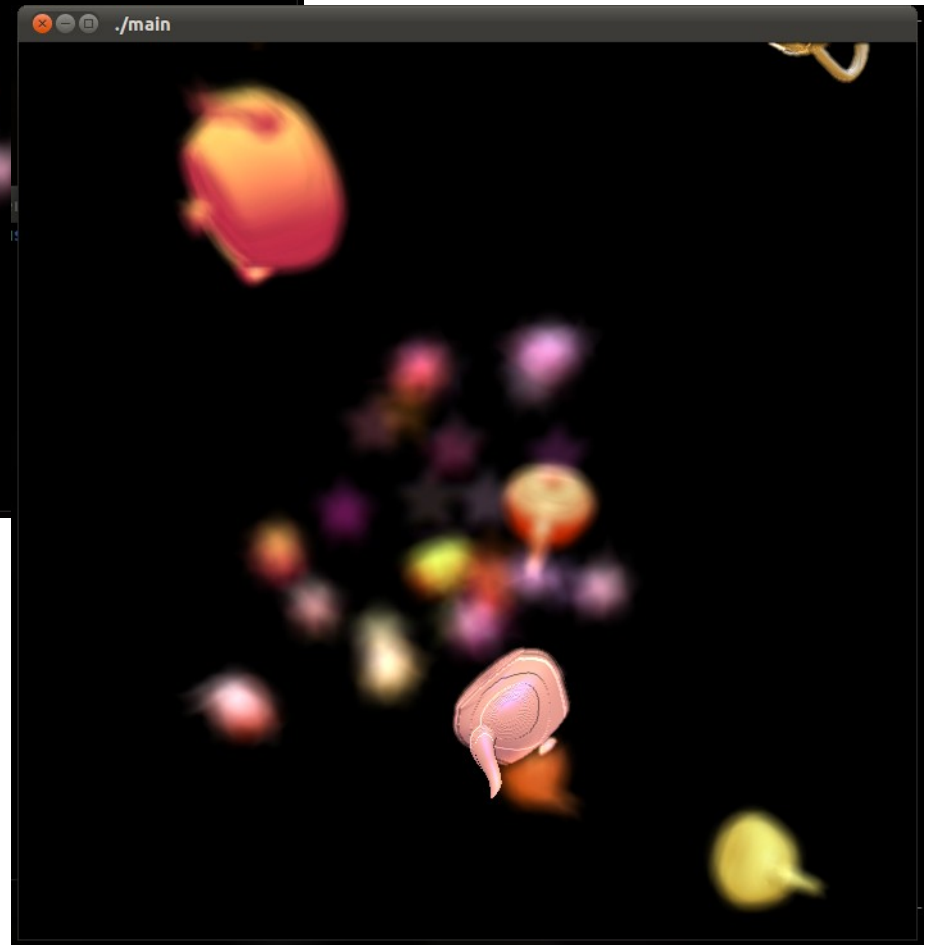
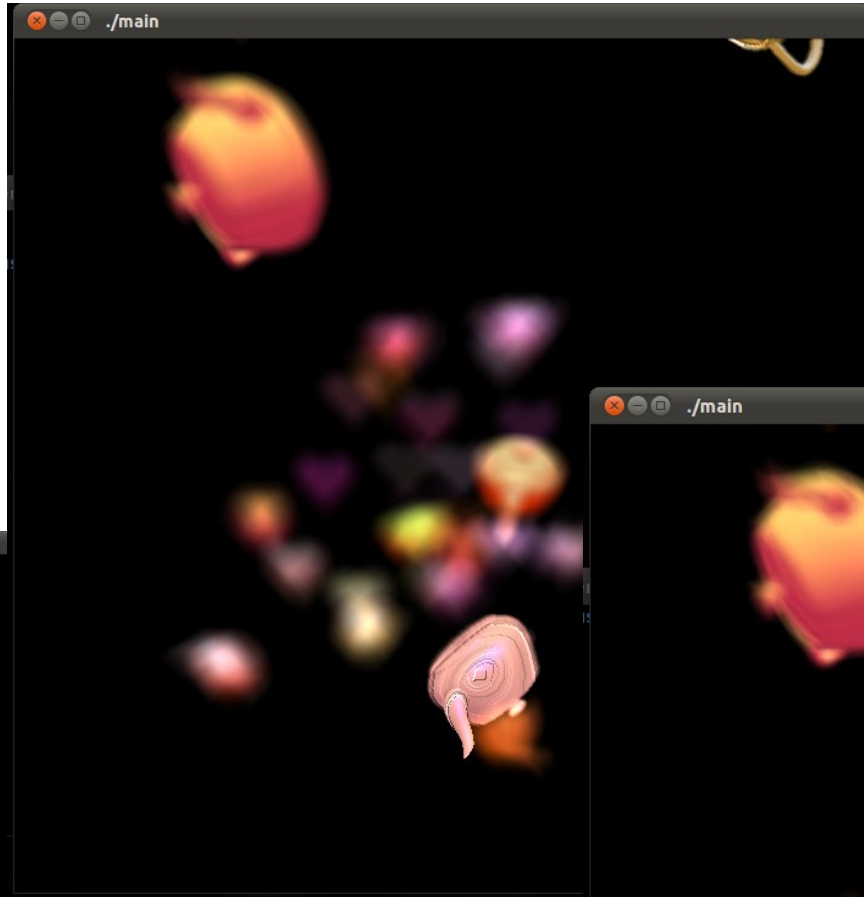
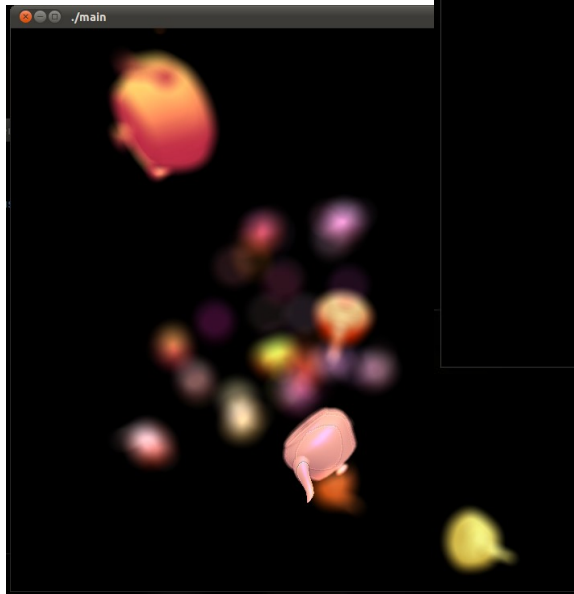


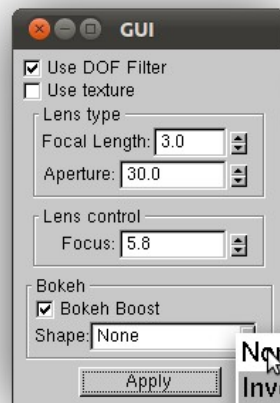
Bokeh

/'boʊkə/
(Japanese)

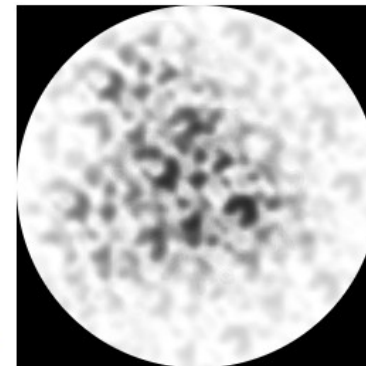
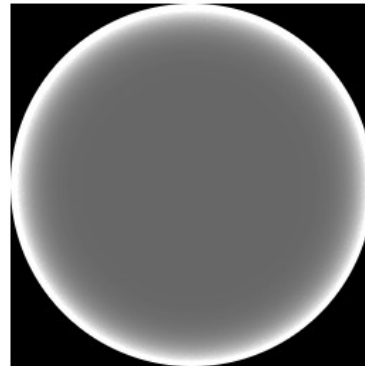
is the blur, or the aesthetic quality of the blur, in out-of-focus areas of an image (...).

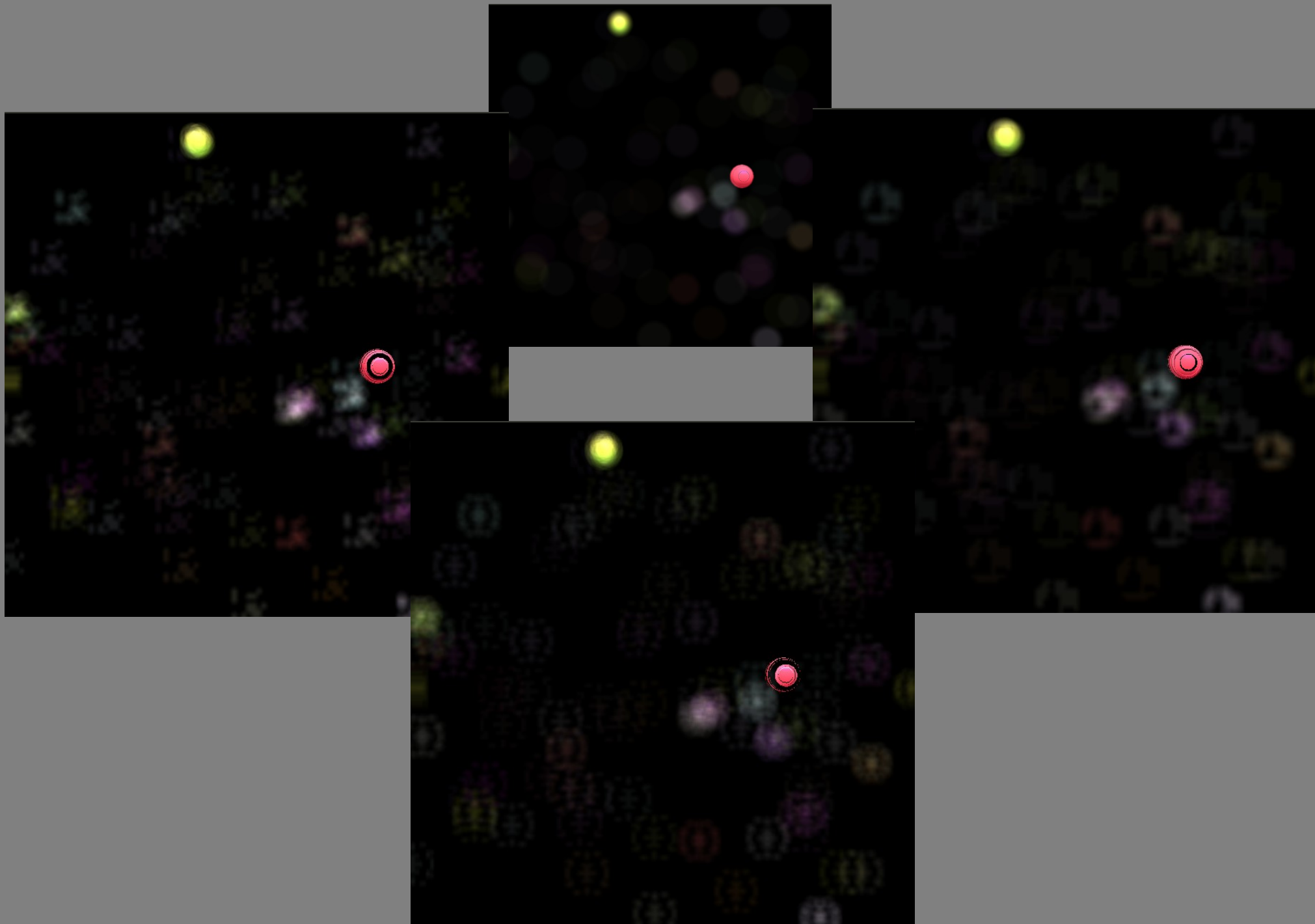


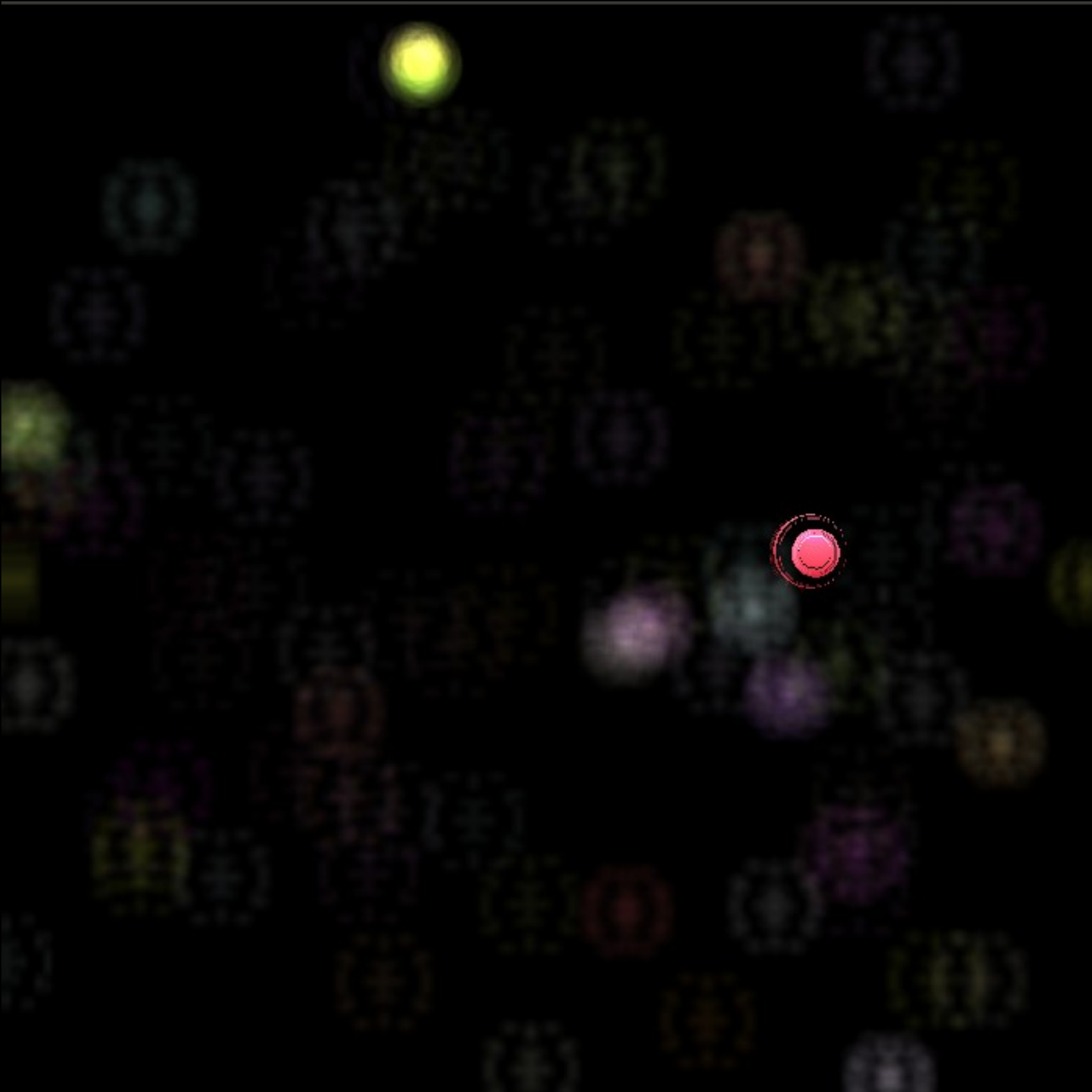




- None
- Inverse Gaussian
- Dirty Lens
- Lens Diaphragm
- Heart
- Star
- Levin's C.A.
- Zhou's C.A.
- Veeraraghavan



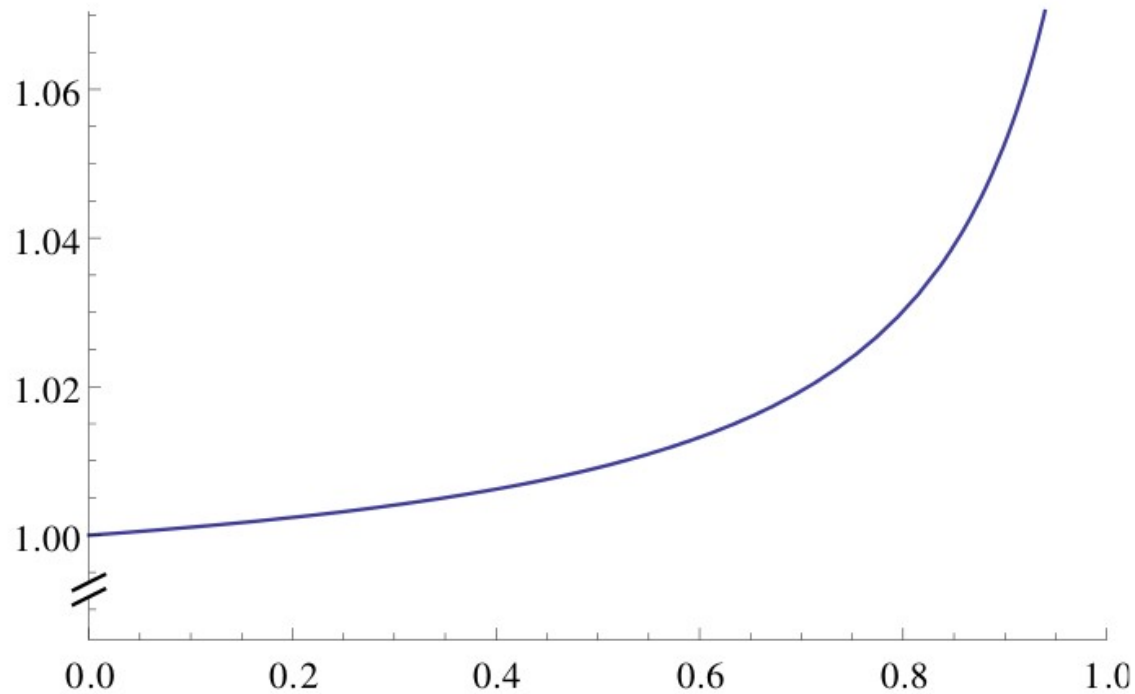




Bokeh Boost

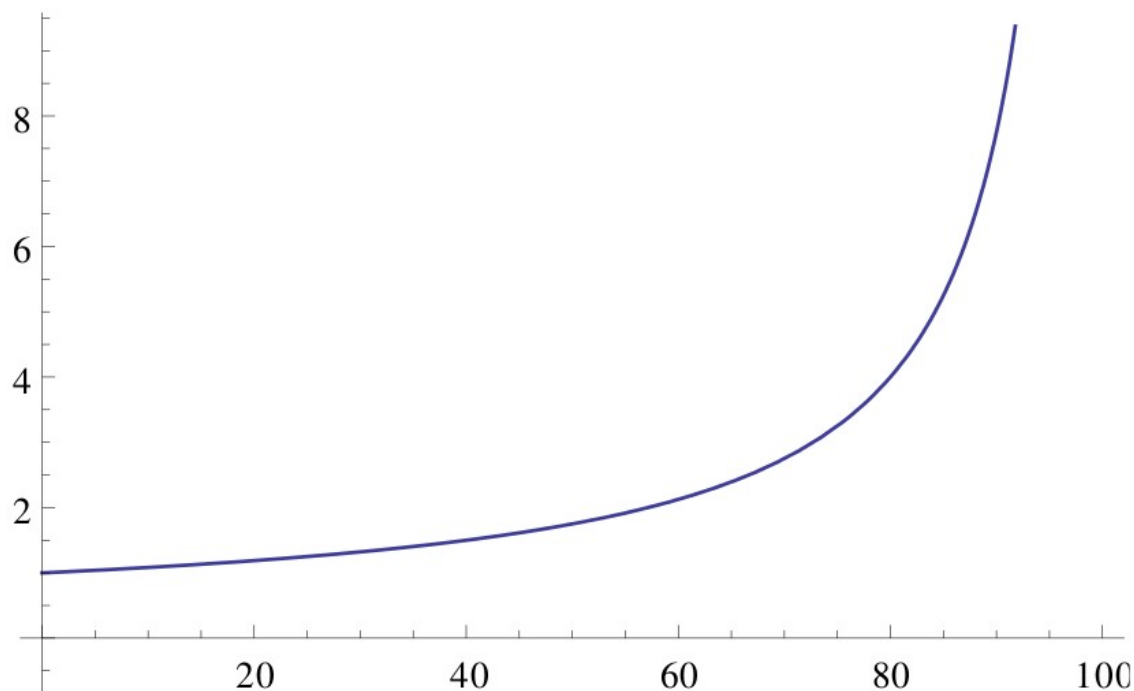
Modulação de highlight

$$f(x) = \frac{1}{95. - x 88.} + \left(1. - \frac{1}{95.}\right)$$



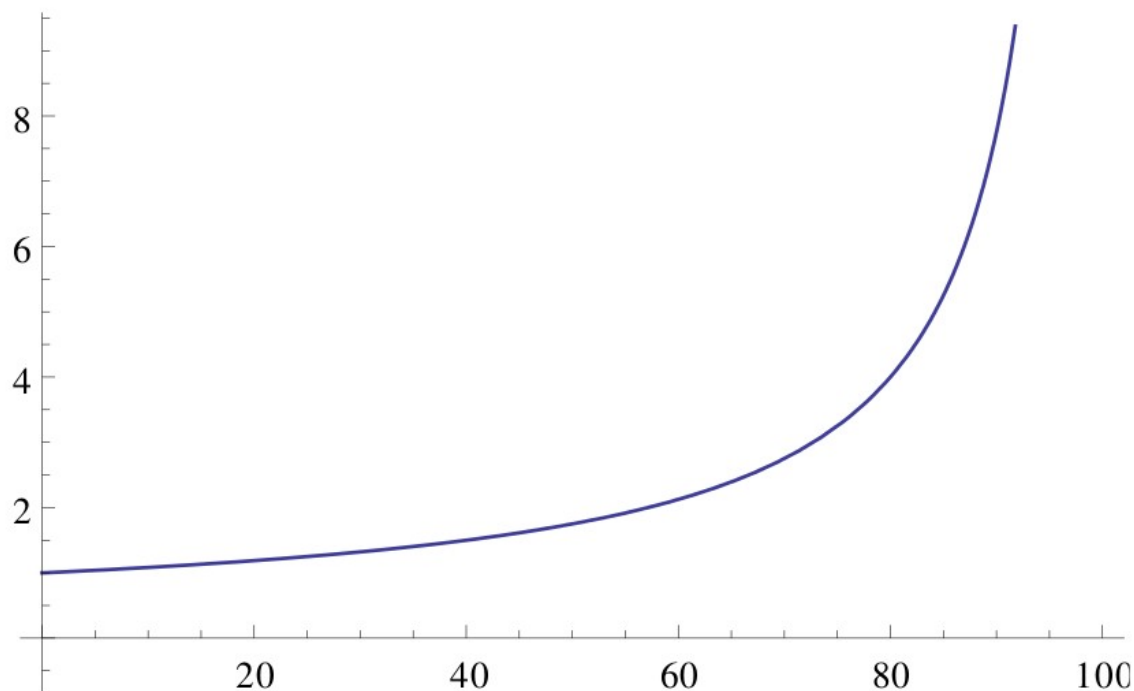
Compensação de área

$$f(x) = x \times \frac{3}{400 - x^4} + 1$$



Compensação de área

$$f(x) = x \times \frac{3}{400 - x^4} + 1$$

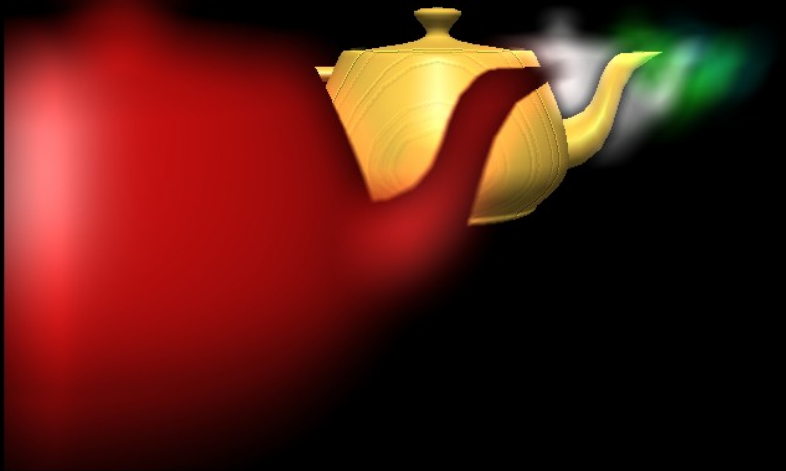




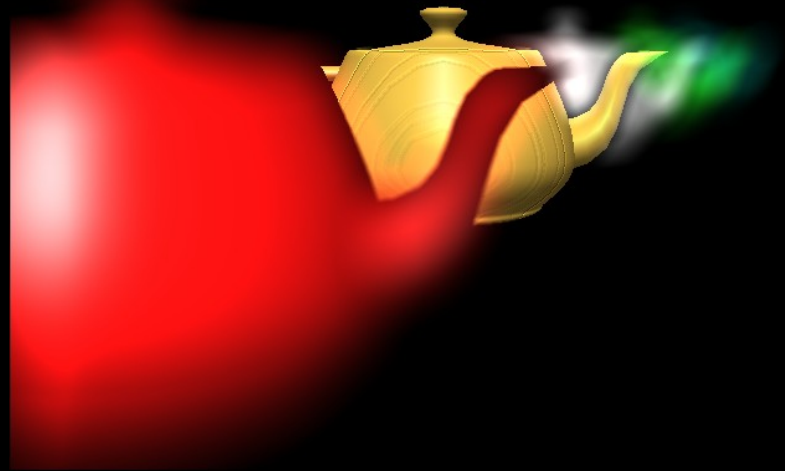
Sem



Com



Sem



Com

Trabalhos futuros



Como fazer o blending entre cada faixa de borramento?

Trabalhos futuros

- Ajustar melhor as funções de modulação
- Kernel por interpolação bilinear/trilinear
- Deconvolução
- Shader

Referências

- BERJÓN, Daniel; MORÁN, Francisco, **Realistic depth of field effects with OpenGL**
- YU, Tin-Tin. **DEPTH OF FIELD IMPLEMENTATION WITH OPENGL**
- RIGUER, Guennadi; TATARCHUK, Natalya; ISIDORO John. **Real-Time Depth of Field Simulation**
- BUHLER, Juan; WEXLER, Dan. **A Phenomenological Model for Bokeh Rendering**