

# Subpixel level Pathtracing

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## Abstract

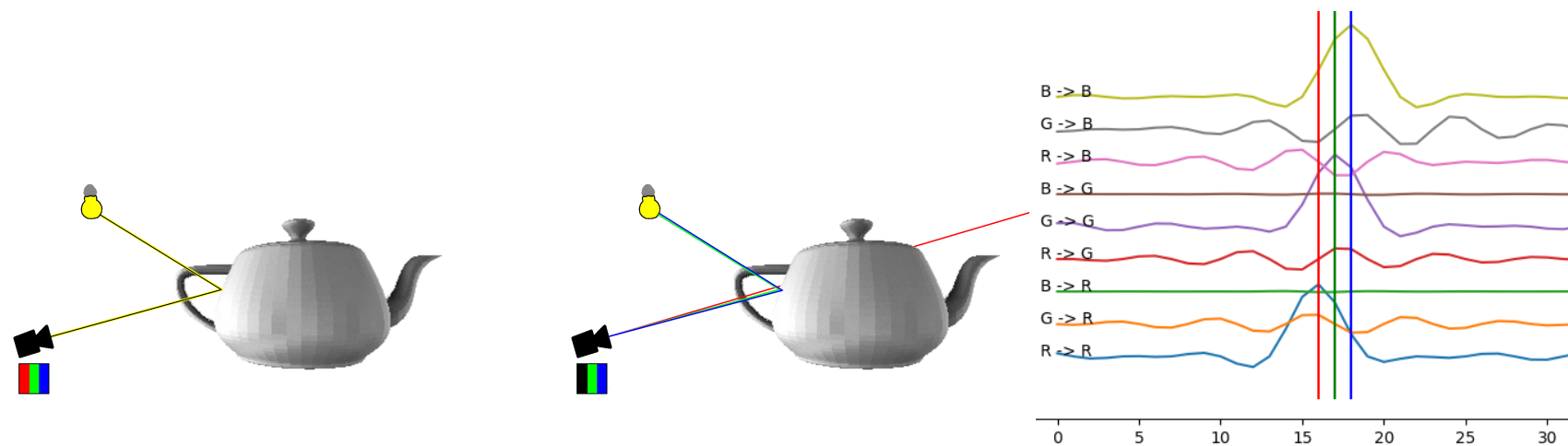
New method improve the resolution of a pathtracer by setting individual subpixels, rather than full pixels. Three methods all improve the image quality of rendered images.

## Introduction

A screen is made up of many pixels, each of which is made up of three individual subpixels, a red one, a green one, and a blue one. Since human eyes are much more sensitive to luminance than colour, this can be exploited to increase the perceived quality of an image.

Subpixel level rendering is a technique to increase the effective resolution of a screen by setting subpixel luminance values, rather than full pixels. It is used currently in rendering text, while there are many other situations where increased resolution could look good. In this project subpixel level rendering is applied to a pathtracer, to increase the resolution of 3D rendered scenes.

## Images



## Method

The subpixel level renderer was made by adapting a standard pathtracer to sample three rays per pixel, each centered at the center of a subpixel. Then the colour of the pixel is determined by the red value of the first subpixel, the green value of the second subpixel, and the blue value of the last subpixel.

An optimal filter was implemented based on J. C. Platt's paper, and compared to the subpixel level renderer. Lastly a pathtracer was made that has the filter built-in and uses random offsets.

## Conclusions

Subpixel level pathtracing can vastly improve perceived realism in pathtraced images. Applying an optimal filter is the best for minimizing the error. Using random offsets to randomly sample subpixels provides a good balance between speed and performance.

## Gitlab

Code is at [https://gitlab.ewi.tudelft.nl/cjppeters/realistic\\_rendering](https://gitlab.ewi.tudelft.nl/cjppeters/realistic_rendering).

