

ECE/CS 412

Introduction to Computer Graphics

Class 6

Pradeep Sen
Advanced Graphics Lab



Announcements

- HW1 is due tomorrow (Tuesday)



Homework help

- Part 1. Interpolation
- Part 2. Seam carving
- Part 3. PhotoMosaic



Last time

- Finished up with signal processing and sampling theory
- Key ideas: aliasing, Nyquist rate

Today

- Applications of 2-D graphics
- Computational photography



Traditional 2-D graphics

- Sprites
- 2-D transformations
- Etc.
- We will talk about these things in a few weeks, when we lead up to 3-D graphics



Computational Photography

- Kind of like image processing on steroids
- Image processing: 2D image \rightarrow 2D image
- Computational photography: imaging/image system \rightarrow 2D image



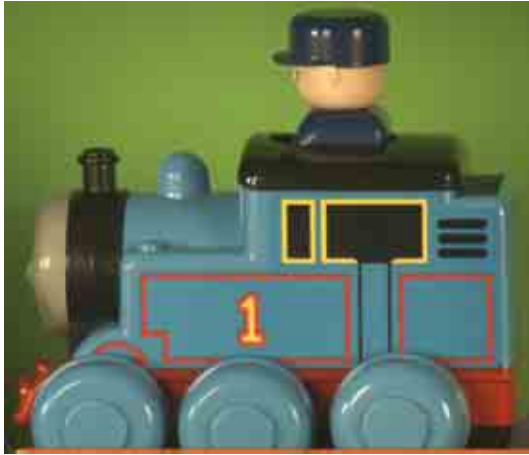
Examples



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Example 1: Image deblur





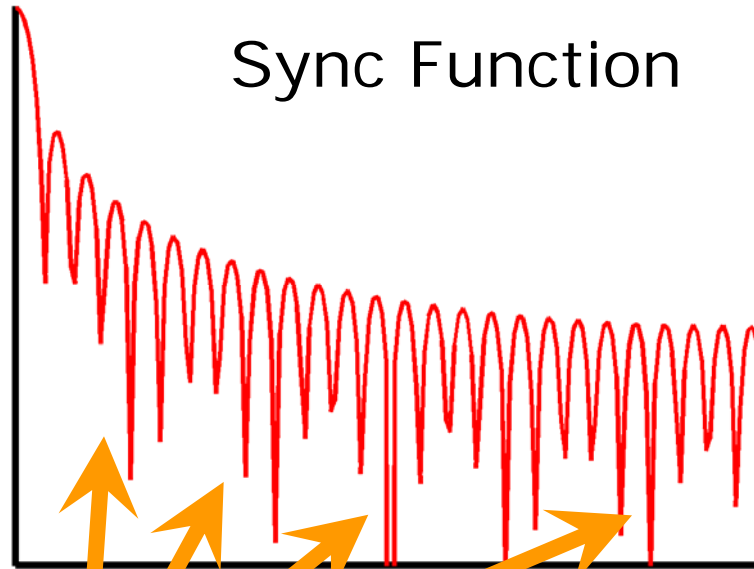
Traditional Camera:
Box Filter

Sinc Function

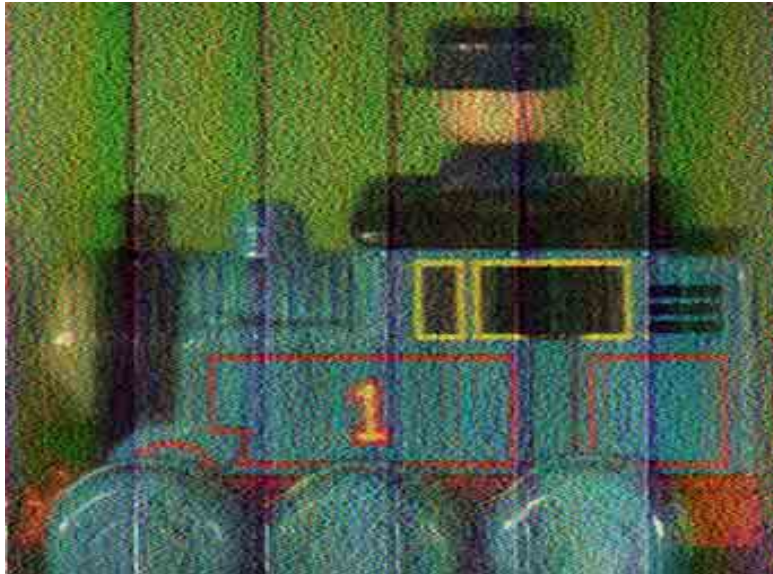
Blurring

==

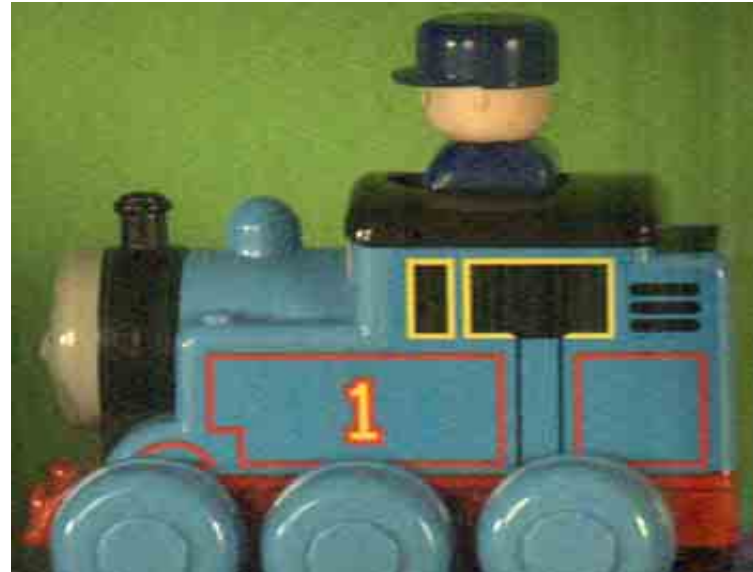
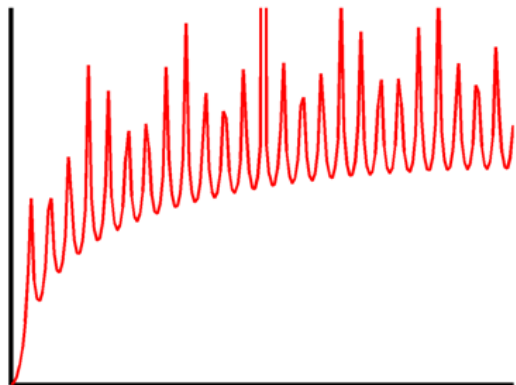
Convolution



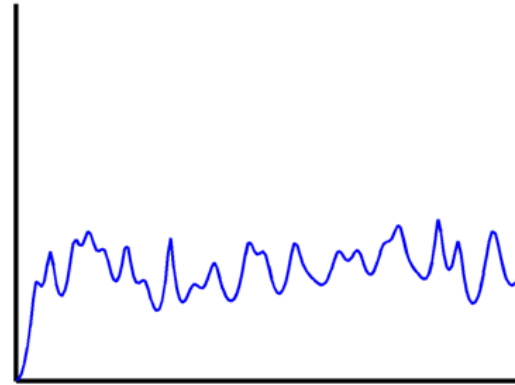
Traditional image processing



Traditional deblurring



New technique



Solution: flutter shutter camera



Slide courtesy Ramesh Raskar (MERL)

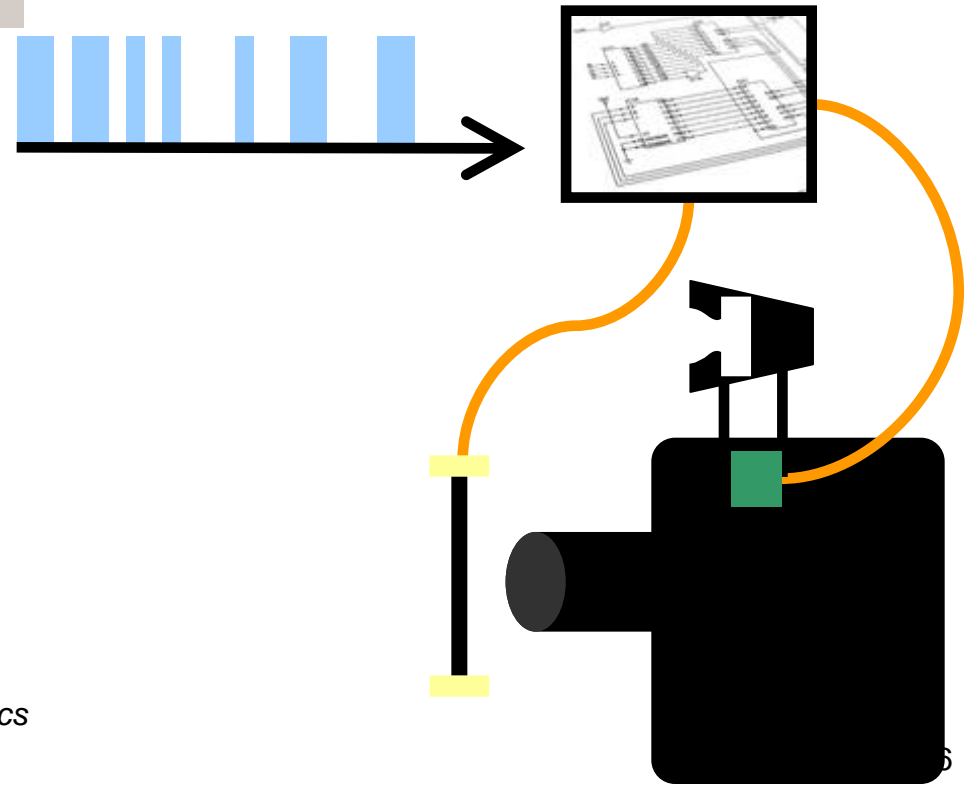


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Implementation

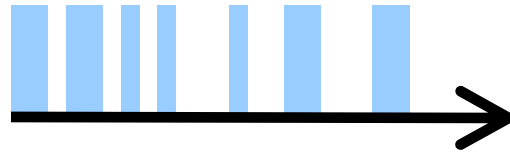
Completely Portable



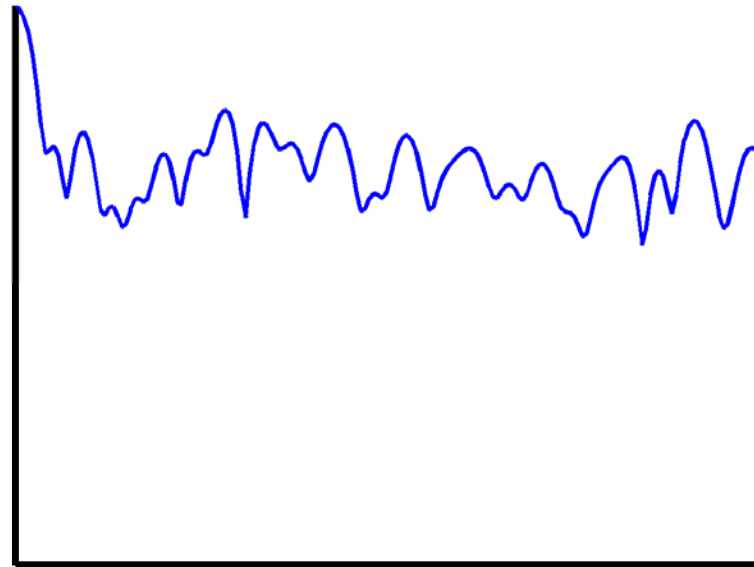
Slide courtesy Ramesh Raskar (MERL)



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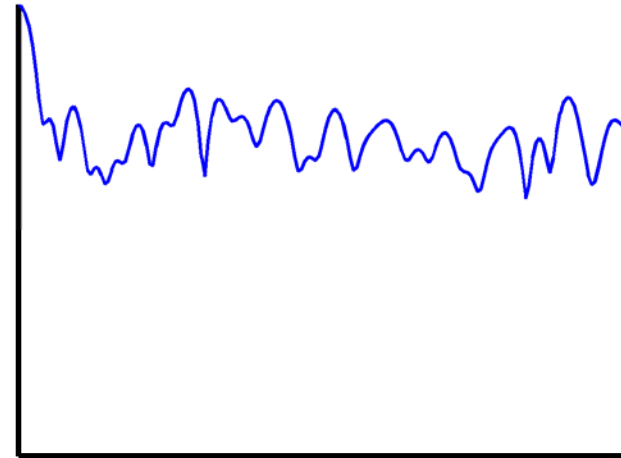
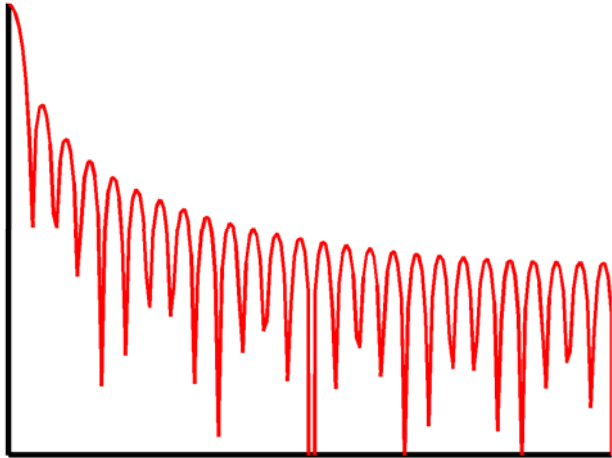
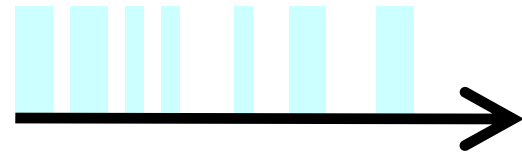


Flutter
Shutter:
Coded Filter

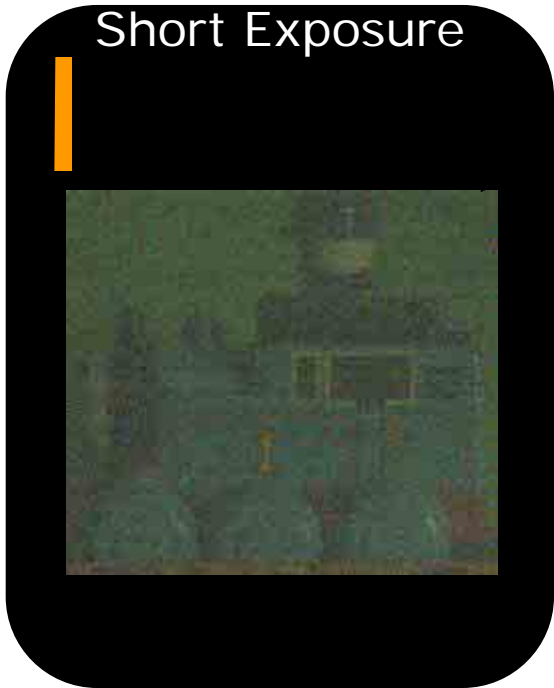




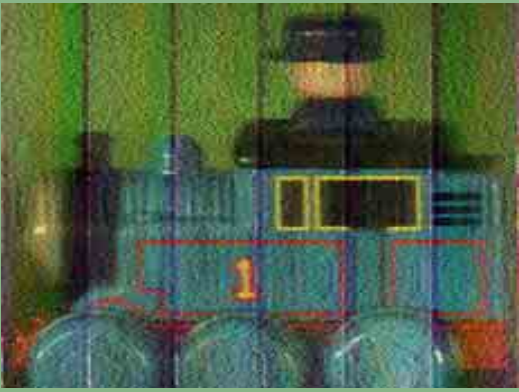
Comparison



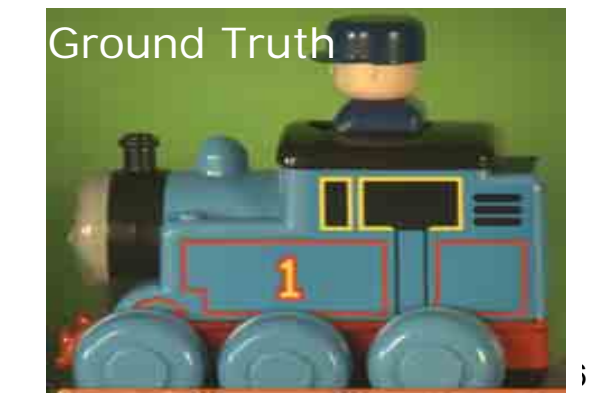
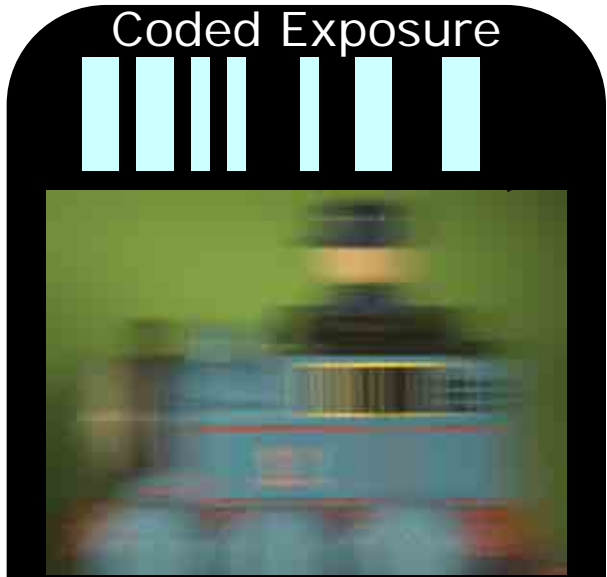
Short Exposure



Long Exposure



Coded Exposure



Slide courtesy Ramesh Raskar (MERL)



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Example 2: Image completion

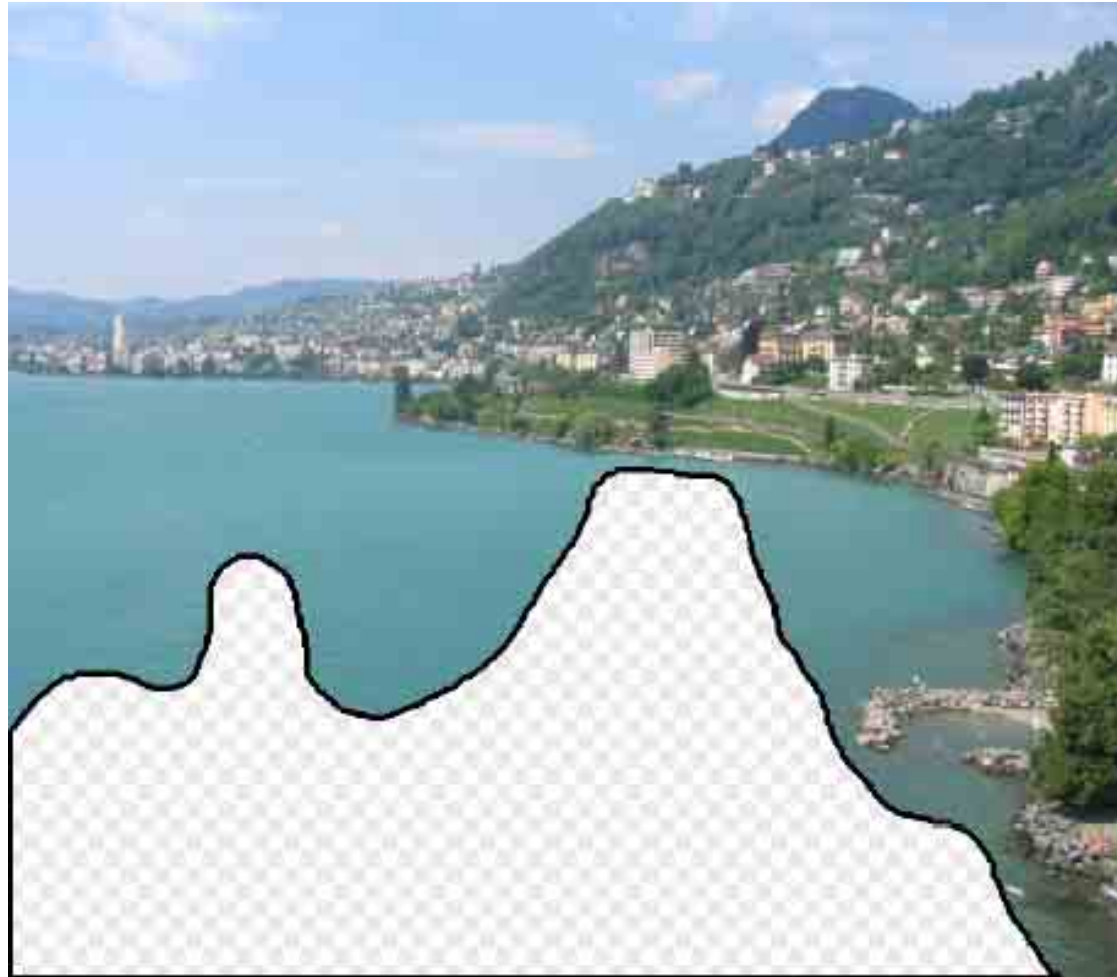


Slide courtesy Alyosha Efros (CMU)



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Example 2: Image completion



Slide courtesy Alyosha Efros (CMU)



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Example 2: Image completion



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Add a database of images



Slide courtesy Alyosha Efros (CMU)



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Results

