

A Picture is Worth 1,000,000,000,000 Words



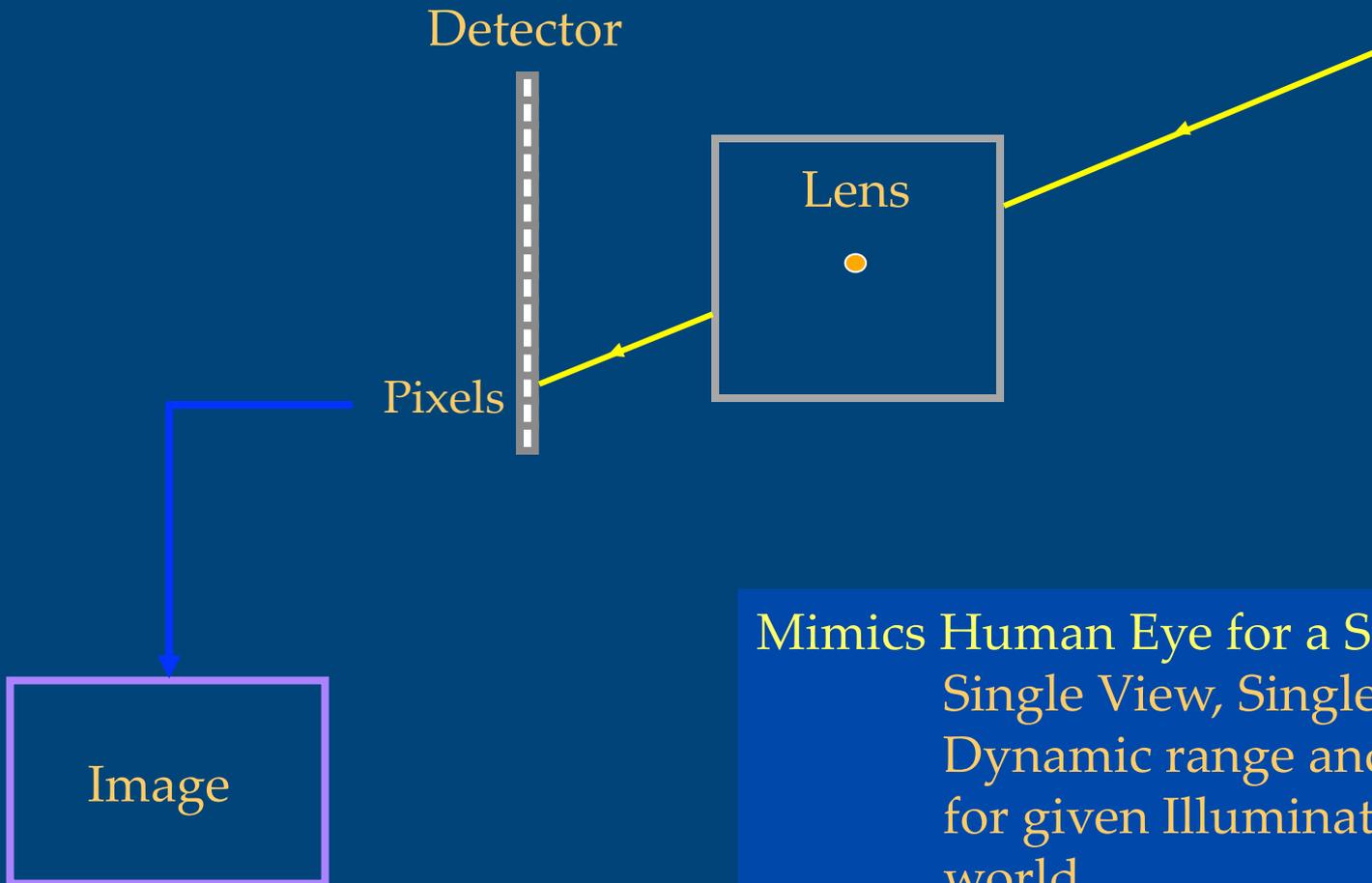
Applications of Computational photography

by:

Alex Alarcon

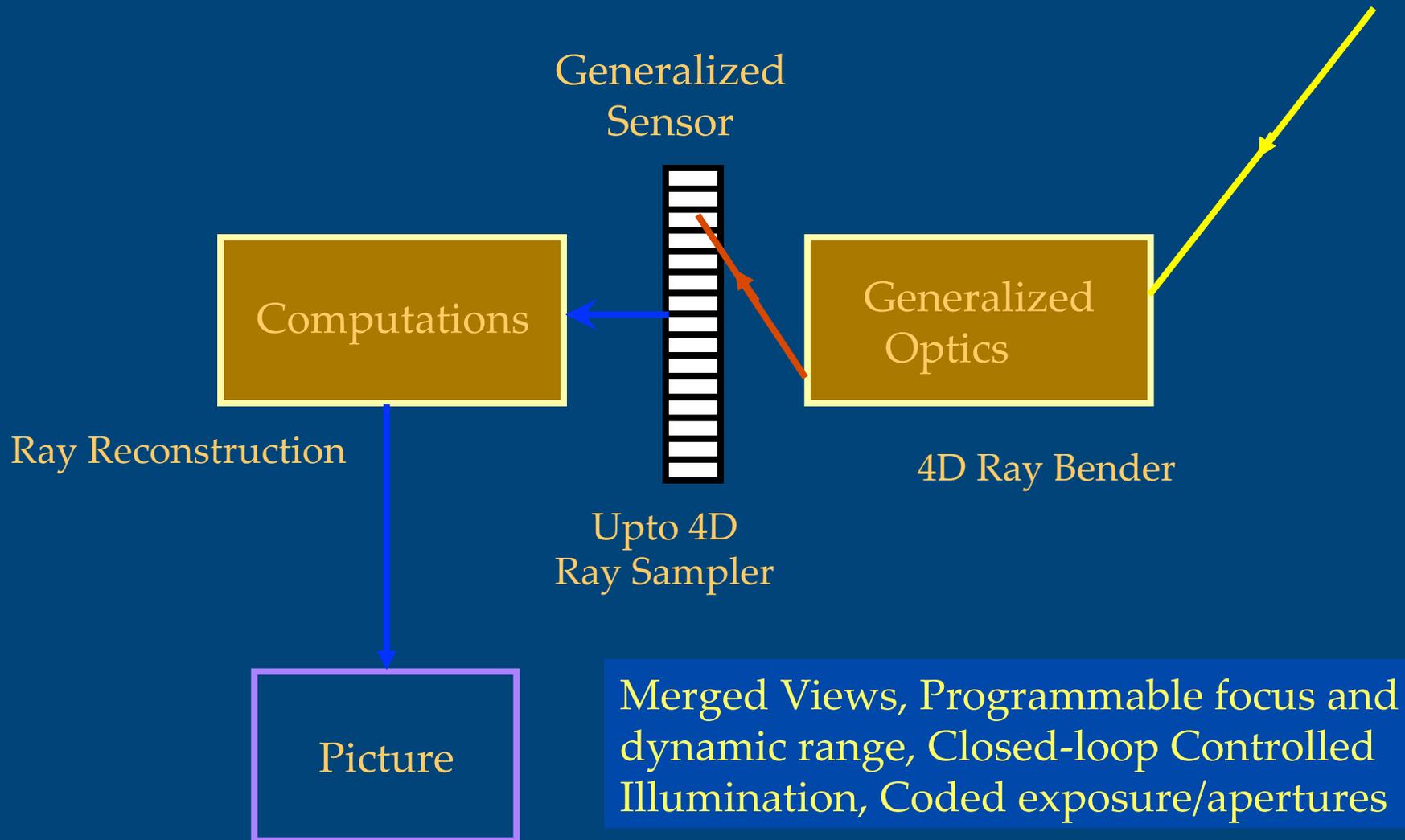
ART 185GL

Traditional Photography



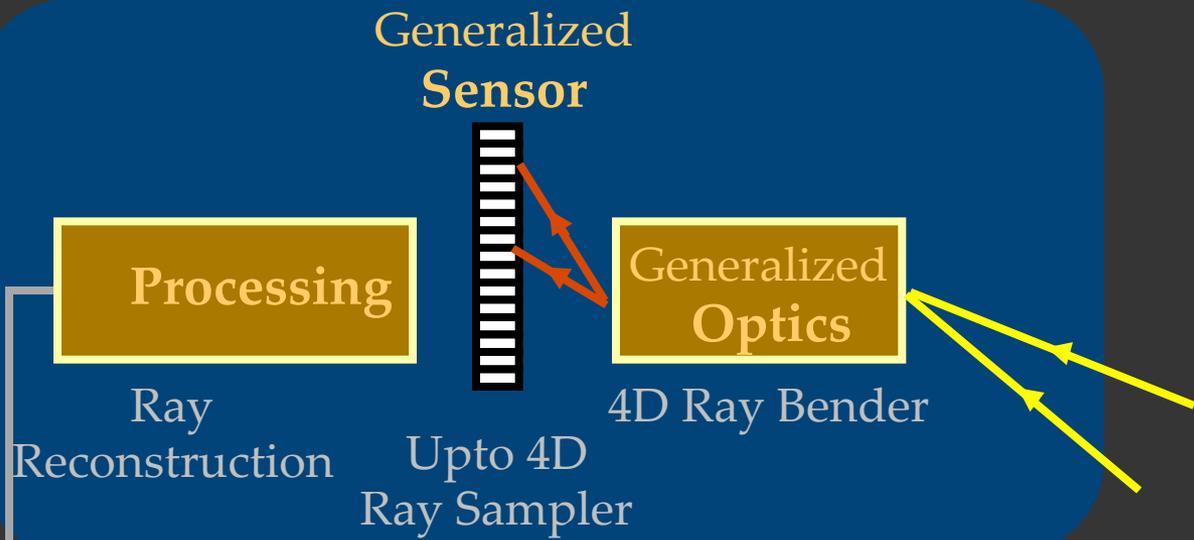
Mimics Human Eye for a Single Snapshot:
Single View, Single Instant, Fixed
Dynamic range and Depth of field
for given Illumination in a Static
world

Computational Photography: Optics, Sensors and Computations

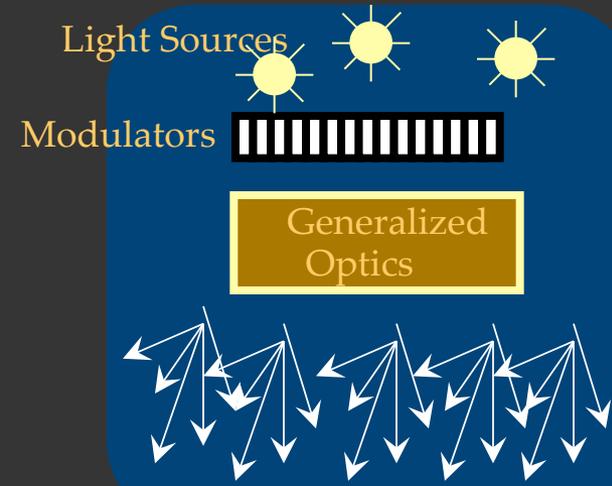


Computational Photography

Novel Cameras



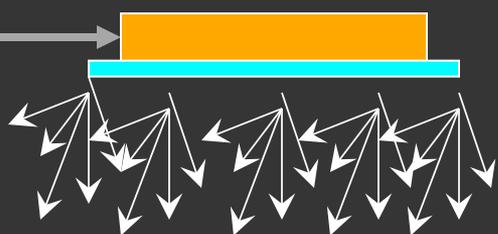
Novel Illumination



4D Light Field



Display



Recreate 4D Lightfield

Computational Photography

Computational photography combines plentiful computing, digital sensors, modern optics, actuators, and smart lights to escape the limitations of traditional film cameras and enables novel imaging applications. Unbounded dynamic range, variable focus, resolution, and depth of field, hints about shape, reflectance, and lighting, and new interactive forms of photos that are partly snapshots and partly videos are just some of the new applications found in Computational Photography.

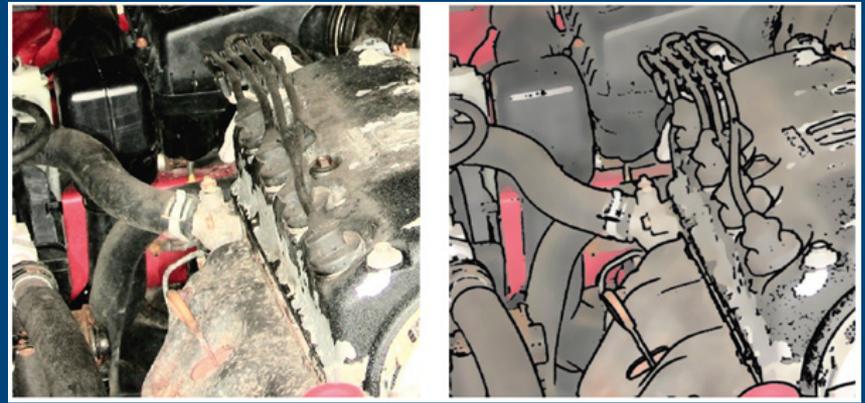
Rays versus pixels

Beyond Photorealism: Artistic Application

Computational Photography allows for cameras to produce images that appear hand drawn

This is because the camera is more like a computer that records a richer representation of the world by capturing the whole spectrum of image data that can be manipulated without applying external processing.

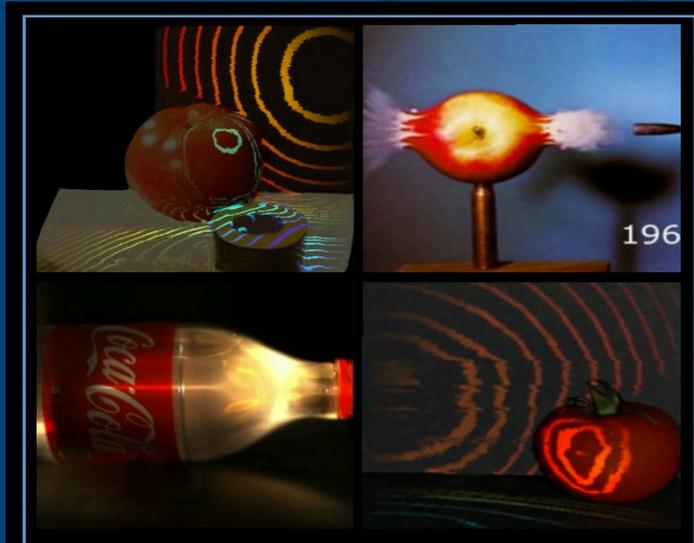
Non-photorealism is more of an artistic application that challenges the notion of representation and the human element in painting/ drawing.



FEMTO-PHOTOGRAPHY

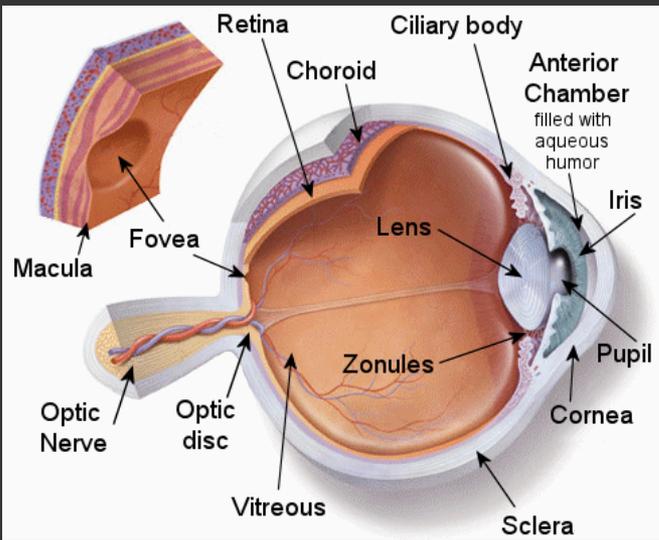
capturing life at a trillion frames per second

- Both scientific and artistic applications
- application in computational photography that pieces together images to create trillion frames per second video
- able to photograph light photons and see around corners
- able to see how “nature paints its picture” versus how our eyes perceive it.

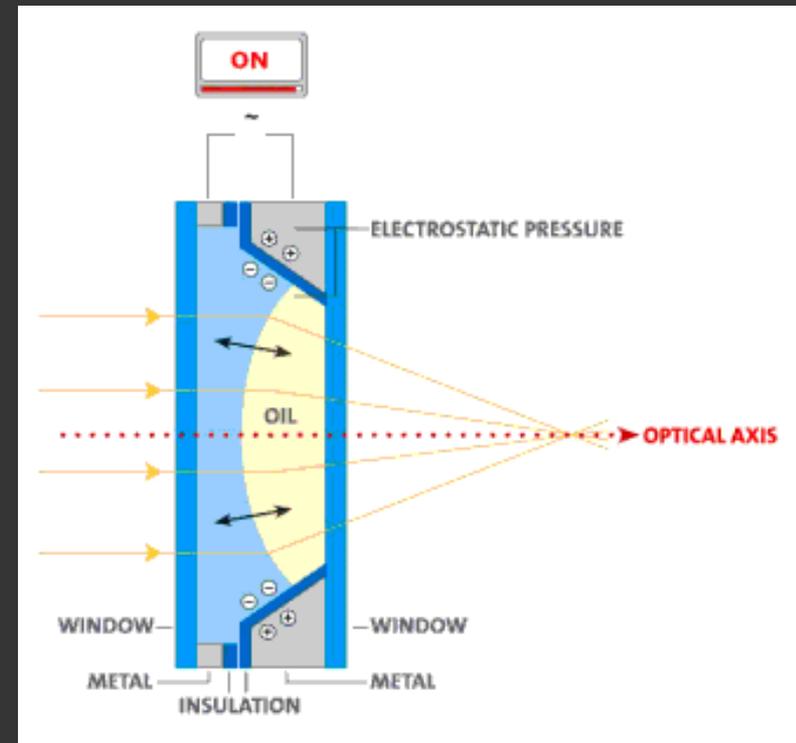
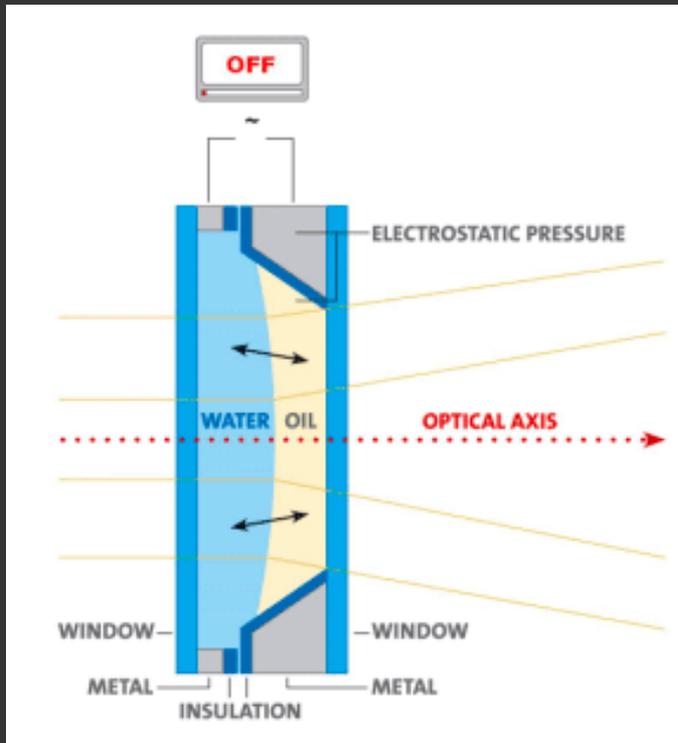


Femto-Photography allows scientists to capture high-speed video at a trillion frames *per second*

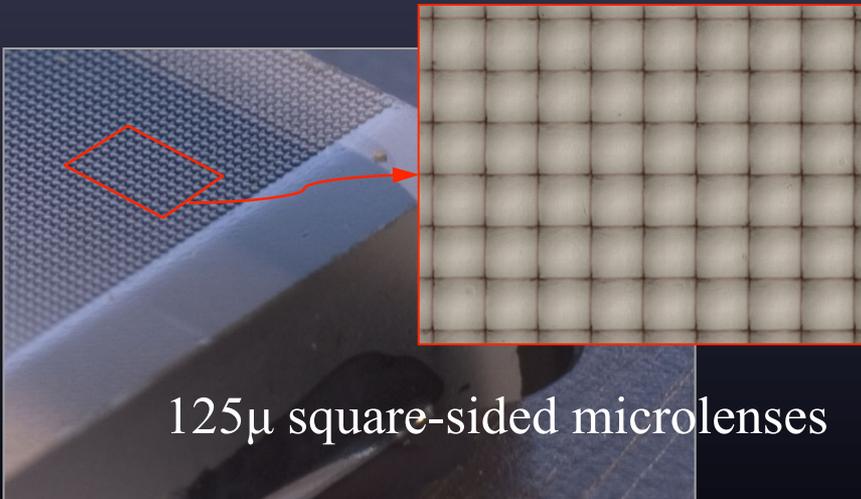
The Eye's Lens



Varioptic Liquid Lens: Electrowetting

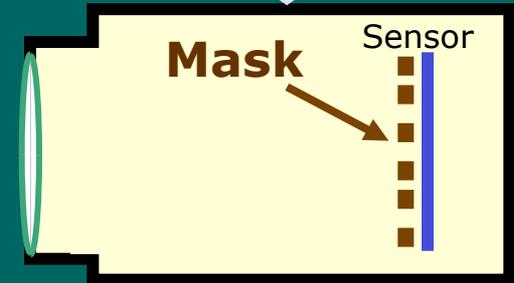
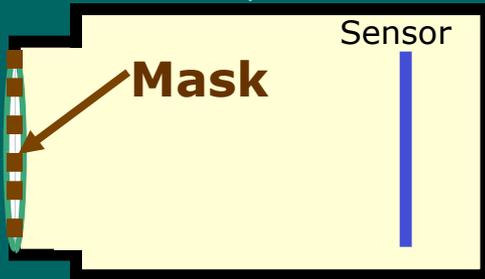


Digital Refocusing using Light Field Camera

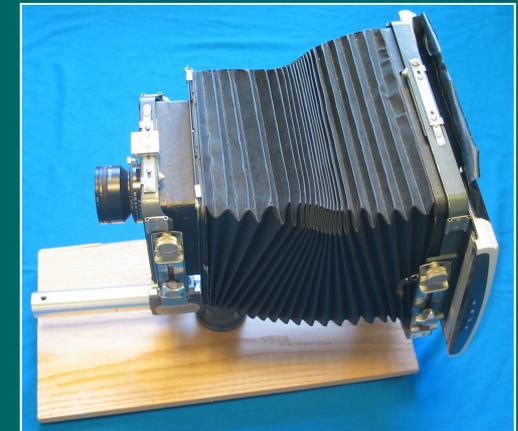


125 μ square-sided microlenses

Coding and Modulation in Camera Using Masks



Coded Aperture for
Full Resolution
Digital Refocusing

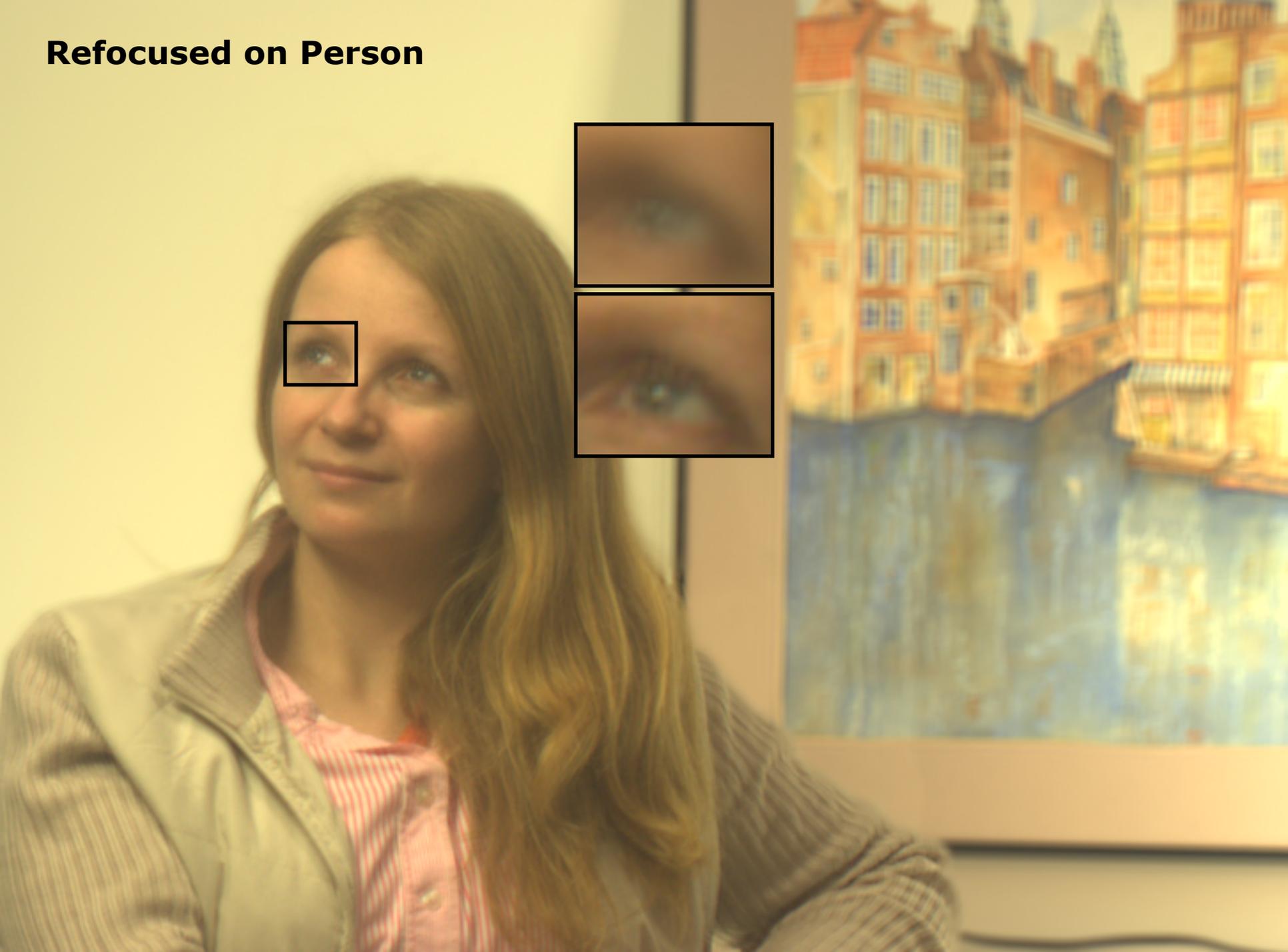


Heterodyne Light
Field Camera

Captured Blurred Photo



Refocused on Person



Ives' Camera



Patented 1903
 Array of pinholes
 near image plane

No. 725,567.

PATENTED APR. 14, 1903.

F. E. IVES.

PARALLAX STEREOGRAM AND PROCESS OF MAKING SAME.

APPLICATION FILED SEPT. 25, 1902.

NO MODEL.

