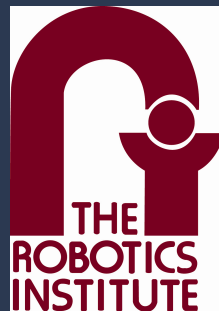


Coded Computational Imaging

Amit Agrawal, Ashok Veeraraghvan,
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Robotics Institute, CMU
MIT Media Lab



Course WebPage :

<http://www.umiacs.umd.edu/~aagrwal/CVPR10Tutorial/index.html>

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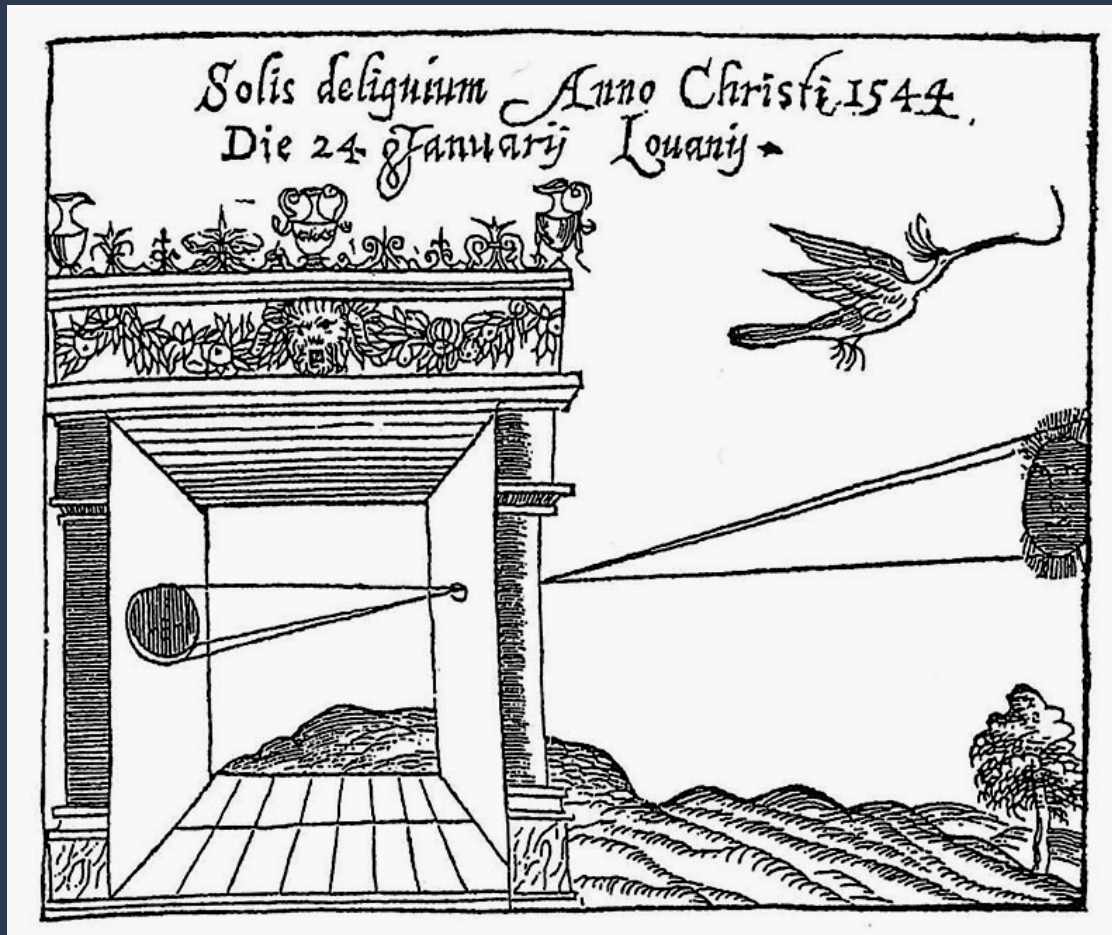
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Todd Zickler
Pradeep Sen
Wikipedia (Imaging History)

A Brief History of Images

1544

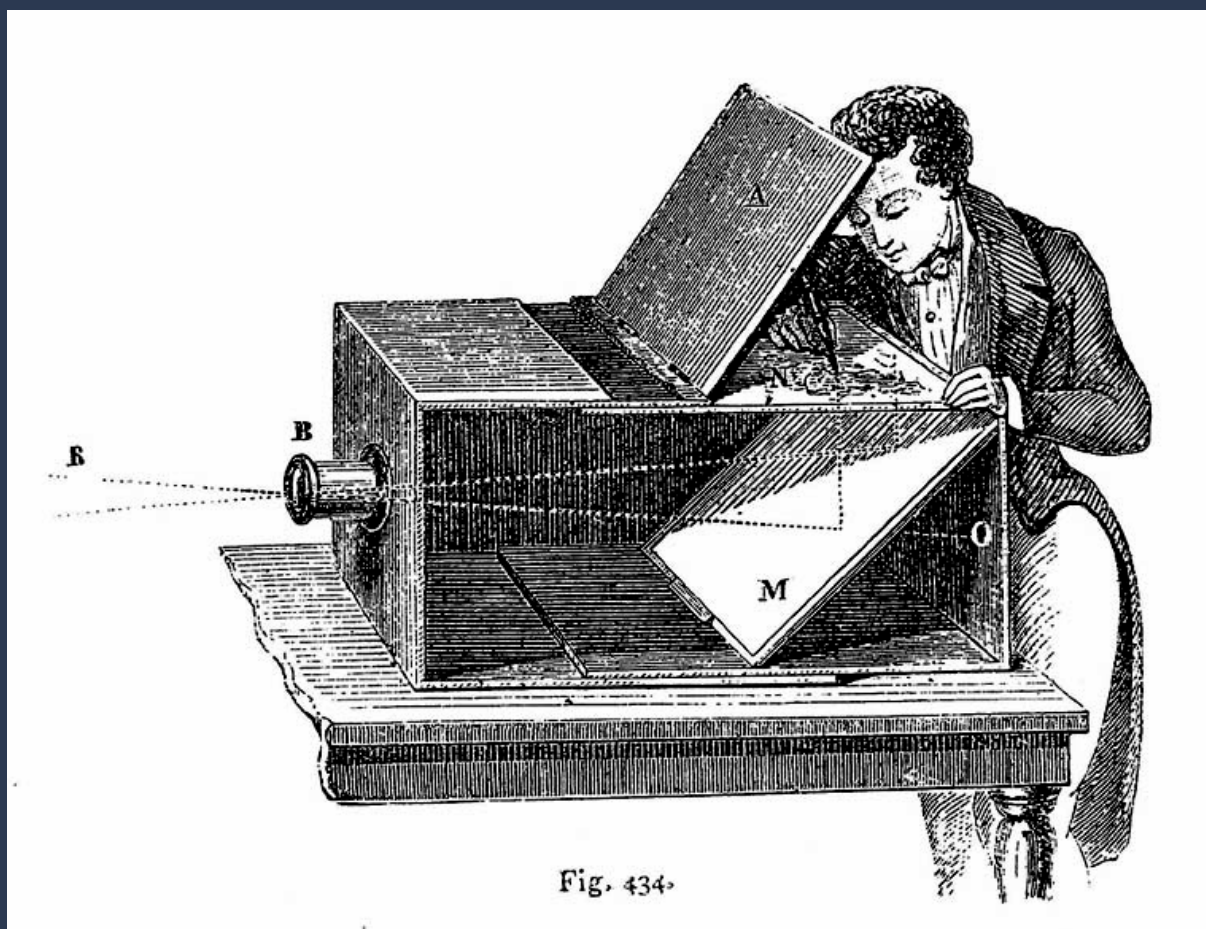


Camera Obscura, Gemma Frisius, 1544

A Brief History of Images

● 1544

● 1568



Lens Based Camera Obscura, 1568

A Brief History of Images

● 1544

● 1568

● 1816



Joseph Nicéphore Niépce (1765-1833)



The first negative (not original)
[Not fixed...quickly vanished]

A Brief History of Images



The first permanent photograph (8 hour exposure), Niepce

● 1544

● 1568

● 1816

● 1826

A Brief History of Images



Still Life, Louis Jaques Mande Daguerre, 1837

● 1544

● 1568

● 1816

● 1826

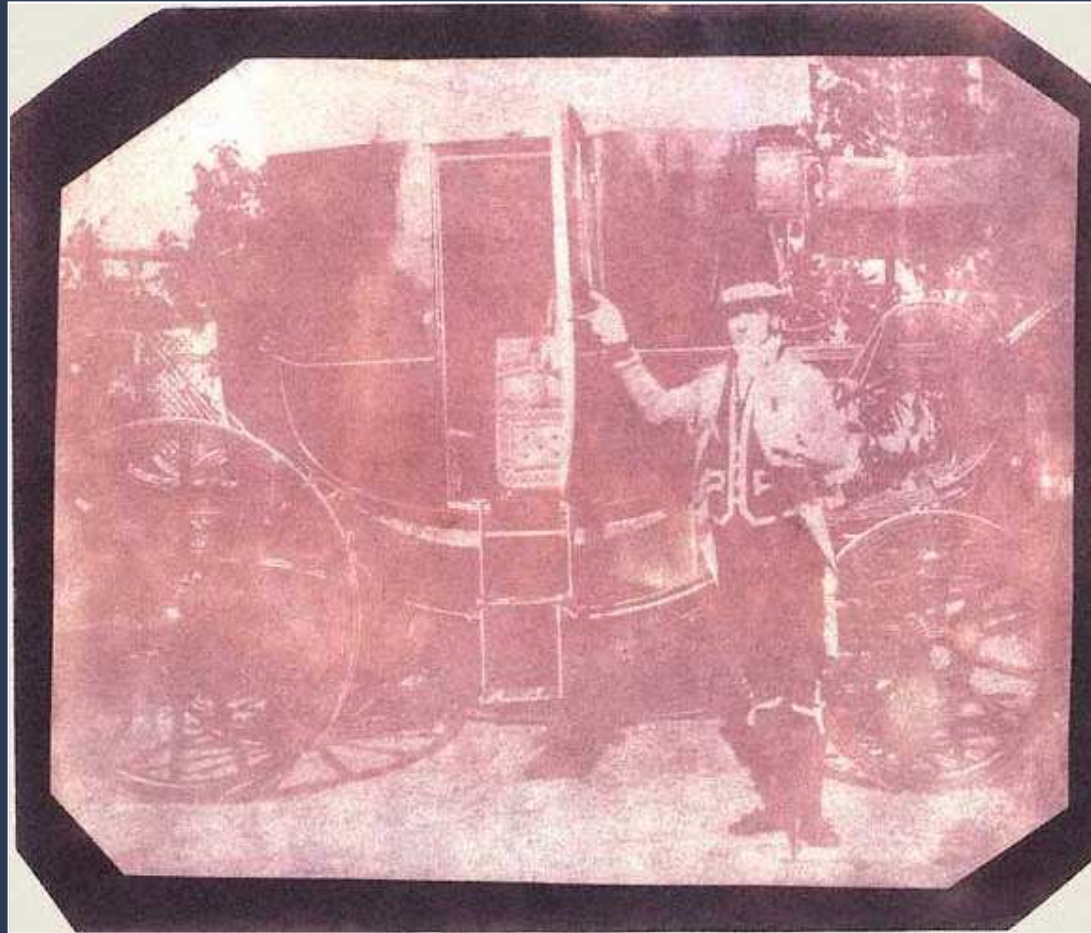
● 1837

A Brief History of Images



Daguerreotype Panorama (wiki)

A Brief History of Images



● 1544

● 1568

● 1816

● 1826

● 1837

● 1841

William Henry Fox Talbot , negative to positive photographic process

A Brief History of Images



tartan ribbon, James Clerk Maxwell, additive color photograph

● 1544

● 1568

● 1816

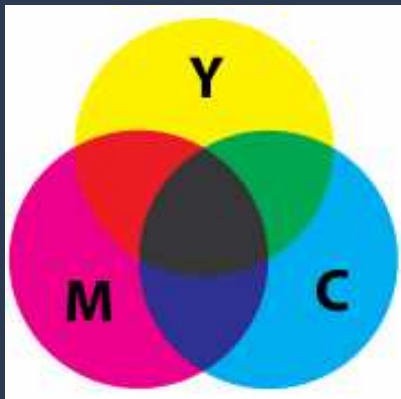
● 1826

● 1837

● 1841

● 1861

A Brief History of Images



Louis Ducos du Hauron, subtractive color photograph

● 1544

● 1568

● 1816

● 1826

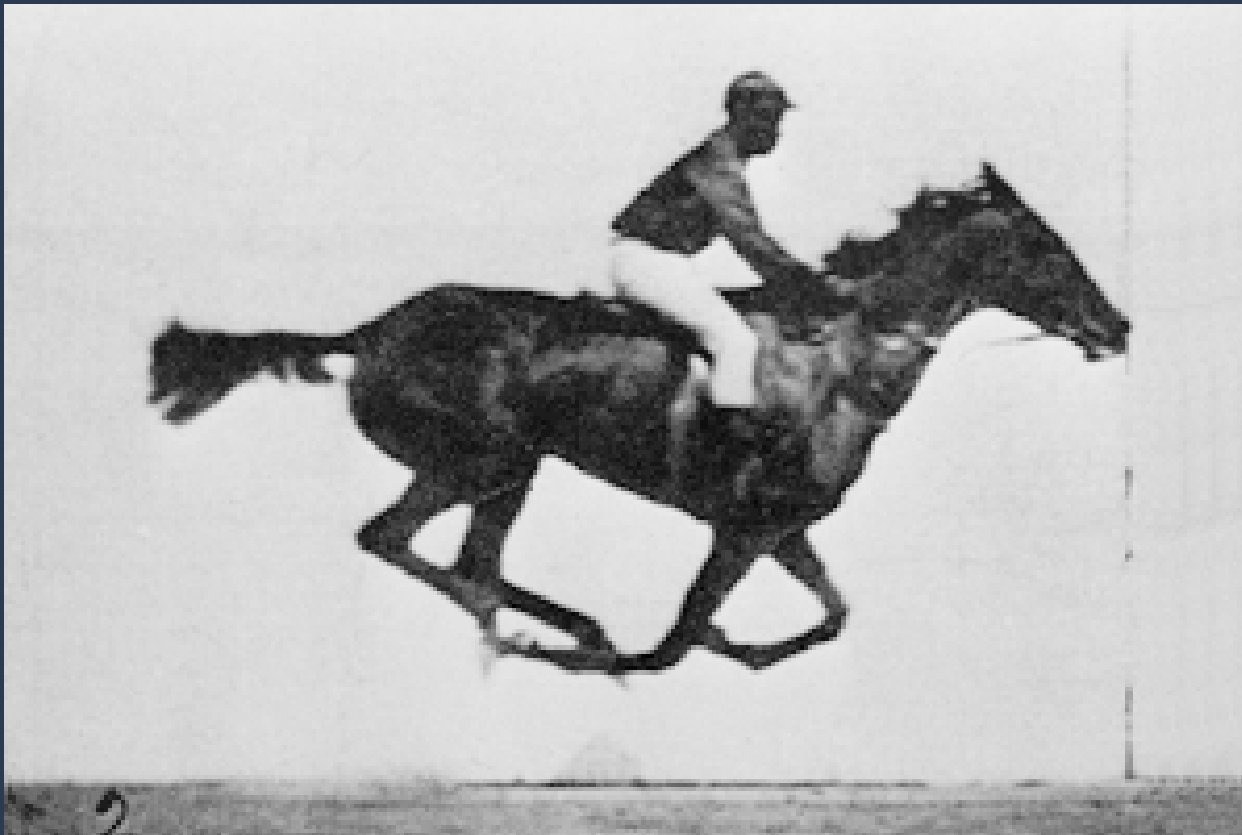
● 1837

● 1841

● 1861

● 1868

A Brief History of Images



The Horse in Motion, Muybridge, fast motion using 24 cameras.

● 1544

● 1568

● 1816

● 1826

● 1837

● 1841

● 1861

● 1868

● 1878

A Brief History of Images

● 1544

● 1568

● 1816

● 1826

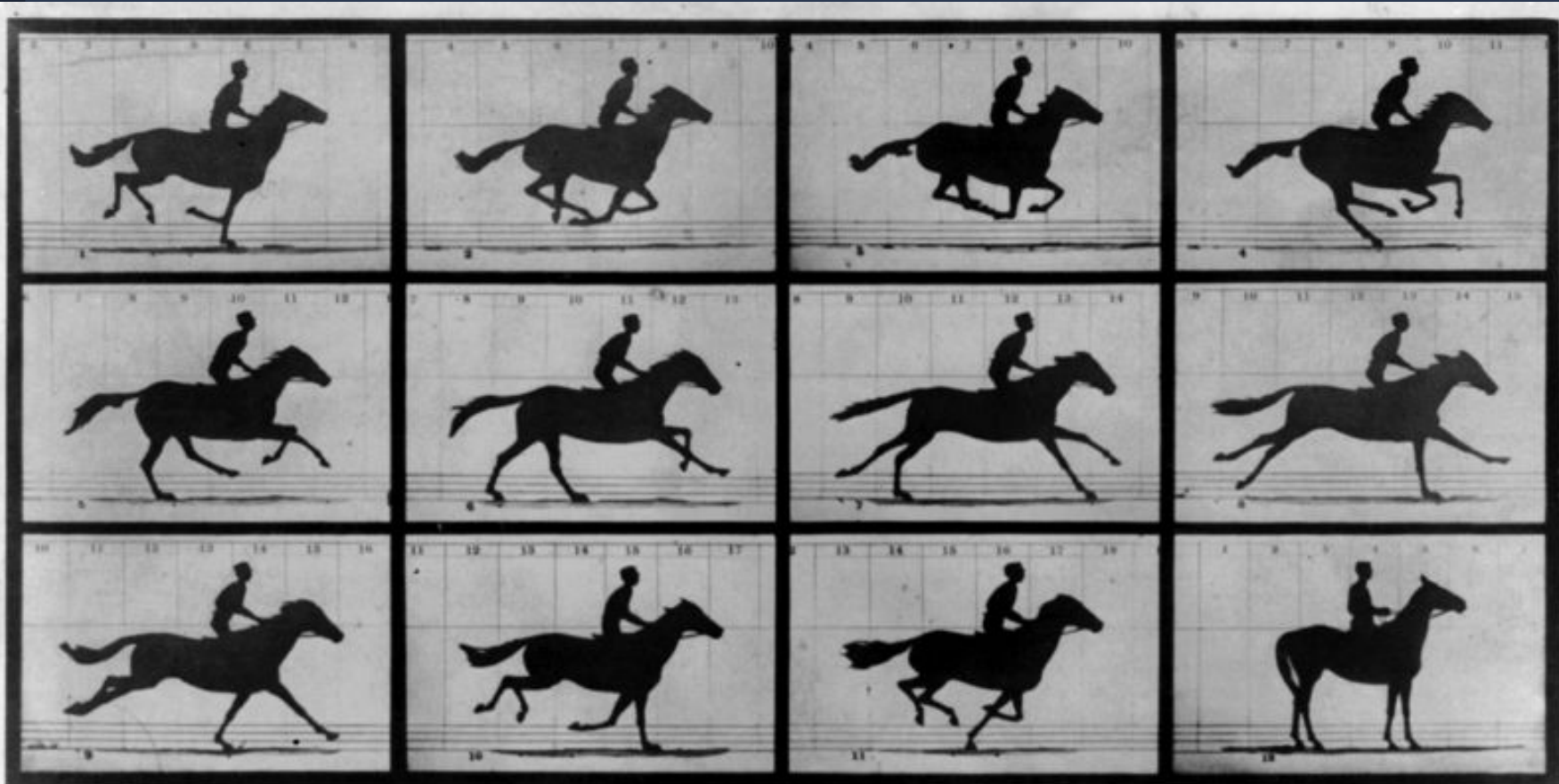
● 1837

● 1841

● 1861

● 1868

● 1878



Copyright, 1878, by MUYBRIDGE.

MORSE'S Gallery, 417 Montgomery St., San Francisco.

THE HORSE IN MOTION.

Illustrated by
MUYBRIDGE.

AUTOMATIC ELECTRO-PHOTOGRAPH.

"SALLIE GARDNER," owned by LELAND STANFORD; running at a 1.40 gait over the Palo Alto track, 19th June, 1878.

The negatives of these photographs were made at intervals of twenty-seven inches of distance, and about the twenty-fifth part of a second of time; they illustrate consecutive positions assumed in each twenty-seven inches of progress during a single stride of the mare. The vertical lines were twenty-seven inches apart; the horizontal lines represent elevations of four inches each. The exposure of each negative was less than the two-thousandth part of a second.

A Brief History of Images



The Leica, the 35mm format in still photography.

The photographic film is cut into strips 35 millimeters wide.

- 1544
- 1568
- 1816
- 1826
- 1837
- 1841
- 1861
- 1868
- 1878
- 1925

A Brief History of Images



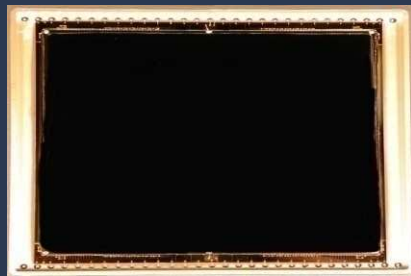
Edwin H. Land



Poloroid instant image camera

- 1544
- 1568
- 1816
- 1826
- 1837
- 1841
- 1861
- 1868
- 1878
- 1925
- 1948

A Brief History of Images



Silicon Image Detector, 1973



● 1544

● 1568

● 1816

● 1826

● 1837

● 1841

● 1861

● 1868

● 1878

● 1925

● 1948

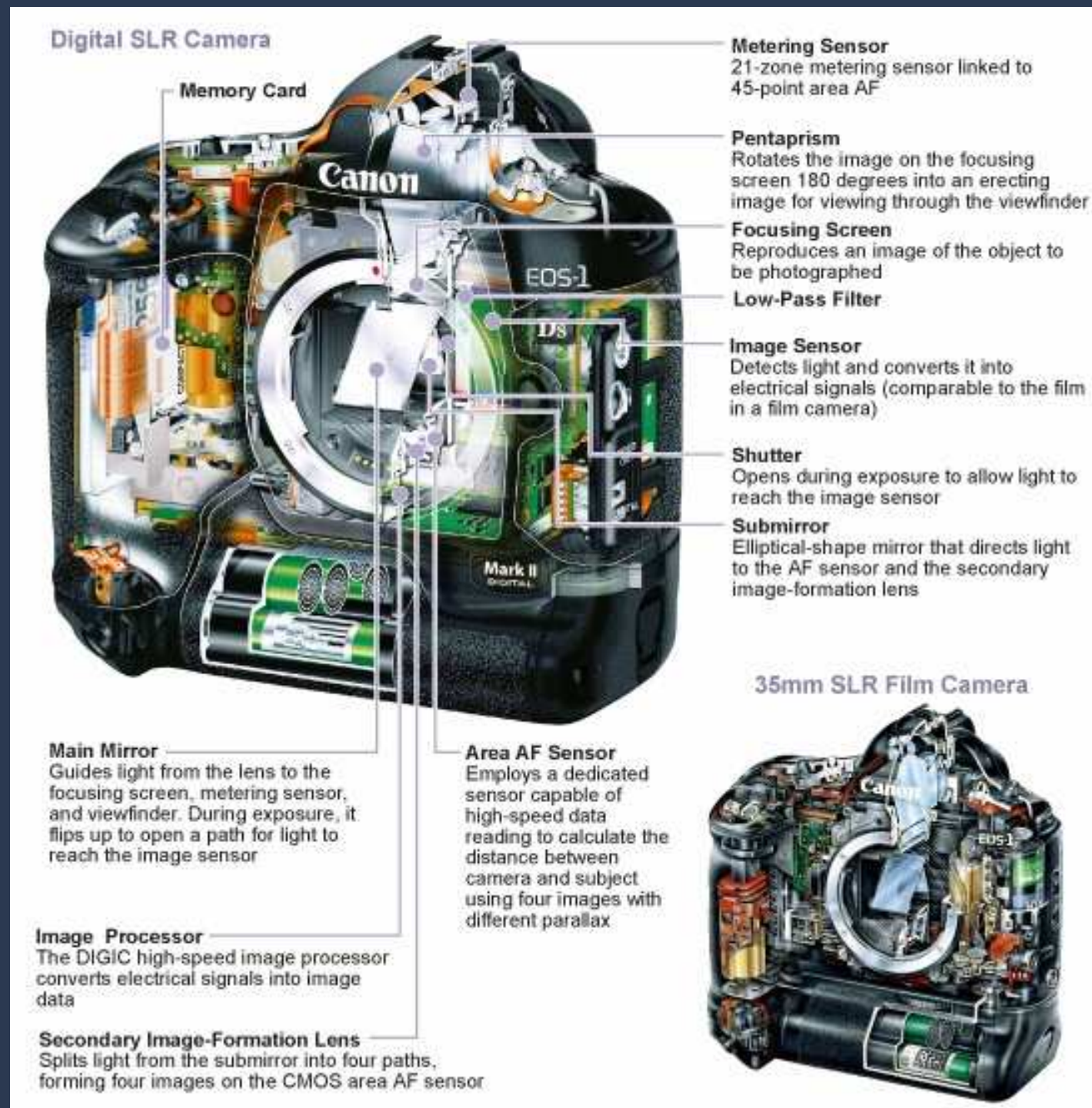
● 1973

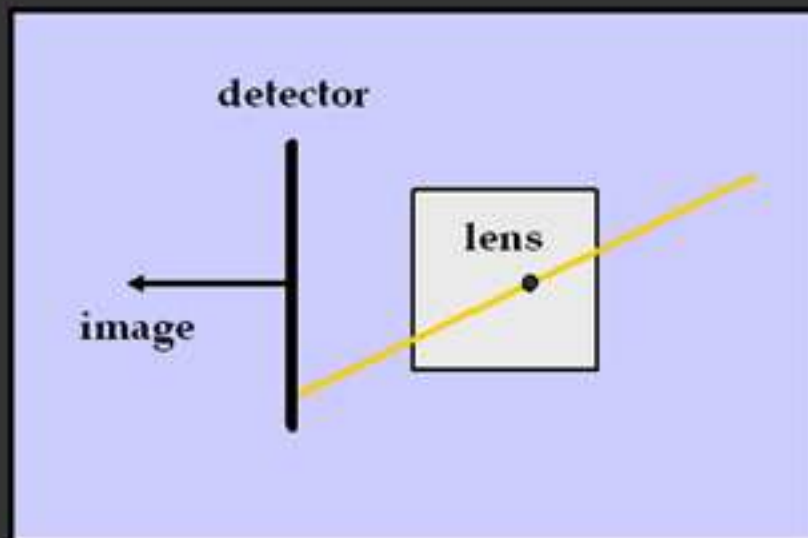
A Brief History of Images



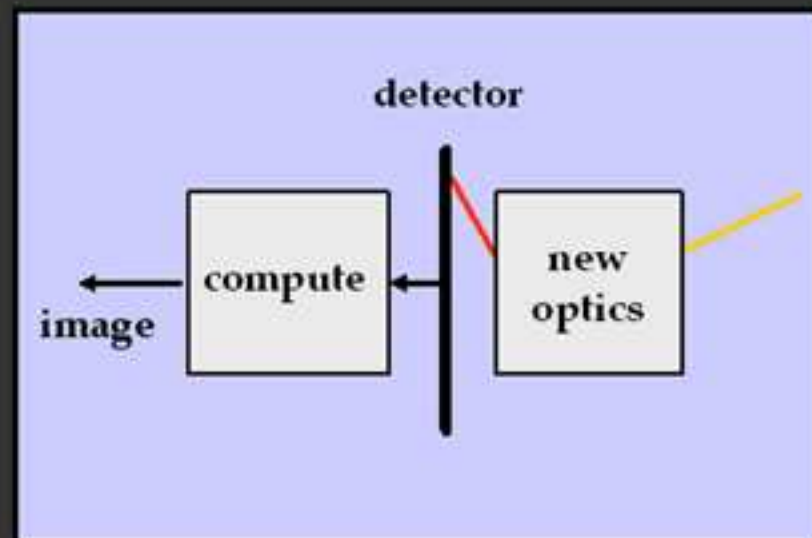
Digital Cameras

- 1544
- 1568
- 1816
- 1826
- 1837
- 1841
- 1861
- 1868
- 1878
- 1925
- 1948
- 1973
- 1995

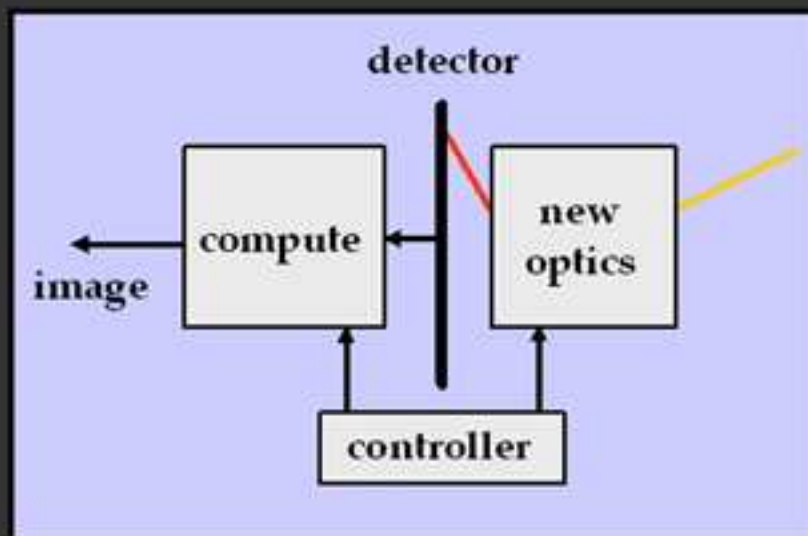




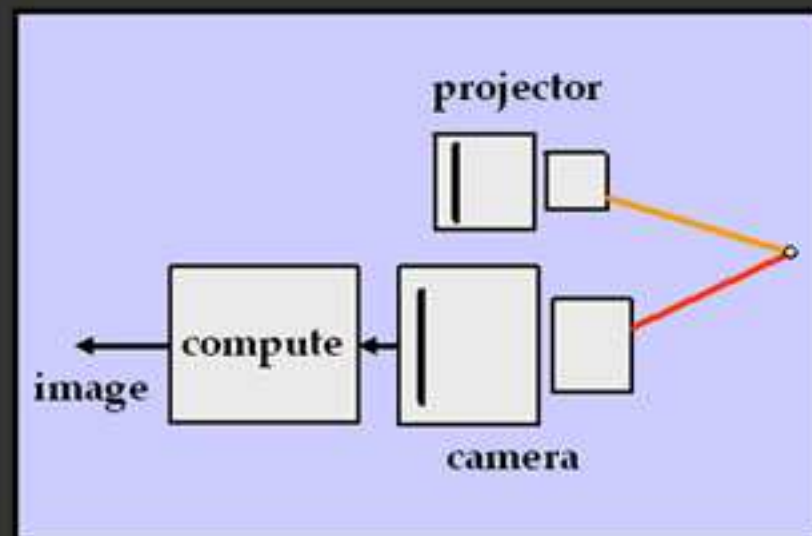
Traditional Camera



Computational Camera



Programmable Imaging



Programmable Flash

Goals

- Focus on understanding concepts in computational imaging
 - Thinking beyond pixels in ray-space
 - 4D Lightfield, Plenoptic Sampling
 - New ways of sampling the visual world
 - Multiplexing
 - Modifying the capture process to simplify the problem
 - Motion blur, Defocus blur
 - Using reconstruction algorithms and priors
 - Compressive Sensing
- What we will not cover
 - Traditional image processing, photo manipulations & editing

Schedule

Introduction	Narasimhan, 10 mins
Assorted Pixels	Narasimhan, 20 mins
Coding and Modulation in Cameras	Agrawal, 45 mins
Break	10 min
Light Fields and Applications	Mohan, 60 mins
Break	10 min
Computational Illumination	Narasimhan, 45 mins
Future Trends	Agrawal, 15 mins
Discussion	