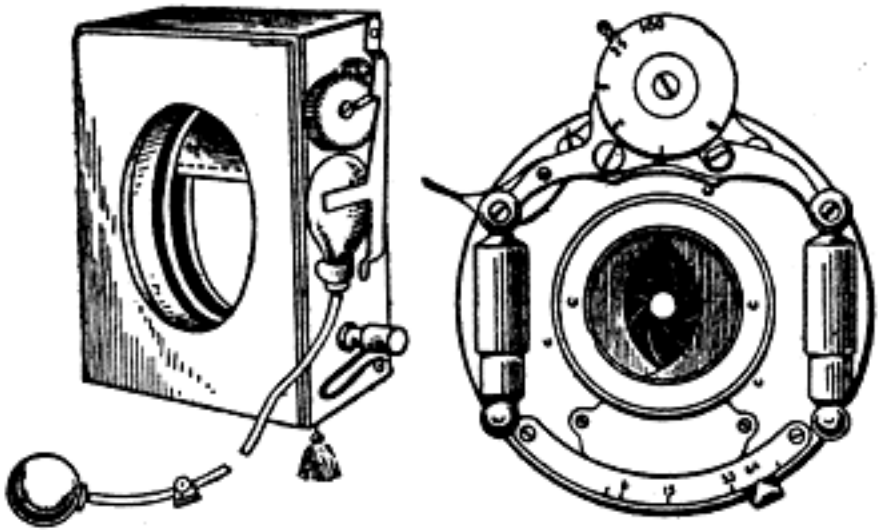
Time vs. space

SHORTENING THE FOCUS (*See* "Focus Adjuster" and "Supplementary Lenses.")

SHUTTERS (Fr., *Obturateurs*; Ger., *Verschlüsse*)

Mechanical devices for exposing the plate. Their use is necessitated by the fact that exposures shorter than one-quarter of a second cannot be given by hand, nor even that without risk of



A. Roller-blind Shutter **B.** Diaphragm Shutter

Exposure: the shutter

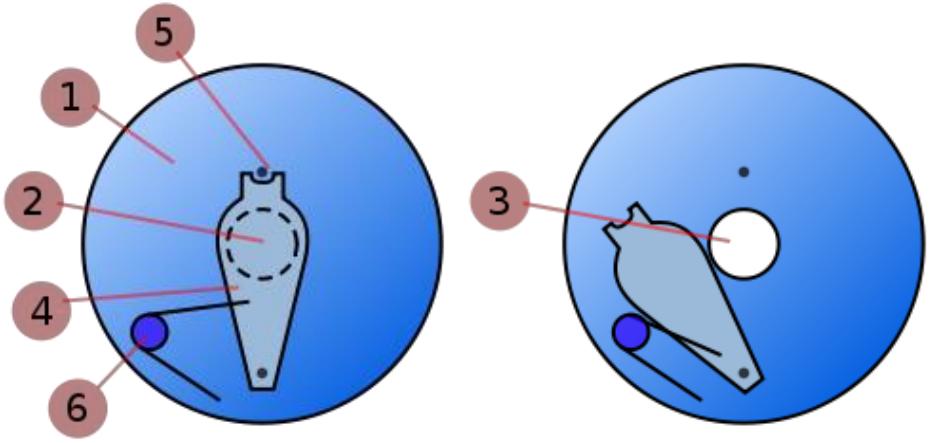
When we record an image we expose the sensitive medium to radiation (light).

Typically this happens through opening and closing a shutter.

There are several types of shutters, and they can be in the lens (central shutter), or at the focal plane (focal plane shutter).

- Leaf shutters
- Diaphragm shutters
- Rotary disc shutter

In early photography the shutter was the lenscap…

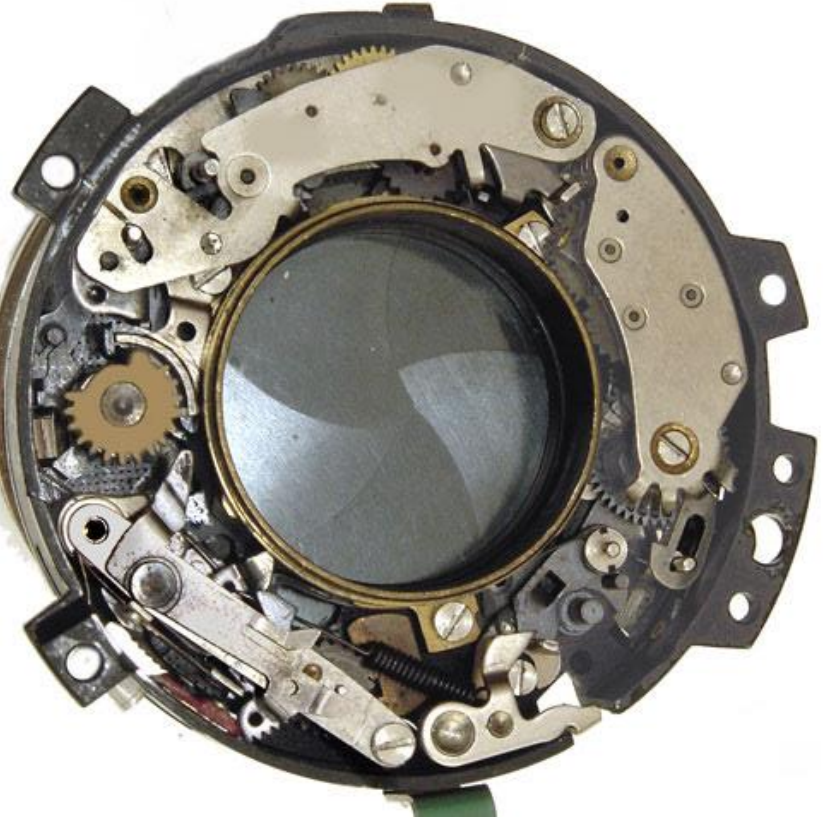


1. Shutter plate
2. Aperture covered by leaf shutter
3. Aperture during exposure
4. Leaf blade
5. Catch mechanism
6. Butterfly spring

Leaf shutter

A *leaf shutter* is a type of camera shutter consisting of a mechanism with one or more pivoting metal leaves which normally does not allow light through the lens onto the film, but which when triggered opens the shutter by moving the leaves to uncover the lens for the required time to make an exposure, then shuts.

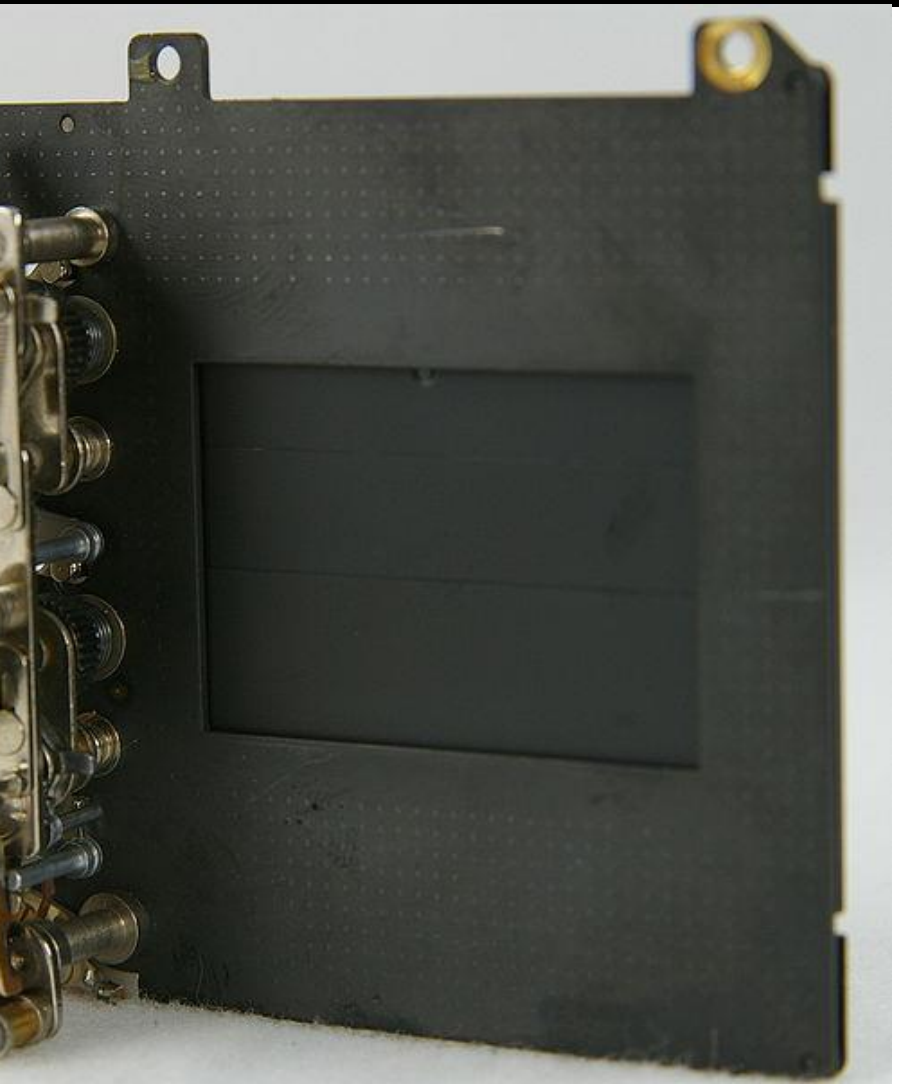
Today often found in disposable cameras.



Diaphragm shutter

A diaphragm shutter is a type of leaf shutter consisting of a number of thin blades which briefly uncover the camera aperture to make the exposure. The blades slide over each other in a way which creates a circular aperture which enlarges as quickly as possible to uncover the whole lens, stays open for the required time, then closes in the same way.

The larger the number of blades, the more accurately circular is the aperture. An odd number of blades is usually used: 3, 5, or more.



Curtain shutter

The traditional type of focal-plane shutter in 35 mm cameras, pioneered by Leitz, the camera company that makes the Leica, uses two shutter curtains, made of opaque rubberized fabric, that run horizontally across the film plane.

For slower shutter speeds, the first curtain opens (usually) from right to left, and after the required time with the shutter open, the second curtain closes the aperture in the same direction.

When the shutter is cocked again the shutter curtains are moved back to their starting positions, ready to be released.

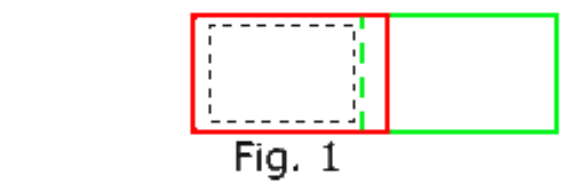


Fig. 1

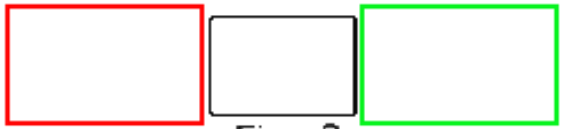


Fig. 2

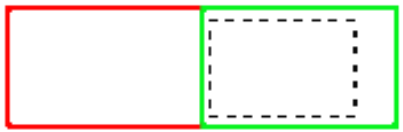


Fig. 3

Slow shutter speed

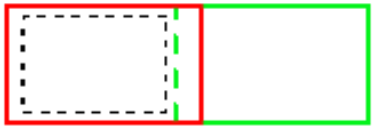


Fig. 1

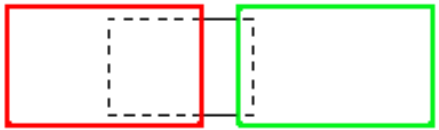


Fig. 2

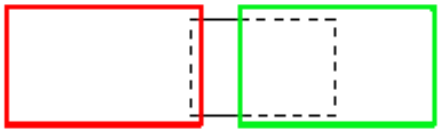


Fig. 3

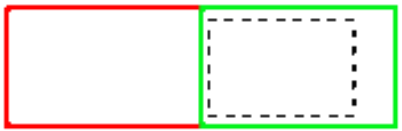
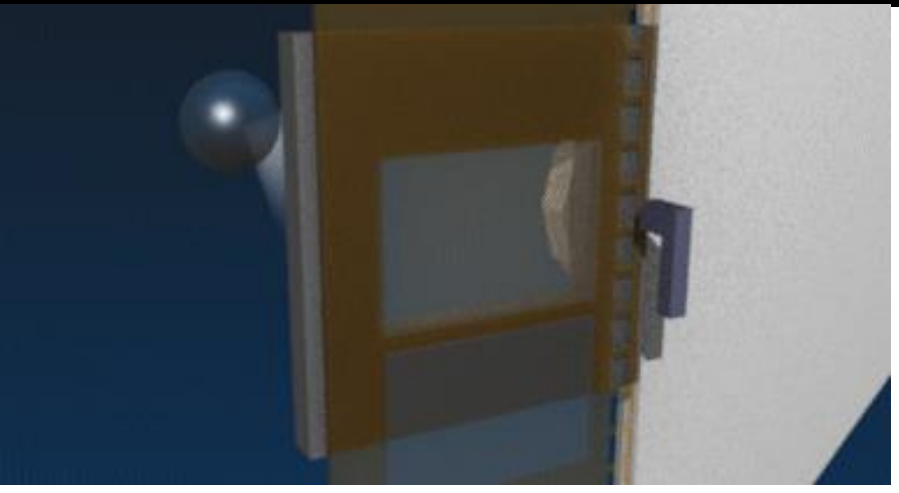
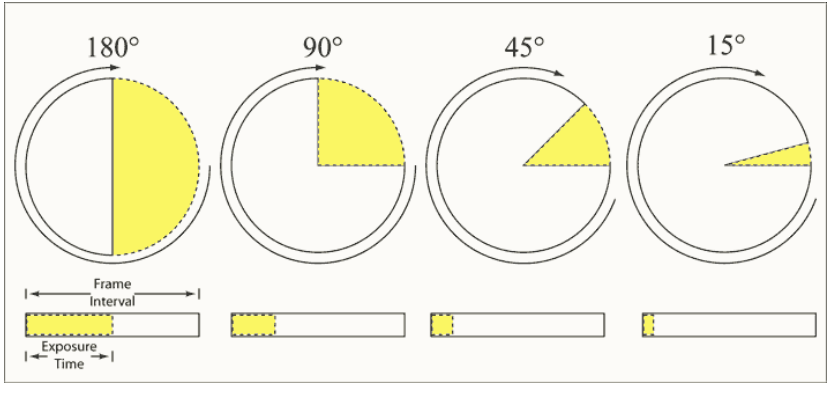


Fig. 4

Fast shutter speed





Rotary shutter disc

Rotary discs are semicircular mirrors which rotate in front of the film gate, and thus expose the film. As the mirror spins it reflects the image onto the ground glass so that it can be viewed by the camera operator part of the time. The other part of the time the mirror allows the light to pass onto the film.

On simple cameras this shutter is fixed and usually semi-circular. On more advanced cameras the shape of the shutter can be adjusted. This shutter setting is referred to as the **shutter angle**.

PZI MD&C PROTOTYPING SESSION: TIME / SLITSCAN

Electronic shutter

Videocameras usually don’t have a real shutter mechanism – but there is still a certain amount of time that the sensor chip records the image.

Rolling shutter

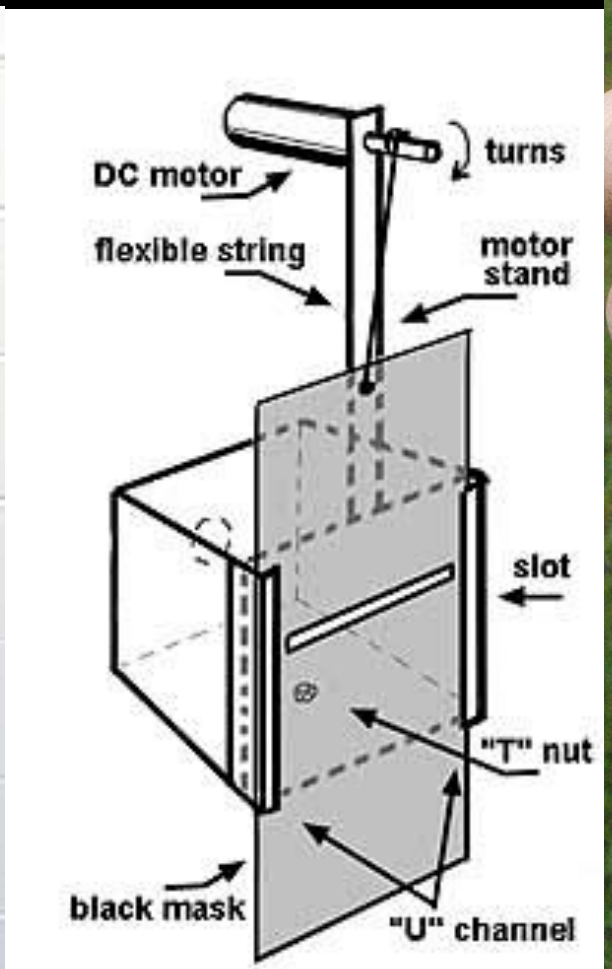
In CMOS chips the sensor is ‘read’ top to bottom (rolling shutter). If the ‘integration time’ is too slow, you get what is called “jellocam”.

http://www.youtube.com/watch?v=7gPNANM8b5U

PZI MD&C PROTOTYPING SESSION: TIME / SLITSCAN

Slitscan photography

The **slit-scan photography** technique is a photographic and cinematographic process where a moveable slide, into which a slit has been cut, is inserted between the camera and the subject to be photographed.


DC motor
turns
flexible string
motor stand
slot
"T" nut
black mask
"U" channel

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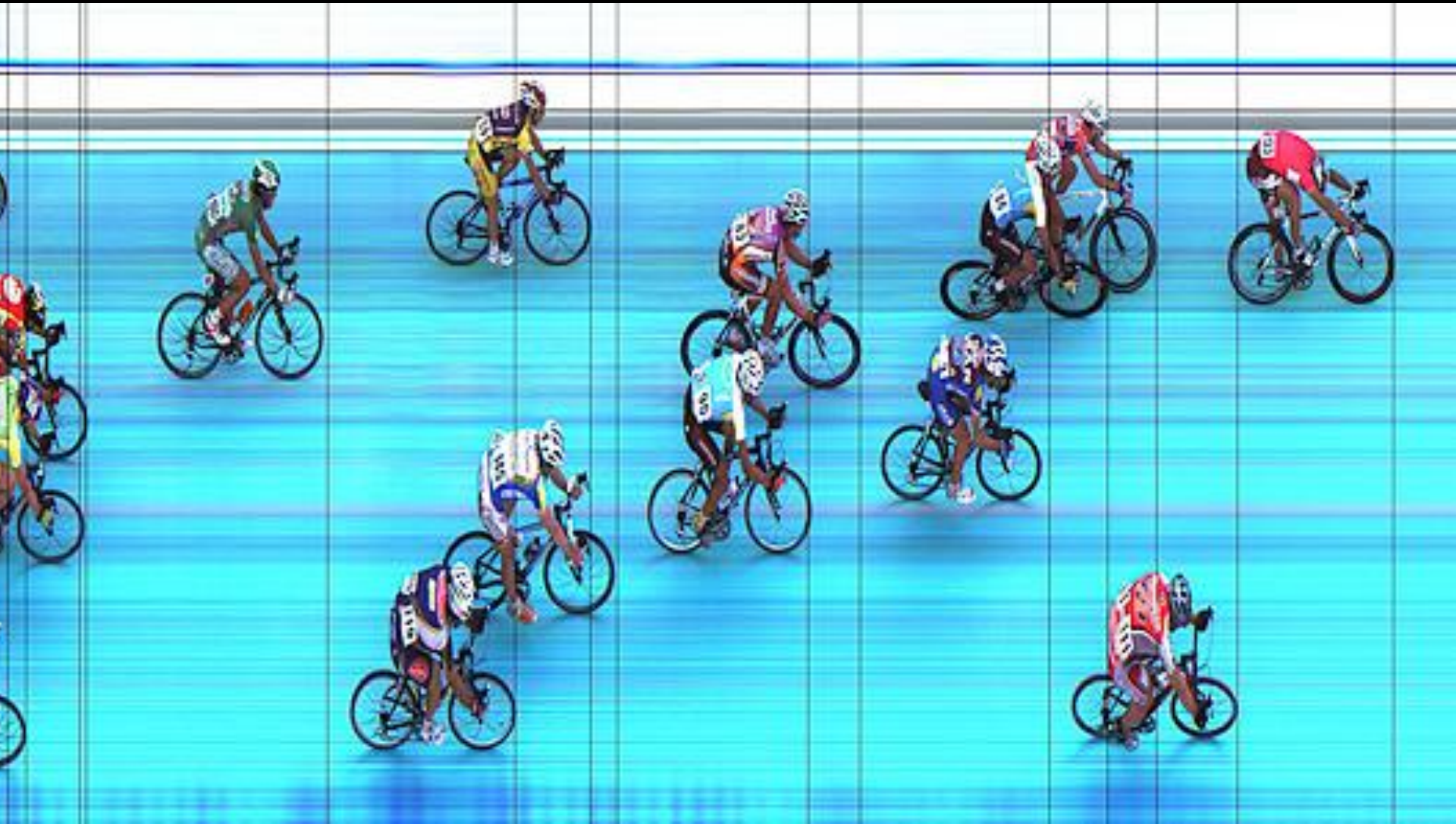

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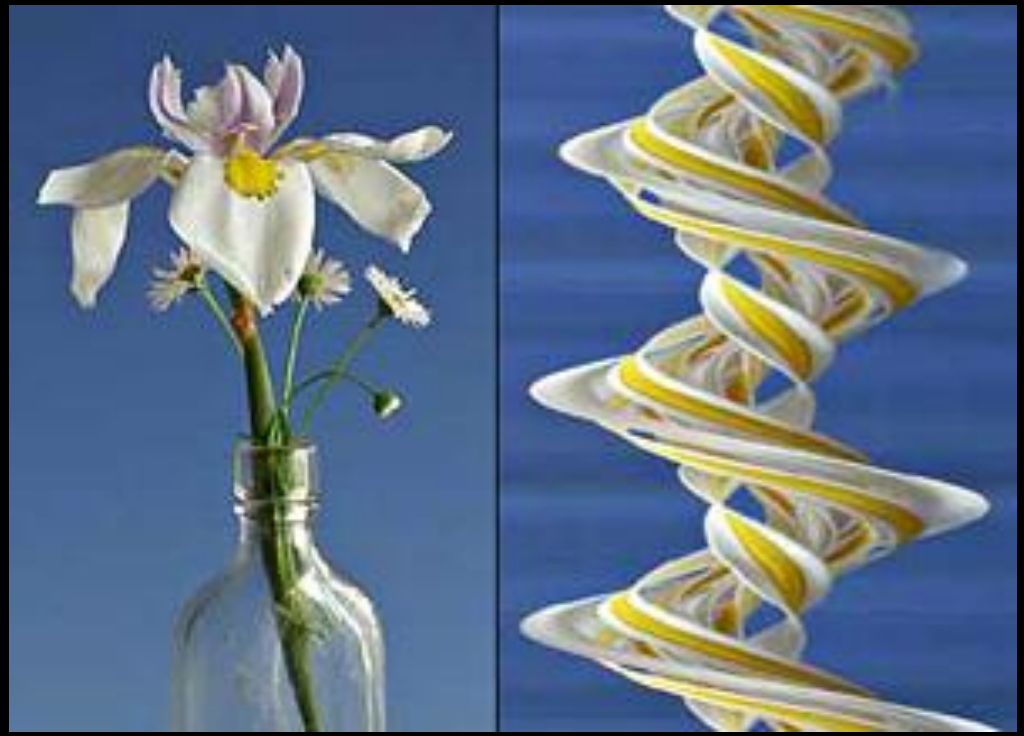

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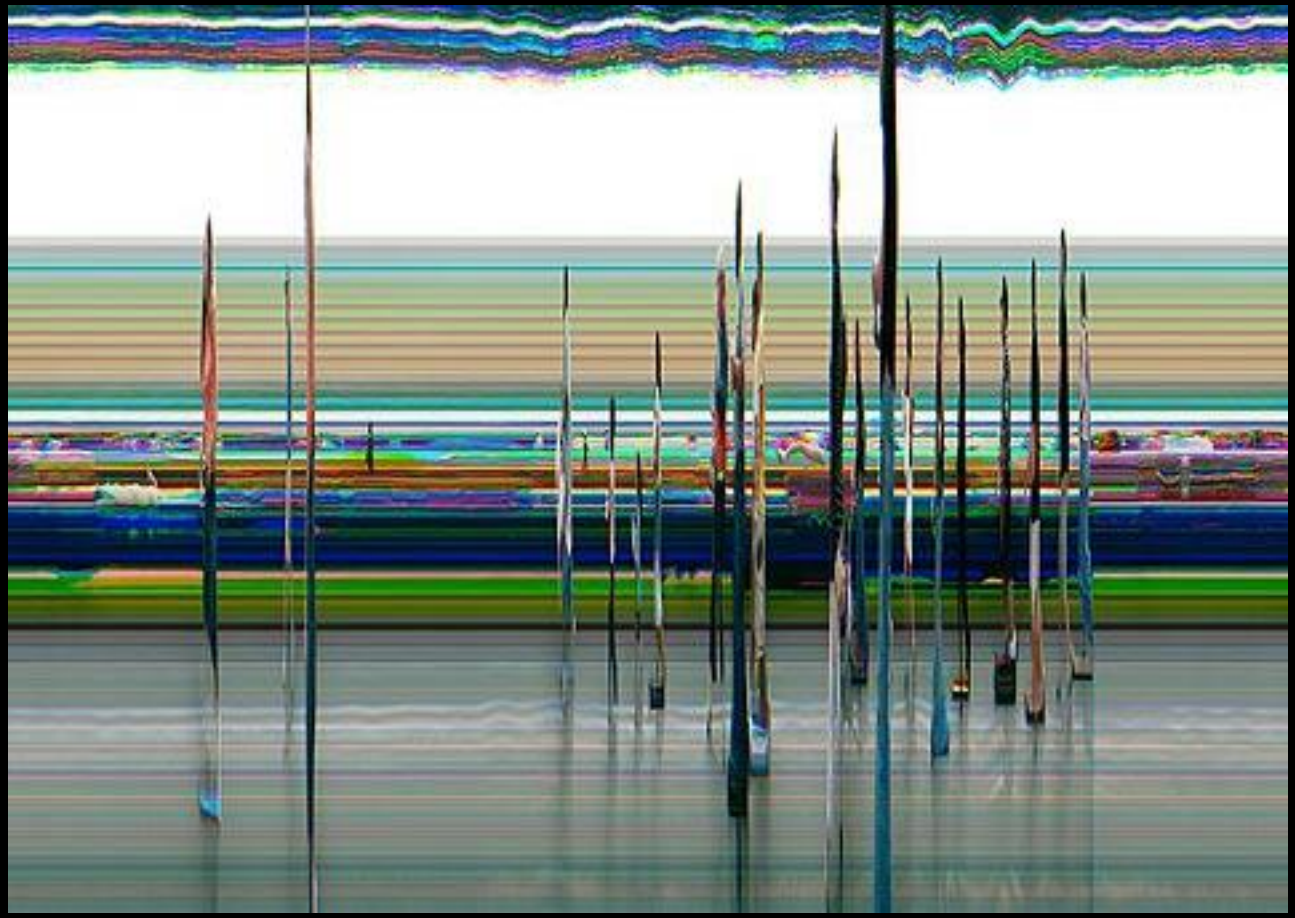

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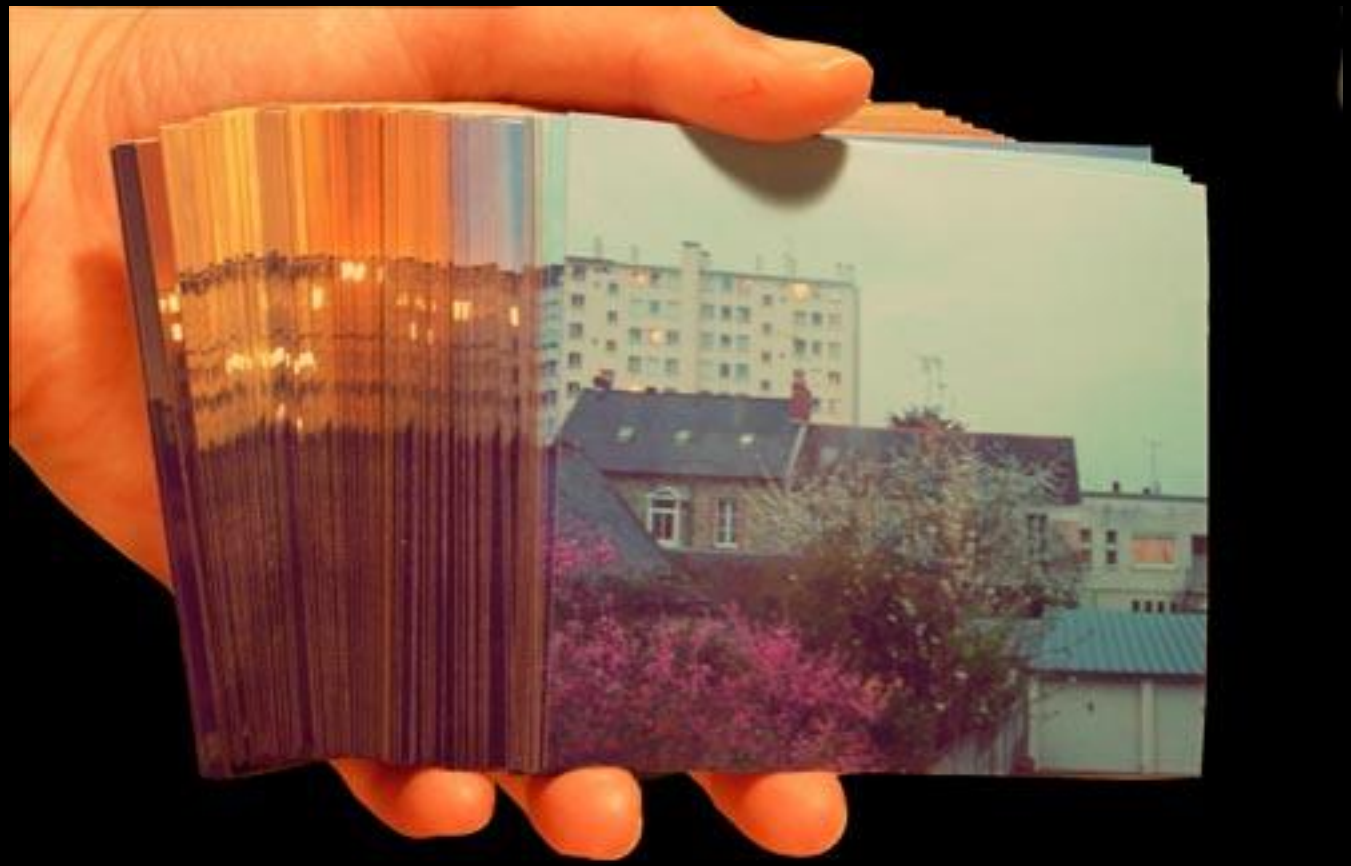
http://vimeo.com/7866

http://www.youtube.com/watch?v=OSOiX-CQ39E

PZI MD&C PROTOTYPING SESSION: TIME / SLITSCAN

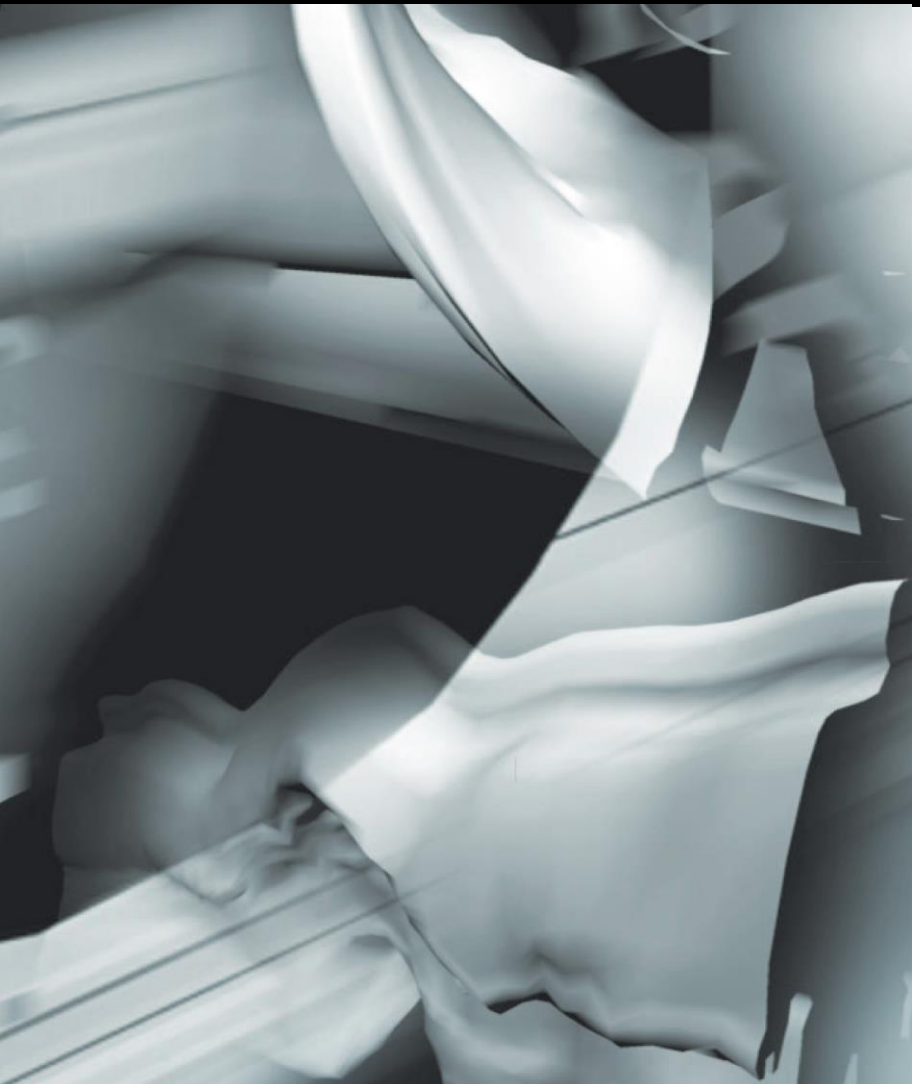


Motion examples

Time displacement experimental video
http://www.youtube.com/watch?v=I2MsDogV4g4

2001 A space odyssey
https://www.youtube.com/watch?v=YbLRzabppus
https://www.youtube.com/watch?v=KhRo2WbWnKU
http://www.underview.com/howscan.html

Unwrapping the 2001 images
http://seriss.com/people/erco/2001/



Timesculptures

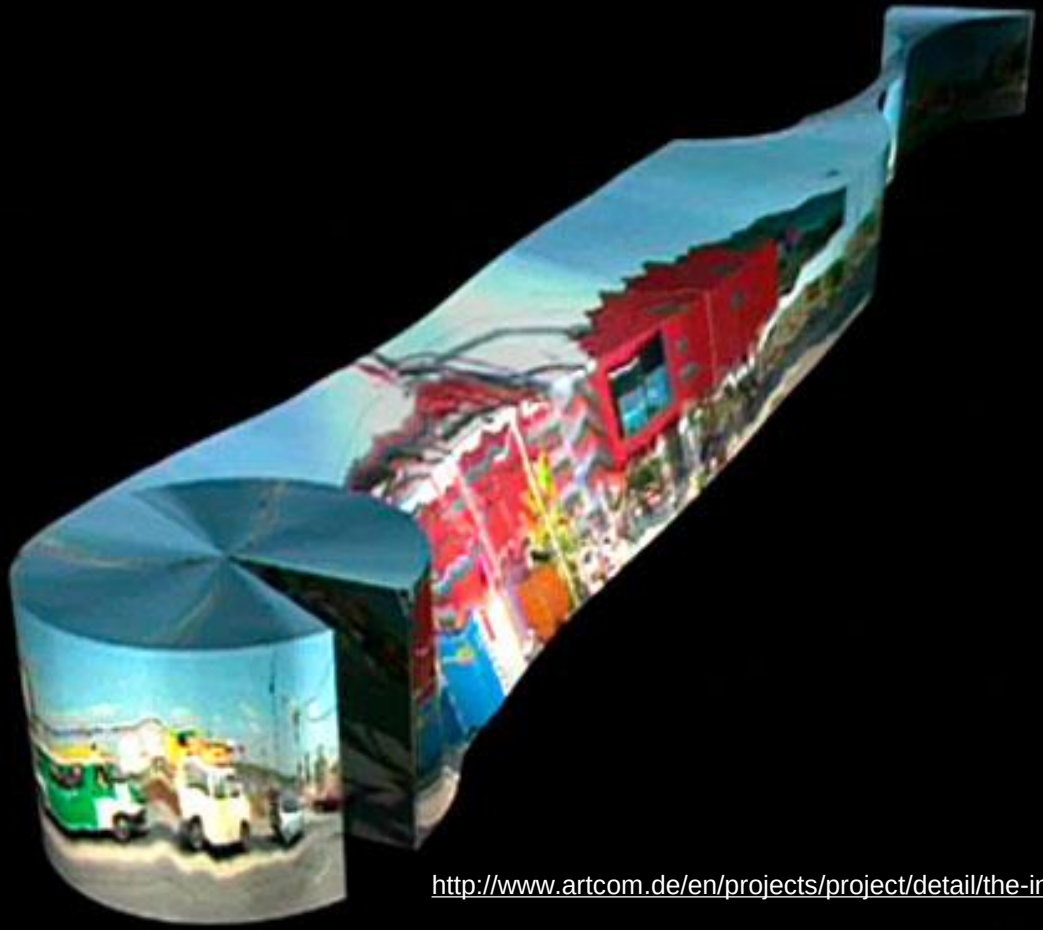
http://www.waliczky.com/pages/demo-videos/Sculptures/Sculptures-demo.htm

http://www.waliczky.com/pages/waliczky_sculptures1.htm

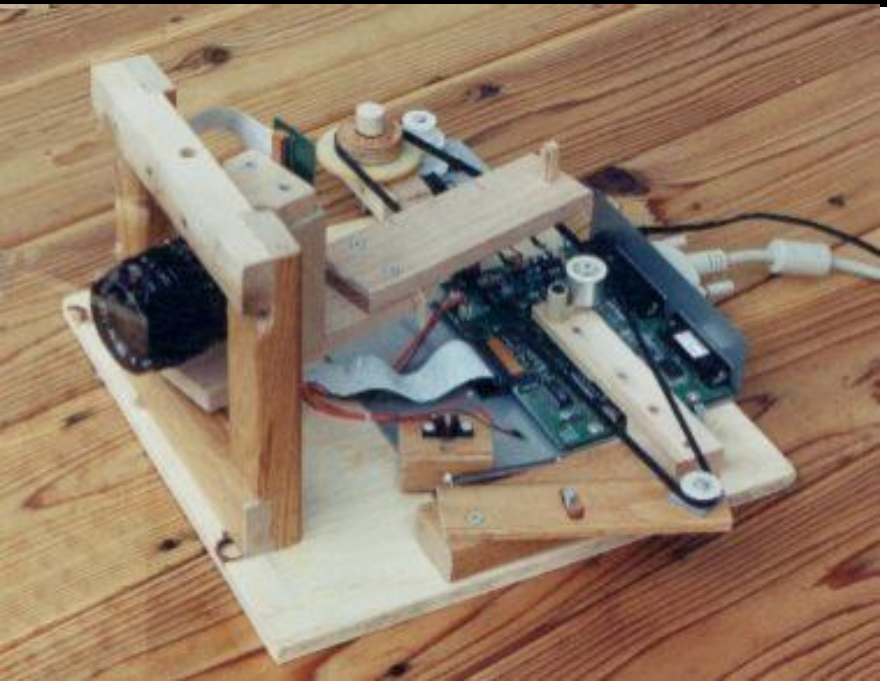
Wegzeit

http://residence.aec.at/wegzeit/

PZI MD&C PROTOTYPING SESSION: TIME / SLITSCAN



http://www.artcom.de/en/projects/project/detail/the-invisible-shape-of-things-past/



DIY scanner cameras

http://www.wired.com/gadgetlab/2008/11/turn-a-flatbed/

http://www.popsci.com/diy/article/2009-06/old-flatbed-scanner-50mm-lens-amazing-130-megapixel-scancam

http://www.sentex.net/~mwandel/tech/scanner.html

Software options

Today it is also possible to use software to displace pixels in time.

Waveslice

http://vimeo.com/1398634

TX-transform

http://www.youtube.com/watch?v=_dLqlbSq428

Further reading

http://www.flong.com/texts/lists/slit_scan/