Montage at Siggraph

UCSD Photonics

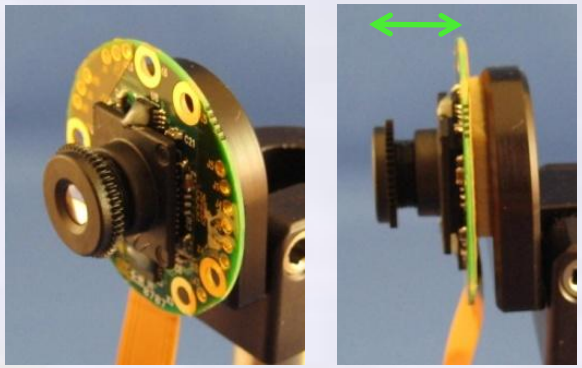
Week-long live technology demonstration, at invitation of Walt Disney Animation Studios

This new class of imagers was developed under the MONTAGE program of the US Defense Advanced Research Projects Agency (DARPA). The resulting prototypes have yielded images comparable to images provide by much larger commercial "compact" cameras.

Conventional Low-Profile Mini Lens

UCSD Photonics

Low Resolution and Thin



Marshall Electronics Low profile Miniature Lens V-4106ID
& Forza/Sunplus 1.92 Mpix CMOS sensor

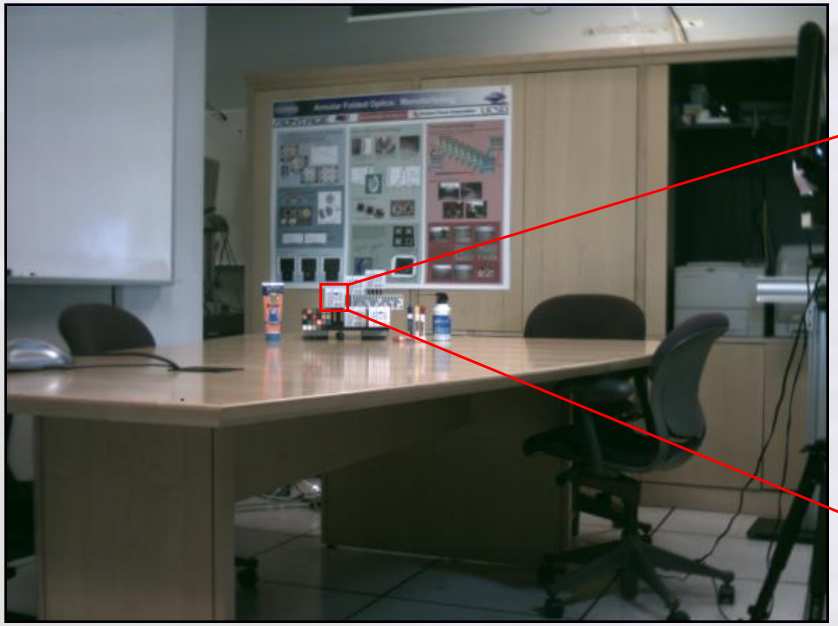
Lens Thickness = 9.4 mm

Focal length = 6 mm
F/2.8
53° full field of view (1600x1200 pixels)

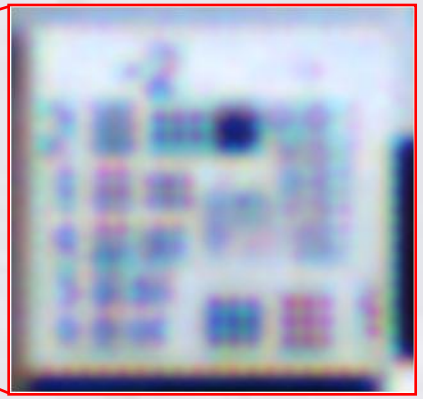
Miniature cameras readily available - just look on your cellphone

Problem: Limited to short focal lengths and small apertures- blurred "digital zoom" images

Full Field (53° over 1.92 Mpixels)



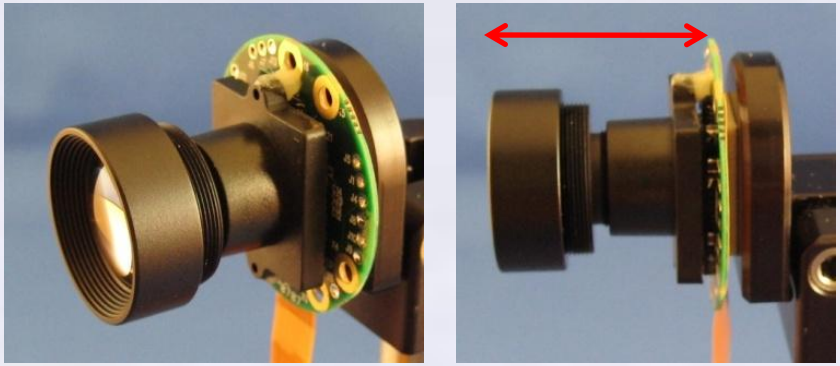
Digital zoom



Conventional Long Focal Length Lens

UCSD Photonics

High Resolution but Thick



Marshall Electronics High Resolution Miniature Glass Lens V-4416.0-1.2-HR
& Forza/Sunplus 1.92 Mpix CMOS sensor

Lens Thickness = 24.3 mm

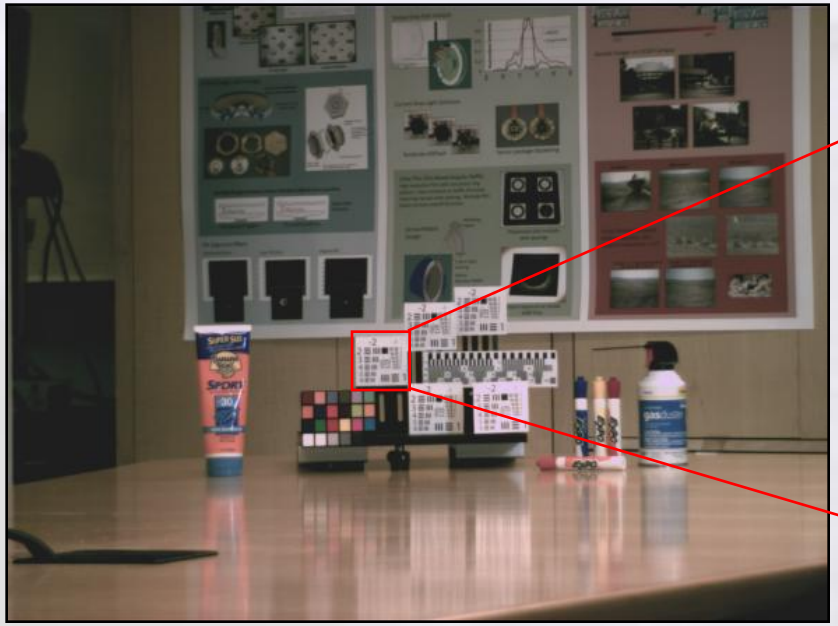
Focal length = 16 mm
F/1.2
21° full field of view (1600x1200 pixels)

Long Focal length provides optical magnification (high resolution)

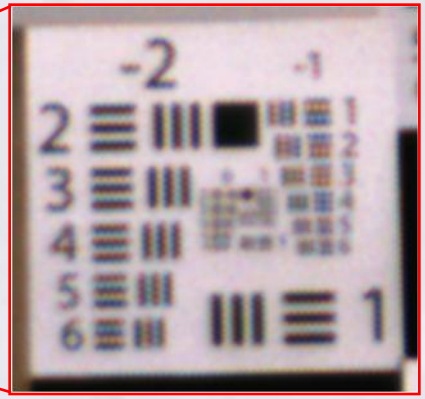
Problem: cannot be fit into short track lengths. Impractical for many applications

A commercial cell phone zoom lens

Full Field (21° over 1.92 Mpixels)



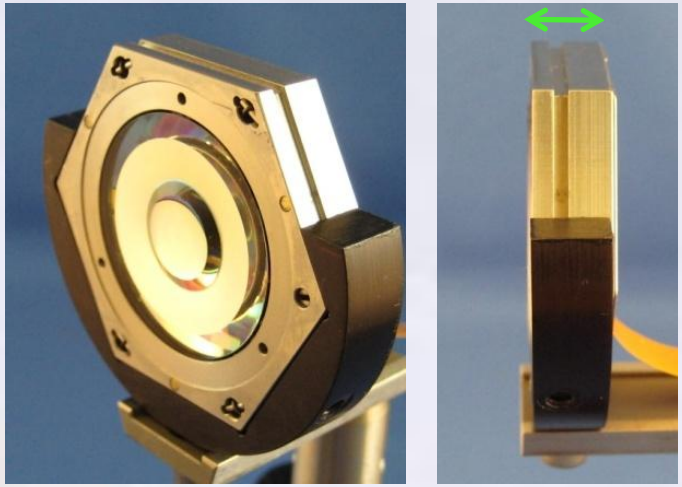
Digital zoom



Ultrathin Four-Reflection Origami Lens

UCSD Photonics

High Resolution and Thin



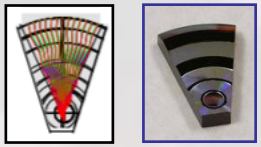
Four-Reflection Origami Lens (Full aperture)
& Forza/Sunplus 1.92 Mpix CMOS sensor

Lens Thickness = 5.5 mm

Focal length = 18.6 mm
F/1.15 (full aperture), F/3 (demo)
17° full field of view (1600 x 1200 pixels)

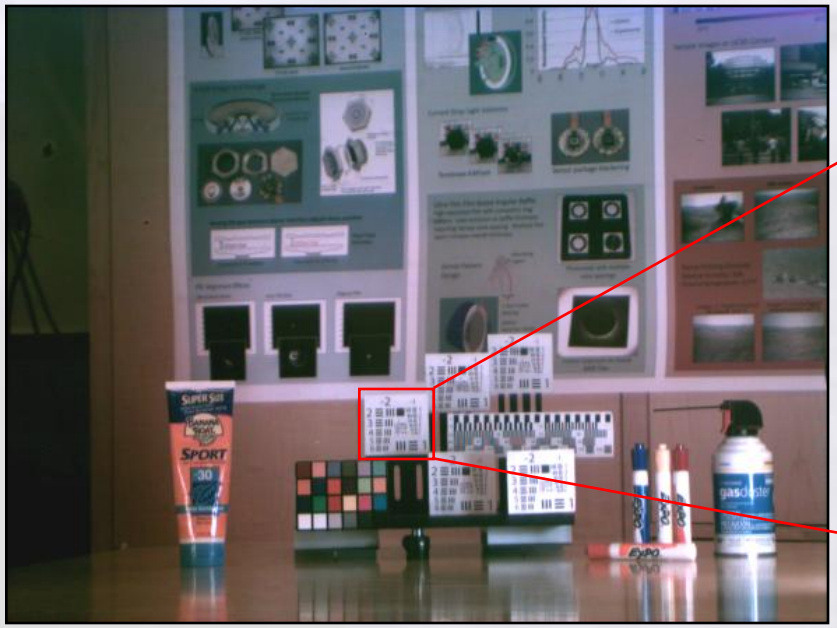
Provides long focal length (magnification) in a short optical track

Can be "sectioned" to further reduce volume and increase depth of field for small portable device applications



50° wedge of an Eight-reflection
Origami Lens

Full Field (17° over 1.92 Mpixels)

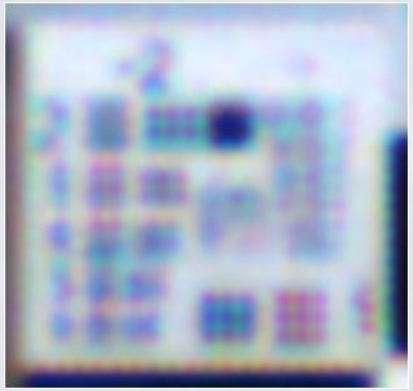


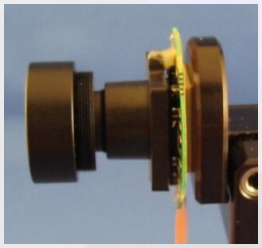
Digital zoom

Comparisons

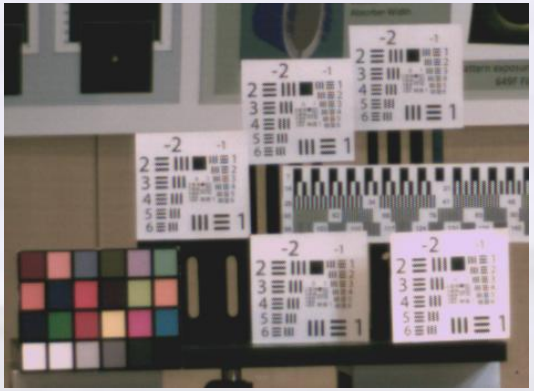
UCSD Photonics

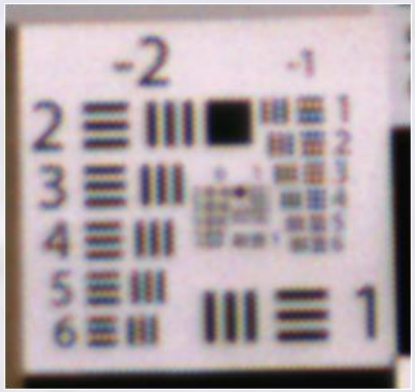
Conventional Mini Lens

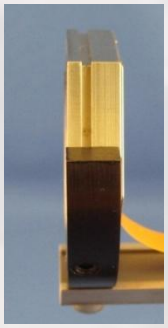




Conventional Long Lens

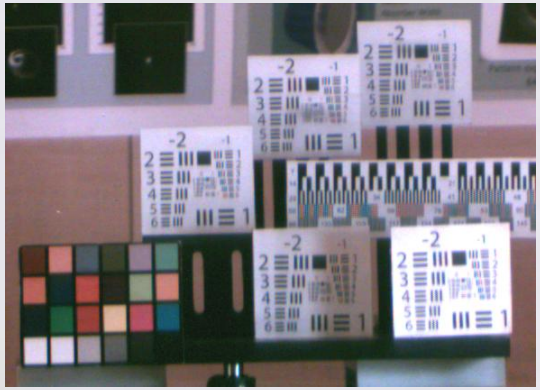




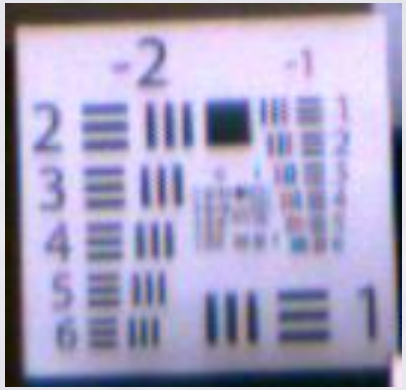


Origami Lens

Full-Field



Digital Zoom #1



Digital Zoom #2