Pixels Everywhere

Media Tech and How it Changed the World

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Transforming Media From Analog to Digital

From Analog to Digital

Traditional media

- Desktop publishing and printing
- Digital audio, music and radio
- Digital photography
- Digital video, HDTV and movies

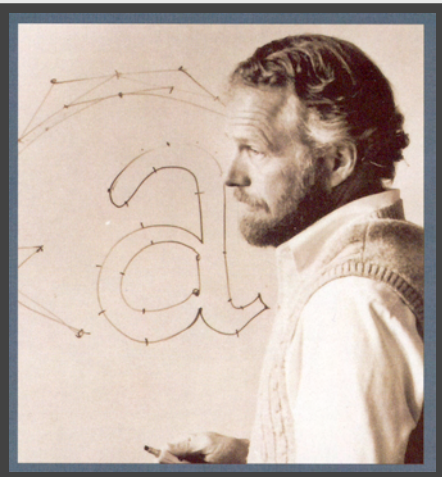
Timelines

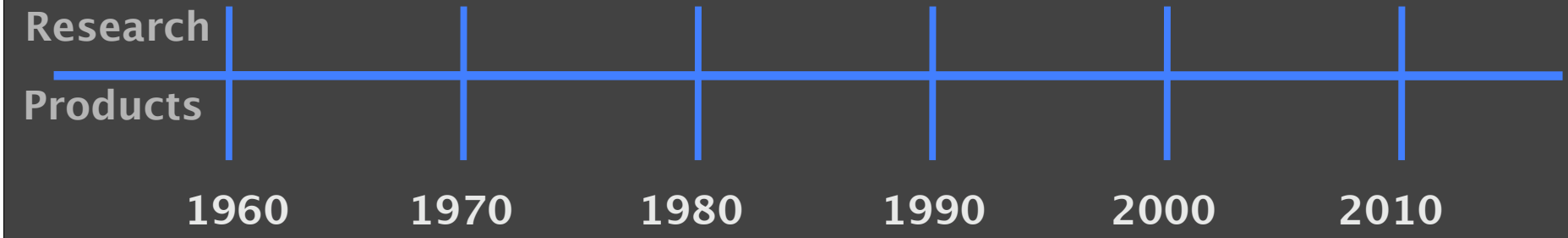
Print

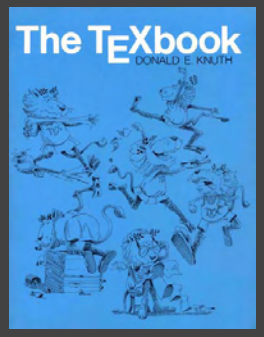
Bezier curve (1962) for outlines

Bravo WYSIWYG text editor (1974)

First laser printer (1969)







Adobe Postscript (1982)

Apple Laserprinter (1985)

Aldus Pagemaker (1985)

Audio

Reed-Solomon codes (1960)

FM Synthesis (1973)

Soundstream restoration of Caruso recordings (1975)

MP3 standard (1991)

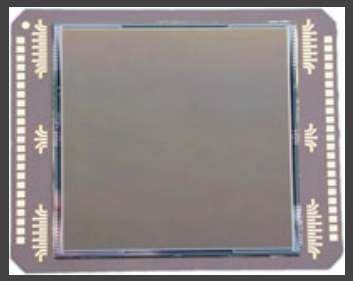
Optical CD (1982)

Apple iPod (2001)

Internet Radio (1990s)

Photography

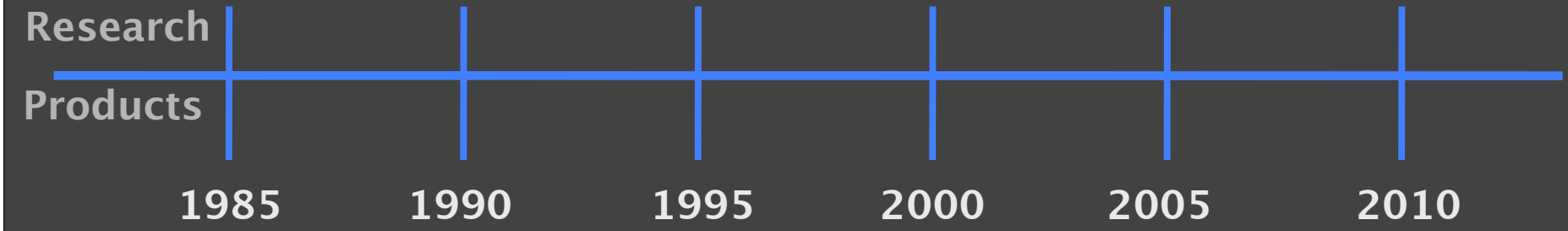
CCD imager (1969)



First digital paint system (1974)

CMOS imager (1993)

Discrete-cosine transform



Adobe Photoshop 1.0 (1990)

Nikon D1 digital SLR (1999)

flickr.com photosharing (2004)

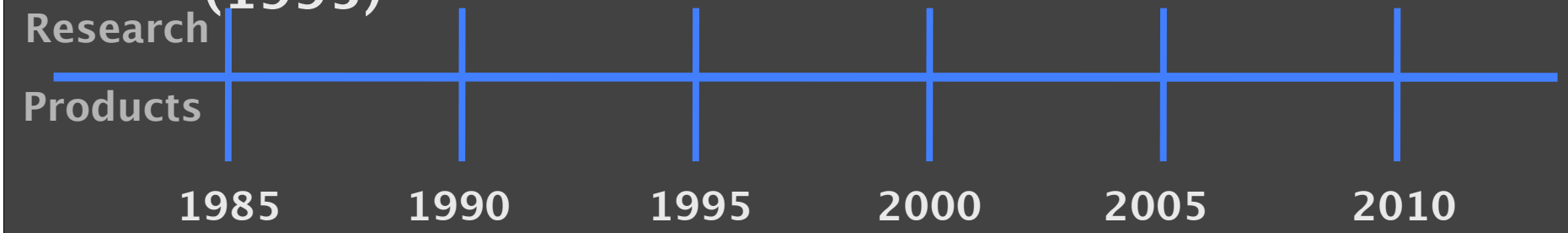
TV and Movies

NHK demo of analog HDTV (1969)

Motion-compensated image compression (-1993)

NSF STC Computer graphics and vis (1991-2002))

First feature-length computer-generated movie (1995)



ATSC standard ratified (1998)

Analog broadcast ends (June 12, 2009)

TIVO time-shifted video (1999)

3D digital projectors

Media & Technology

|Size| of media determines when it was transformed

Media poses science & technology problems

- Storage
  - CD, DVD, Flash
- Networking
  - Gigabyte networks, internet caching
- Processing
  - GPUs, signal and media processors

Invention of New Media

Games

Multimedia computers and media servers

Networked graphics (flash) and the WWW

Sharing music (iTunes), photos (flickr, phototourism), videos (youtube)

Virtual worlds (Google Earth, Second Life, WoW)

Electronic books (Amazon Kindle)

Research Trends

Research Trends

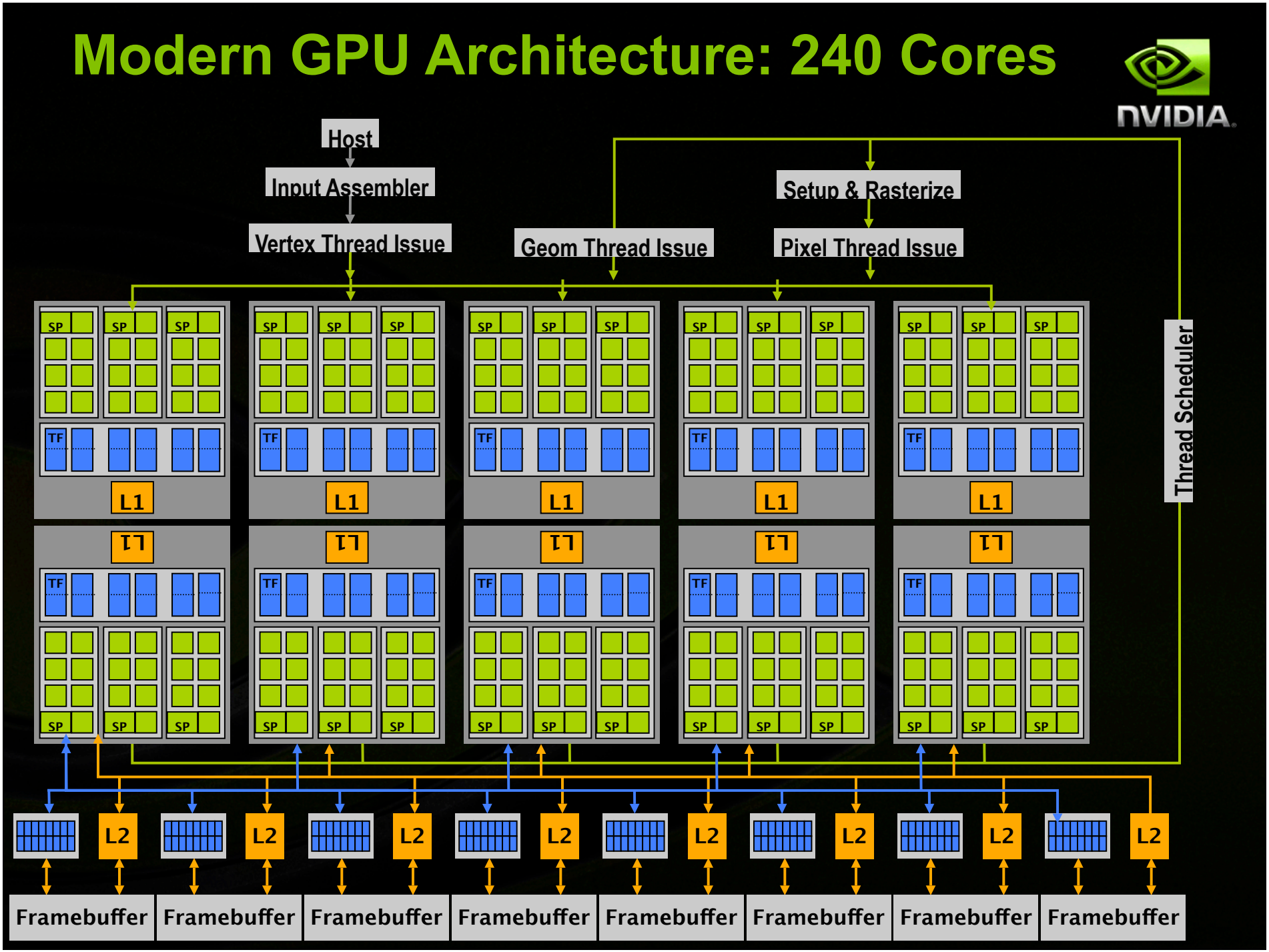
Supercomputers on a chip

Reinventing photography and cameras

Building planetary-scale virtual worlds

New interaction devices

Modern GPU Architecture: 240 Cores



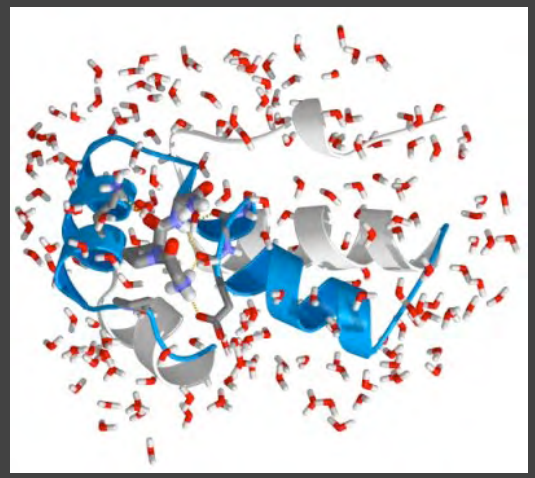
Challenges

Architectures that support 1000s of cores

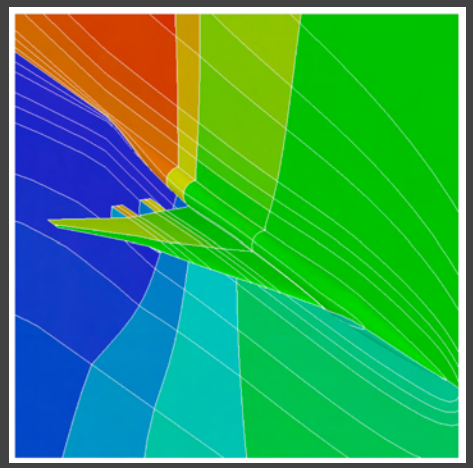
Programming environments for 1000s of cores

Applications beyond graphics and media

One of the most pressing current problems in computer science

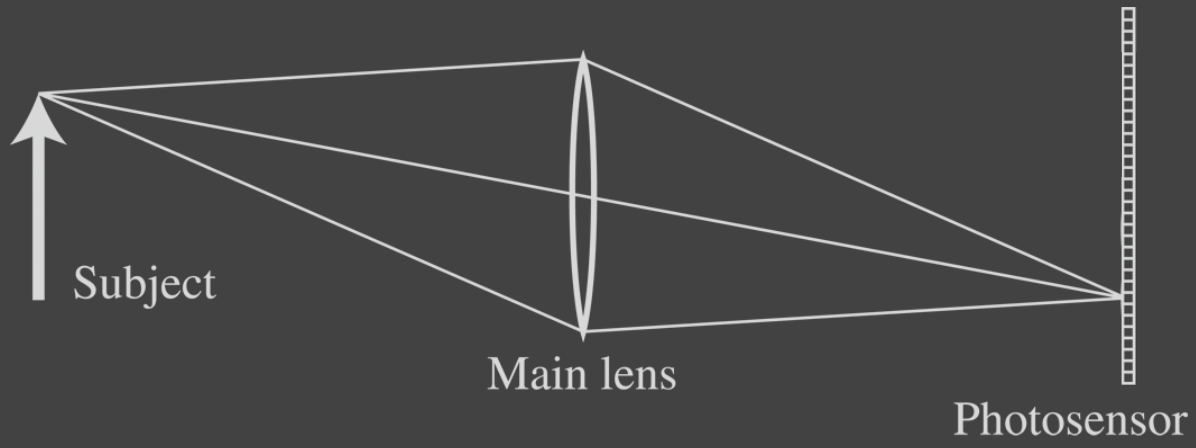


folding@home

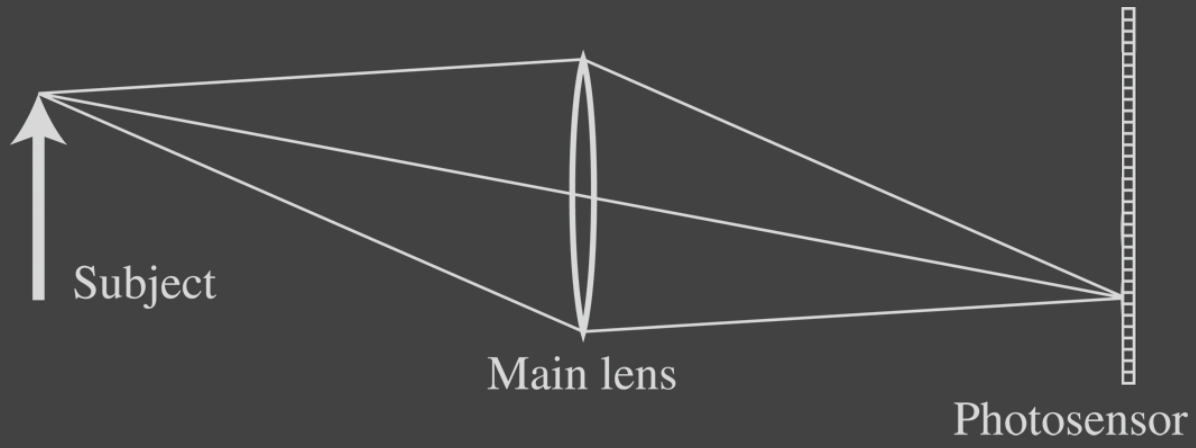


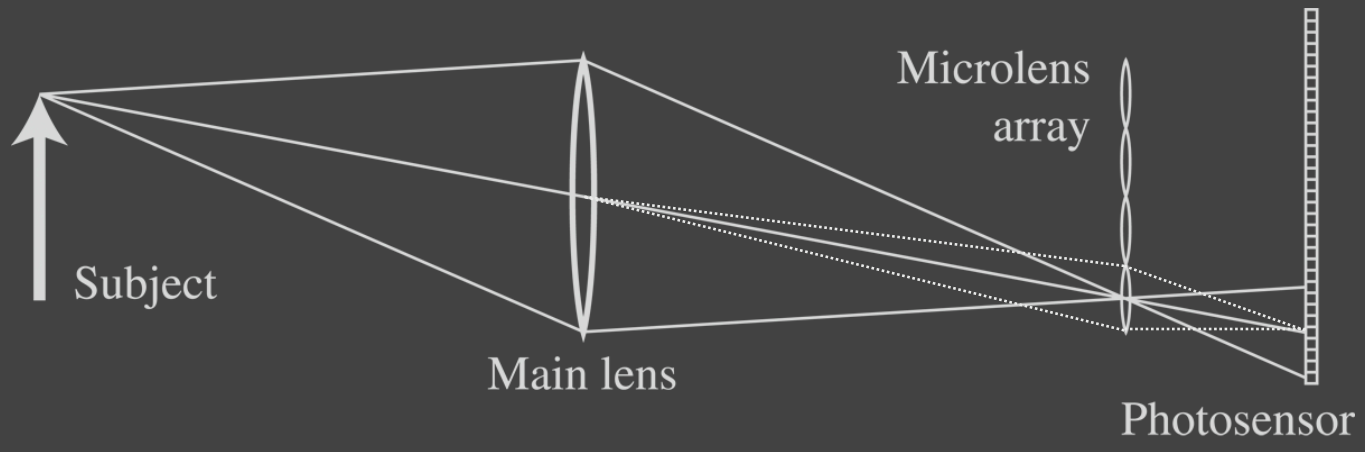
Hypersonic vehicle

From Glass to Digital Lenses

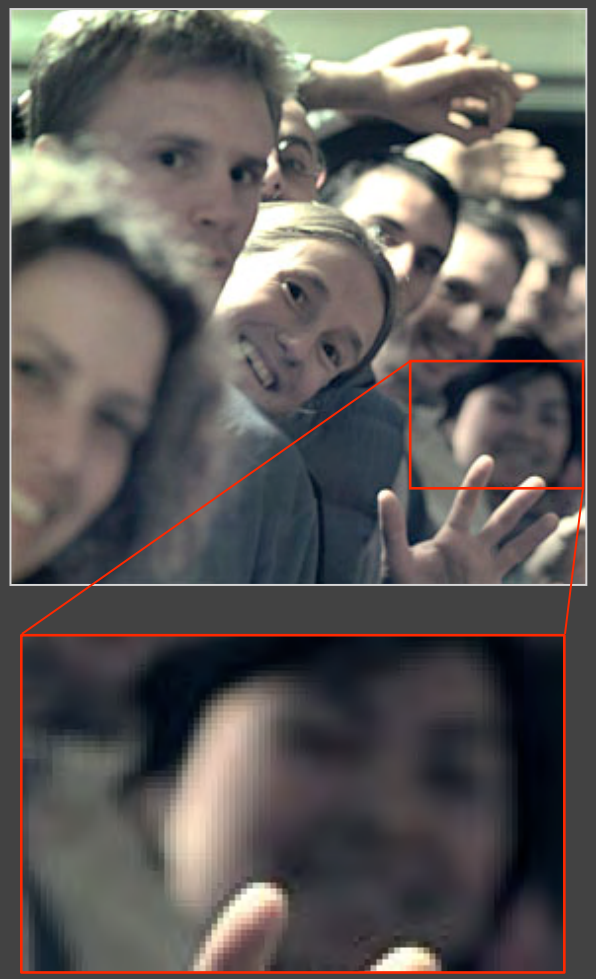


From Glass to Digital Lenses

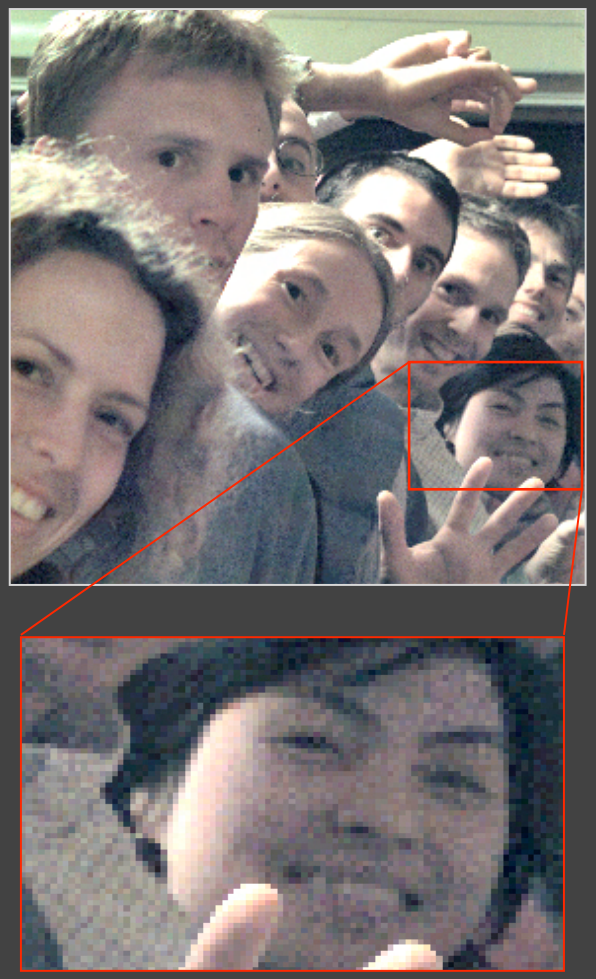




Focus in Software



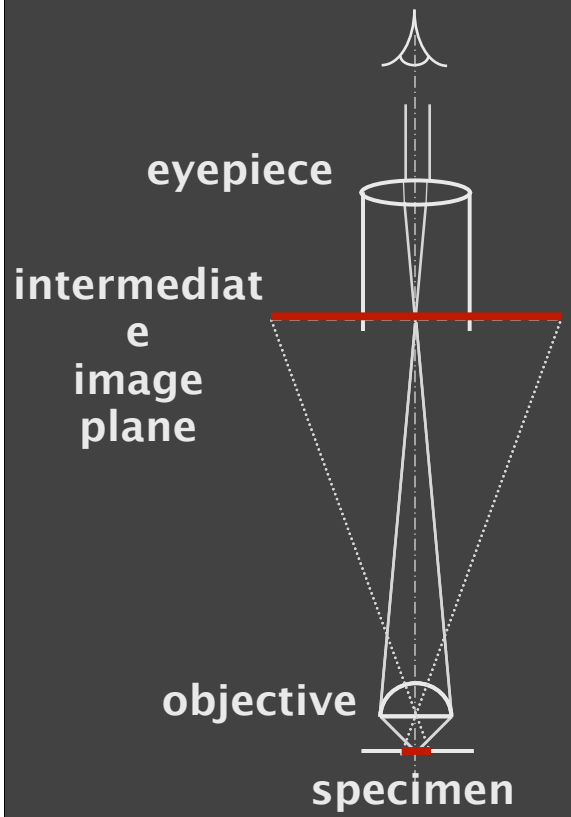
conventional photograph,
main lens at f / 4

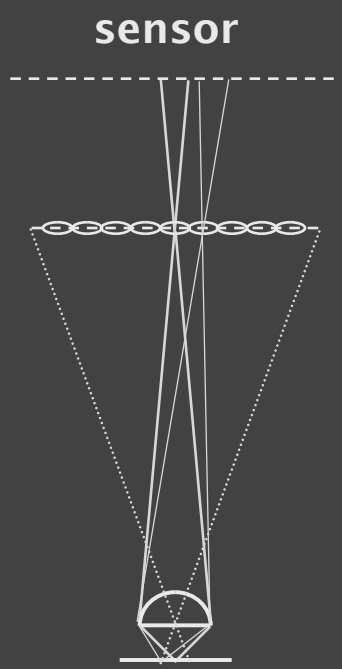


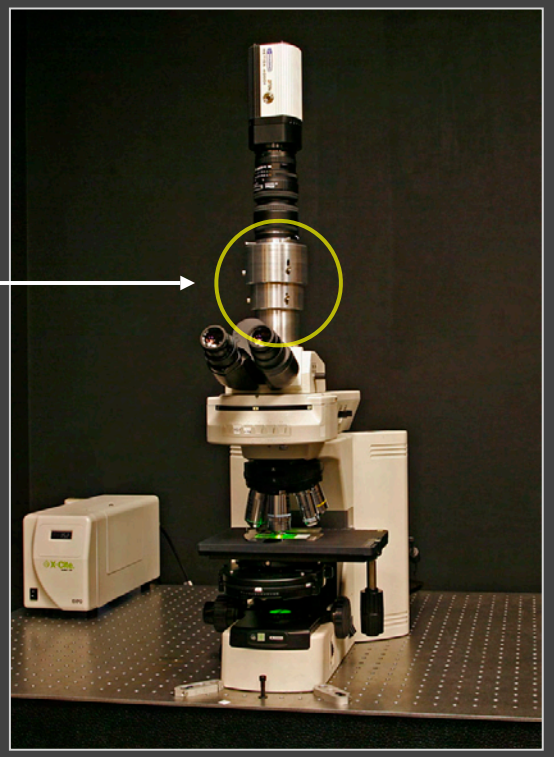
conventional photograph,
main lens at f / 22

light field, main lens at f / 4,
after all-focus algorithm
[Agarwala 2004]

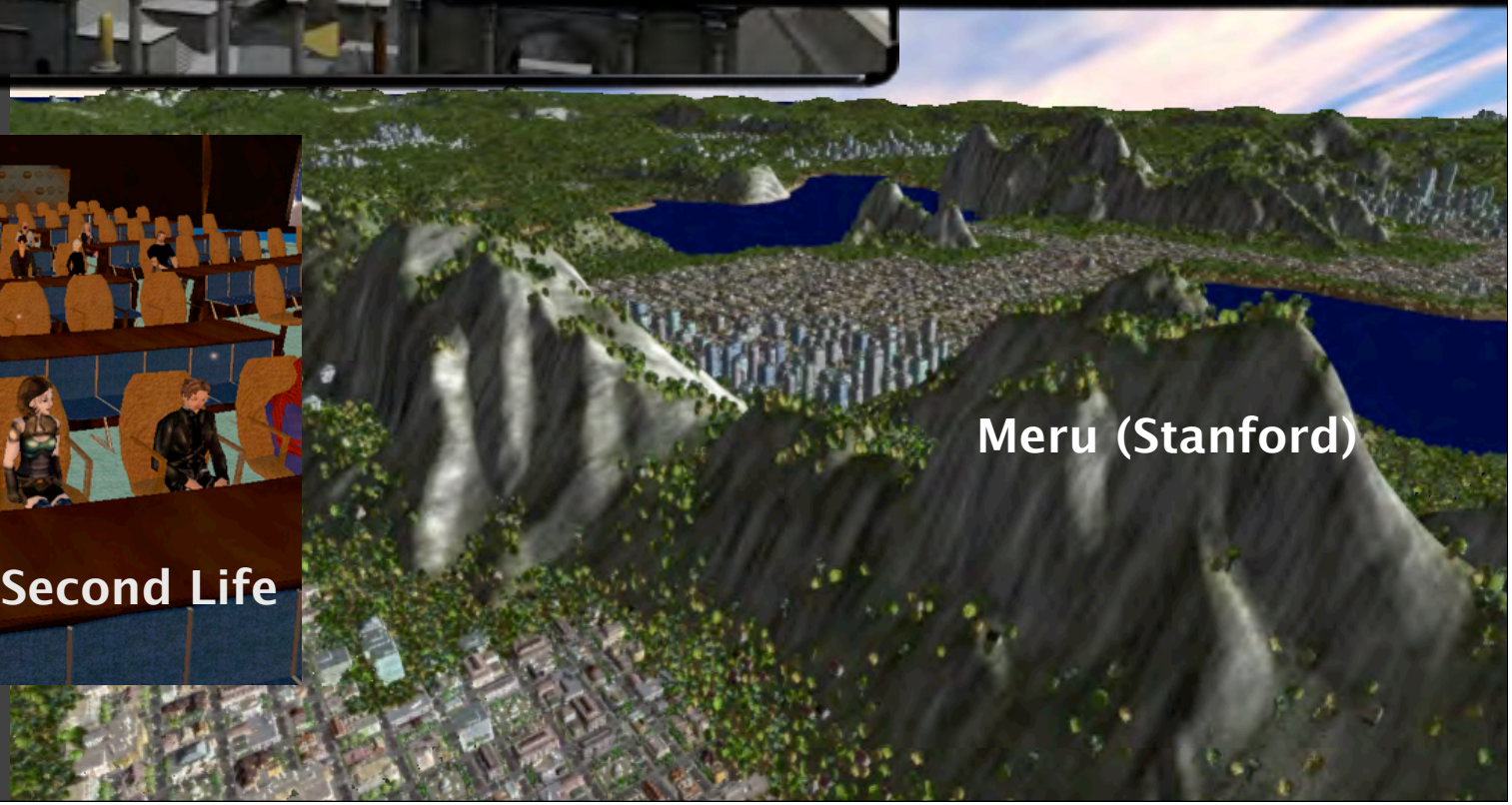
Light Field Microsope







Virtual Worlds



Challenges

Planetary distributed object system (Web 10.0?)

- Real-time response
- Scalable (100B objects)
- Robust and secure

Scalable simulation

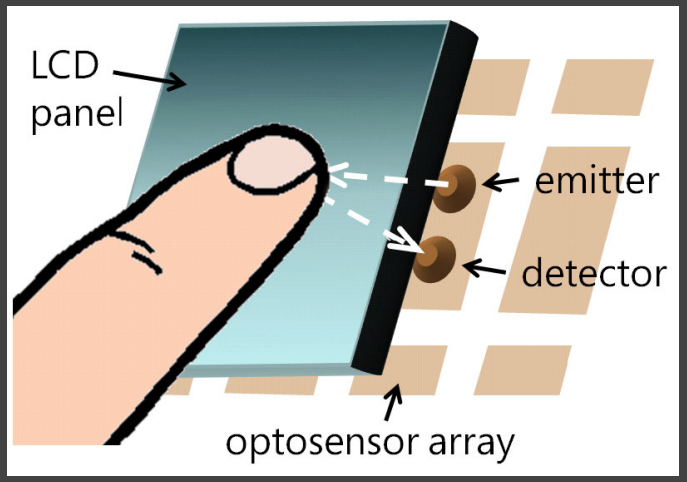
- Simulating physics across a world
- Simulating evolving eco/social system

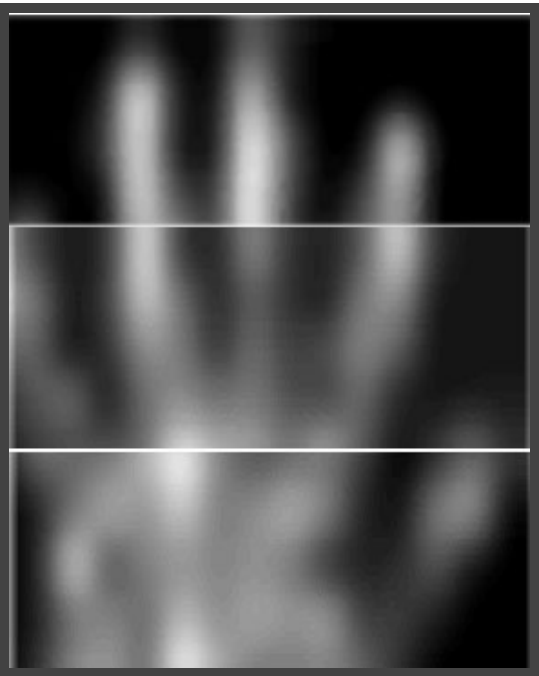
Laboratory for studying social science

Ocarina by Smule on the iPhone

Image courtesy of Ge Wang, Stanford Music Department

Multi-touch Display





Thinsight, Hodges et al. Microsoft

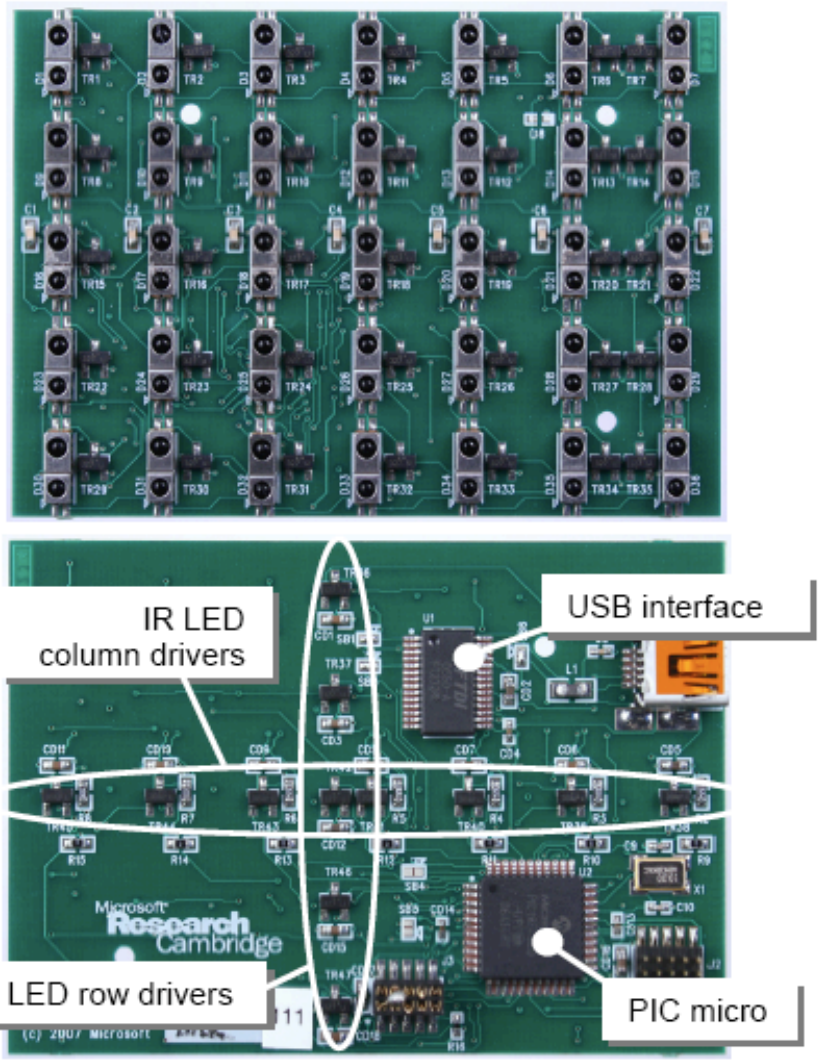


Figure 4: Top: the front side of the sensor PCB showing the 7x5 array of IR optosensors. The transistors that enable each detector are visible to the right of each optosensor. Bottom: the back of the sensor PCB has little more than a PIC microcontroller, a USB interface and the FETs that drive the rows and columns of IR emitting LEDs. Three such PCBs are used in our ThinSight prototype.