Image-Based Rendering

Definition: Using images to enhance the realism of 3D graphics

Brute Force in Image-Space, L. Williams

- Zbuffers for hidden surfaces
- Texture maps for surface detail
- Mipmapping (antialiasing)
- Object tags and dekinking (antialiasing)
- Shadow mattes and maps

Killer Applications

- Virtual Showcase
  - Virtual museums: virtual product displays
  - Virtual showrooms, homes, sets
- Virtual reality (games)
  - Walkthroughs
    - Background environments
    - See-through portals
    - Generalized 3D sprites
  - Post rendering warps: frame interpolation
    - Reduce computation
    - Frame rate leveling
    - Low-latency displays for HMDs
  - Fast stereo from single RGBZ image
- Telepresence
  - Real-time acquisition and redisplay

Light

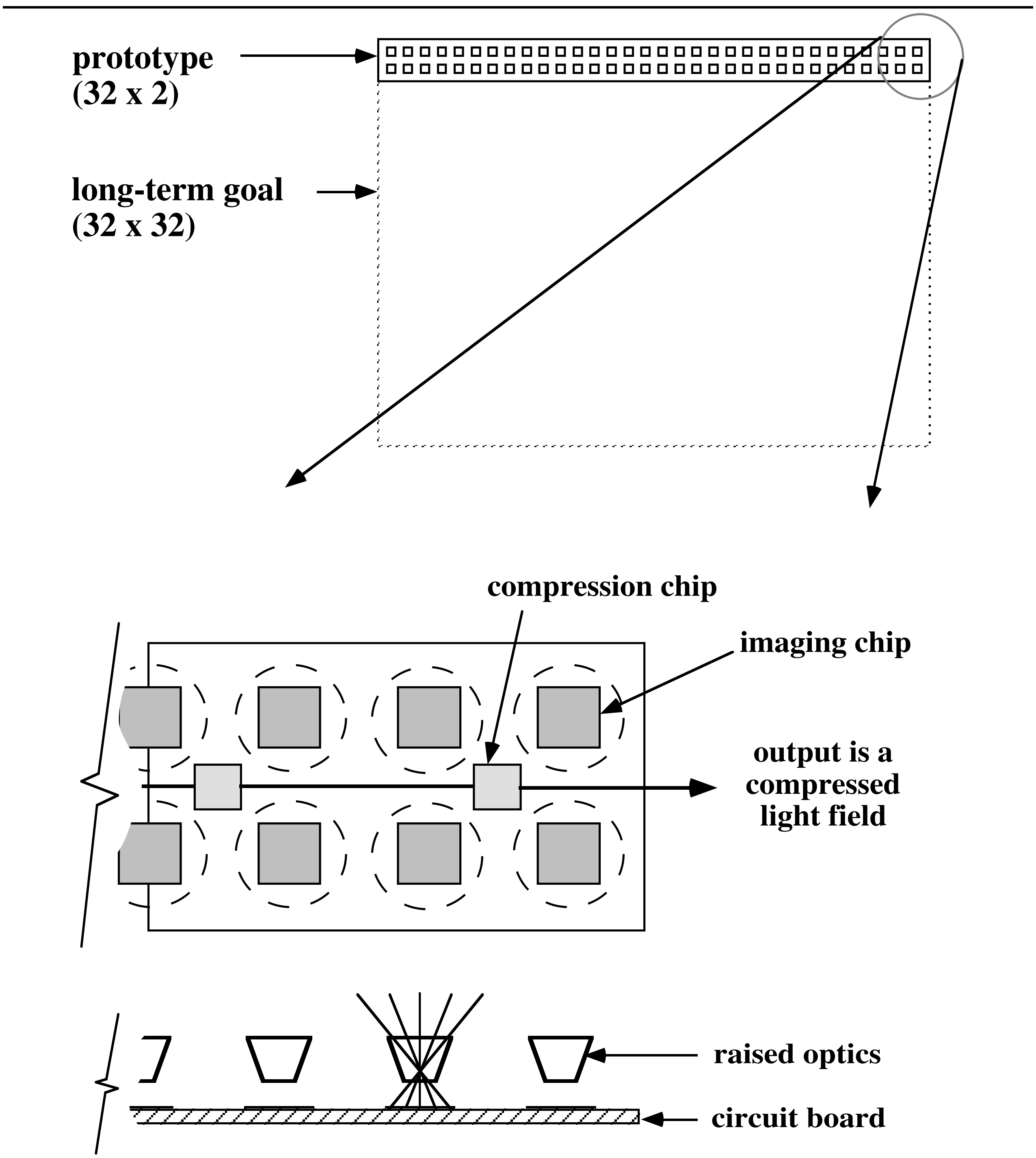
Treat as 1st class primitive

- Geometric primitives
- Image primitives
- Light primitives?
  - Ray and path tracing
  - Radiosity basis functions
  - Shadow and environment maps

Light Fields

- Two fundamental properties
  - Photometry: radiance (power)
  - Geometry: rays and lines
- A light field is like a phase space or configuration space
  - Measure the number of lines: form factors
  - Coverage: best views
  - Features in line space: lines through a point
  - Recast 3D comp. vision as operations on lines
  - View interpolation = radiance interpolation
  - Direct representation of light sources

Ultimate Light Field Camera



Trends

- Technology trends
  - Cheaper and cheaper cameras
  - Media and graphics processors
  - Compression technology
  - Enhanced I/O and parallel processing
- Future capabilities
  - Camera arrays
    - Disney's and Apple's circular panoramic cameras
    - Electronic dolly in a virtual studio
    - 3D TV and telepresence
    - Camera array above a monitor to sense the user
  - Real-time acquisition?