

Projectors

RNDr. Róbert Bohdal, PhD.

Projector technologies

- CRT (Cathode ray tube) – 1960'
- LCD (Liquid crystal display) – 1968 *Dolgoff*
- DLP (Digital light processing) – 1987 *Texas Inst.*
- LCOS (Liquid crystal on silicon) – ≈ 2000

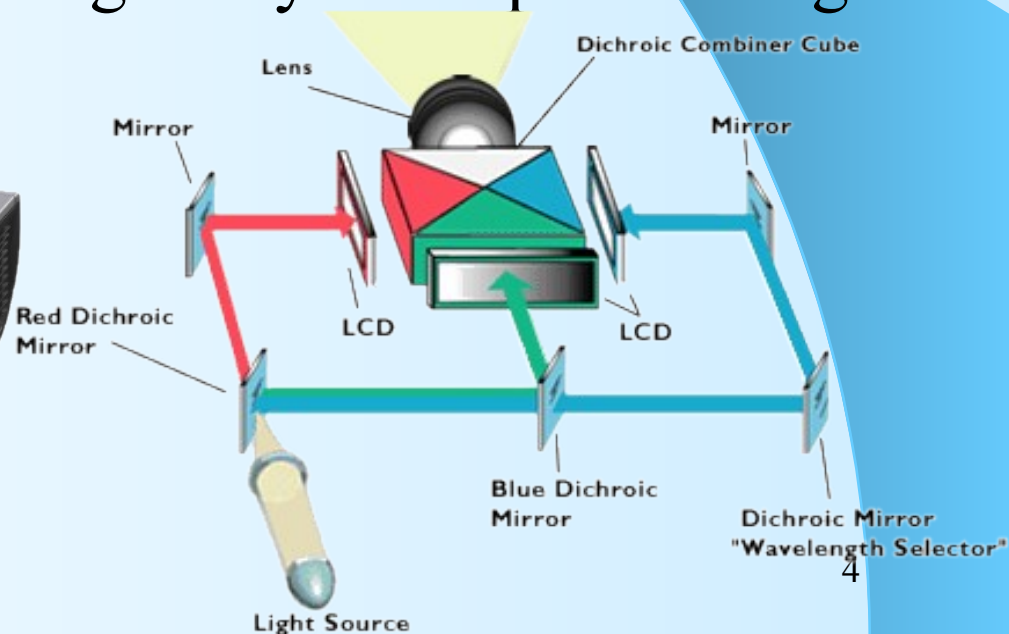
The CRT technology

- It is historically the oldest technology.
- The projector uses three monochrome CRTs before which a R, G or B filter is placed.
- Requires static placement (because of RGB alignment).
- They have high current consumption and high weight.
- They have an excellent contrast and response but low brightness.



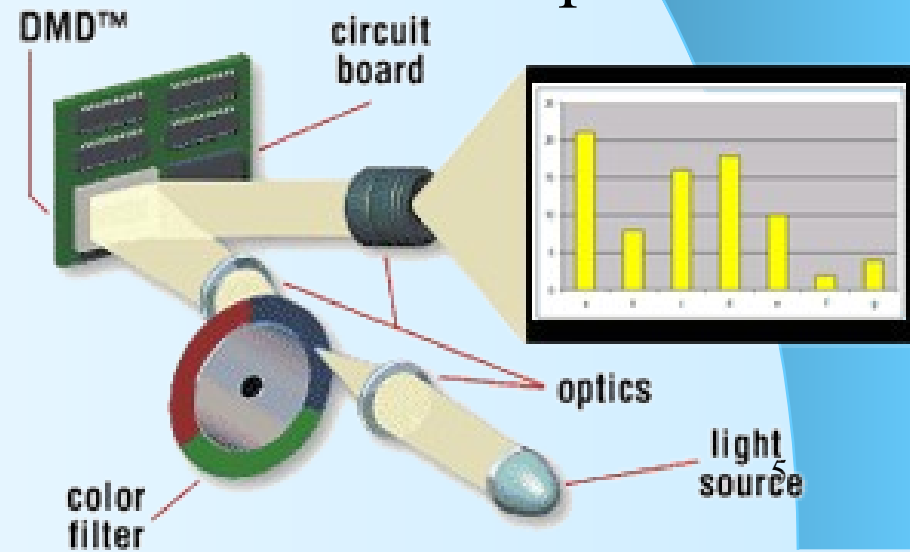
LCD technology

- They usually contain three LCD panels that "modulate" the passing light.
- The light source is a powerful lamp whose beam is divided by the dichroic mirrors into the R, G and B components.
- These 3 beams are merged into one after passing through LC panels. The merged rays then pass through the lenses.



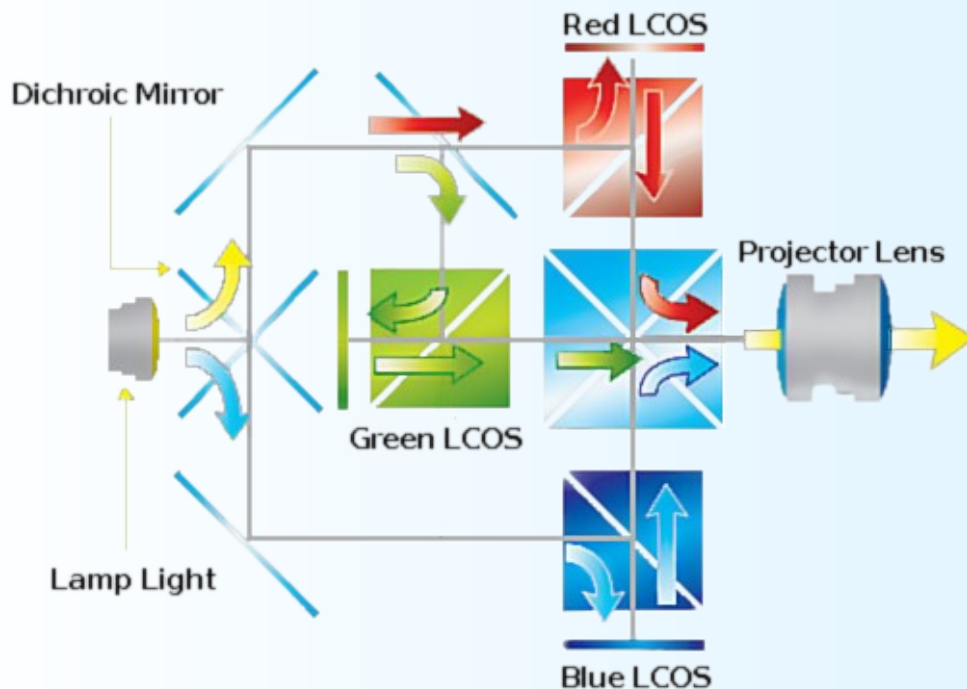
DLP technology

- It uses a DMD (Digital Micro-Mirror Device) chip to display the image.
- The light beam passes through the rotating color filter, then it is reflected by a set of miniature vibrating mirrors toward the lens system.
- The color intensity (shade) is achieved by quickly switching micromirrors.
- There is also version that uses three DMD chips as well as on the LCD.



LCoS technology

- This technology is based on LCD, but the light that passes through is reflected from the reflective layer of the panel.
- The transistors (electrodes) affecting the liquid crystals are placed below the reflective layer.
- Pixel cells can be denser and allow more light to pass.



Comparison LCD vs DLP

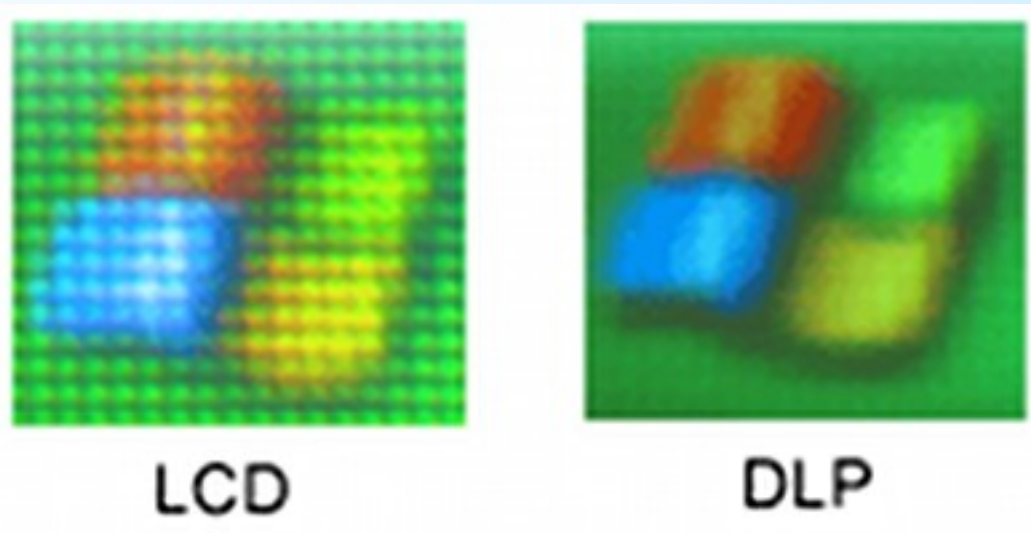
LCD projectors

Pros:

- Brighter
- More saturated color
- Sharper image

Cons:

- “Pixelated” image
- More prone to damage
- Dead pixels problem



Comparison LCD vs DLP

DLP projectors

Pros:

- „Smoother“ image
- Higher contrast
- Compact, smaller and more durable

Cons:

- Less saturated colors
- “Rainbow” effect
- Halo effect around a bright background

Light sources for projectors

- The discharge lamps use an electric arc in a vacuum filled with gas or mercury vapor.
 - Xenon, metal vapor (halide, metal halide, mercury)
 - HID (High Intensity Discharge), UHP (Ultra High pressure)
- Bright LED, incandescent or fluorescent lamp
 - Luminous flux: 2000 – 6000 ANSI lumens
 - Power consumption: 120W – 300W
 - Lifetime: 3000 – 10000 hours
- Halide = compounds between metals and halogens

