

Vorlesung Mensch-Maschine-Interaktion

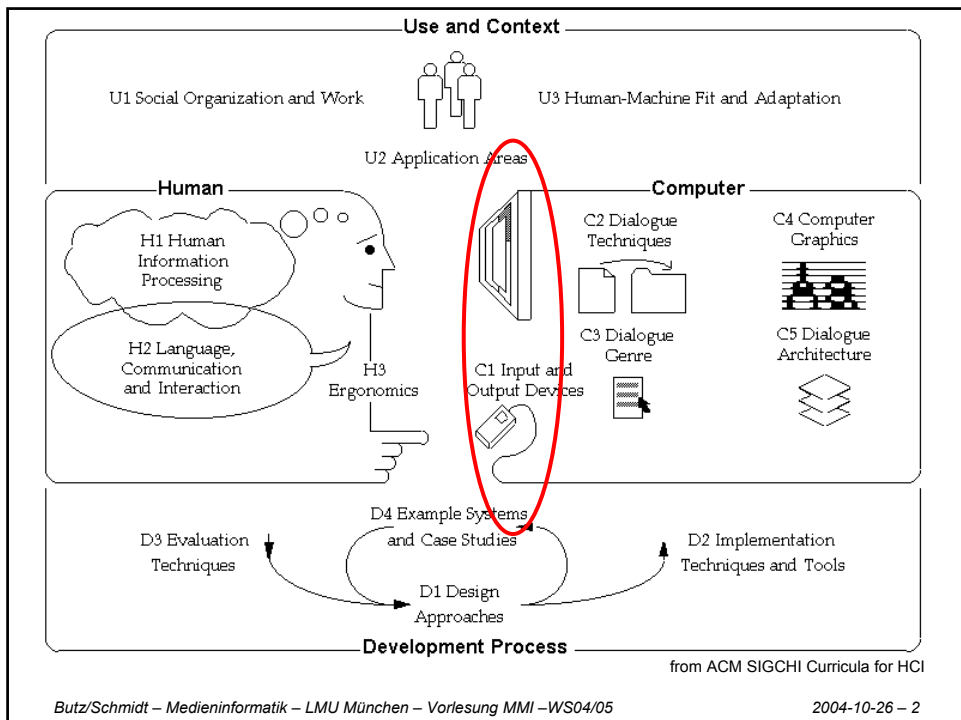
Ludwig-Maximilians-Universität München

LFE Medieninformatik

Andreas Butz & Albrecht Schmidt

WS2004/2005

<http://www.medien.ifi.lmu.de/>



TFT LCD Screens

- Typical color resolution 640x480 to 1920x1200
- ~ 85 pixel/inch
- viewing angle to 170°
- pivot function (90° rotation)



- More on the basic technology
 - <http://electronics.howstuffworks.com/lcd.htm>
 - <http://www.pctechguide.com/07panels.htm>

TFT Display

- Screen arrangements
 - Single display
 - Dual screen
 - Triple display
 - Quad screen
- Resolution
 - Typical color resolution 1024x768 to 1920x1200
 - Grayscale for medical applications up to 2048x2560
 - Hi-resolution displays with 3840x2400



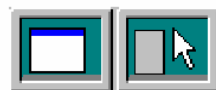
Multiple Screens

- Increased screen real estate
- Connected to one computer (one keyboard and one mouse)
- Screen arrangements with standard hard- and software
 - Dual display
 - Triple display
 - Quad display
- Application areas
 - CAD
 - Software development
 - Media production
 - Financial software
 - Comparison tasks
 - Customer info & adverts
 - Time tables



Multi-screen problems & solutions

- Dialog box appears on the boarder between the screens
 - Position in new screen
 - Position in application screen
 - Position at the cursor
- What is the meaning of maximizing a window
 - Within the current screen
 - overall
- Losing the cursor
 - Example of a solution: High density cursor



More on Multi Displays

Hutchings, D., Smith, G., Meyers, B., Czerwinski, M., & Robertson, G. (2004).

Display space usage and window management operation comparisons between single monitor and multiple monitor users.

In Proceedings of the working conference on Advanced Visual Interfaces, AVI 2004, p. 32-39.

Multi-screen problems & solutions drag and drop over screen borders

- Scenario:
 - Multiple touch screens (e.g. smart boards) are connected to become “one” display
 - Drag-and-drop does not work over borders
- Suggested solution – move possible targets to the object that is dragged
- Drag-and-Pop



<http://www.patrickbaudisch.com/projects/dragandpop/>

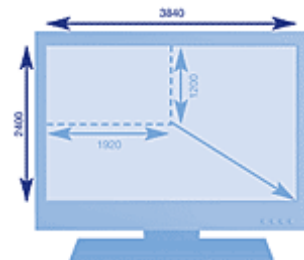
Hi-Resolution Grayscale Displays

- Use for medical imaging, radiology
- Image presentation according to DIN 6868-57
- Calibration software
- E.g. Eizo RadiForce G51
 - 21.3" monochrome LCD
 - 5 mega pixel
 - 2560 × 2048 pixel
 - 154 pixel/inch
 - 10-Bit simultaneous grayscale display



Hi-Resolution Color Displays

- Application examples
 - Medical imaging
 - CAD and construction
 - Digital content creation
 - Geophysical imaging
- E.g. IBM T221 Flat Panel Monitor.
 - 3840x2400 pixel
 - 9.2 million pixel
 - 22.2" TFT LCD
 - 204 pixels/inch
- Resolution close to a photo



Hi-Resolution Displays Potential Problem

- Often standard software is designed for different resolution (e.g. 90 pixel/inch)
 - controls are too small
 - fonts are hardly readable in normal size
- Approach
 - Design for the specific characteristics of the output device

Context & Focus Baudisch et al.

- Central area is a high resolution display
- Peripheral area is low resolution and provides context



- <http://www.patrickbaudisch.com/projects/focuspluscontextscreens/>

Context & Focus

Baudisch et al.

- Central area realized as TFT screen
- Periphery is projected
- Helps with task where context does provide important information



Projectors

Projectors



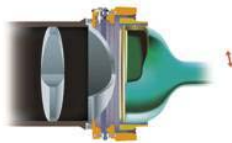
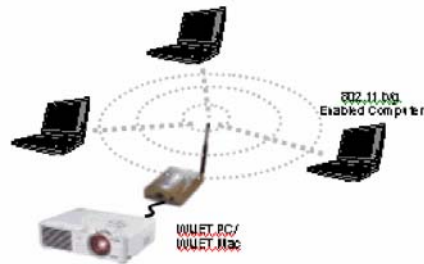
- Key Criteria

- Resolution
- Brightness
- Weight
- Noise
- Lens
- Image correction
- Projection distance
- Connections
- Lamp life time

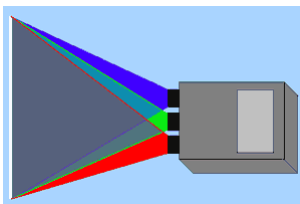
- E.g. Toshiba TLP-T720U
 - Wireless 802.11B

- E.g. WiJET

- <http://www.otcwireless.com/802/wijet.htm>



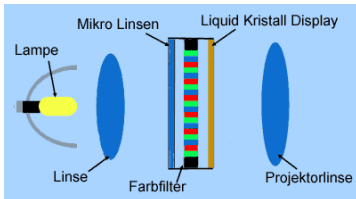
CRT projector



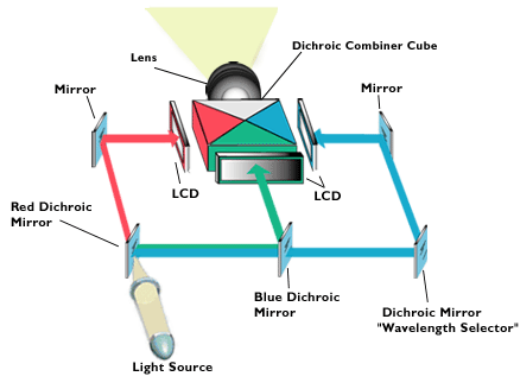
- Use R,G+B CRTs as light sources
- Good black areas
- Low brightness
- Fast
- Need to calibrate convergence!

www.projektoren-datenbank.com/rohre.htm

LCD projector

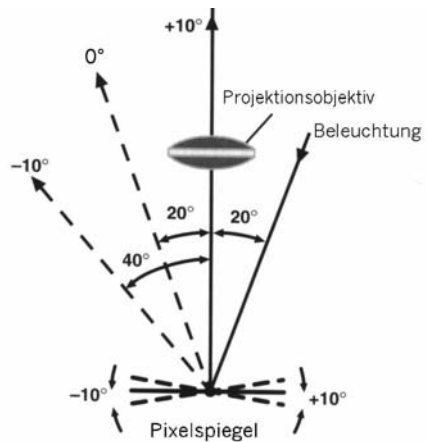
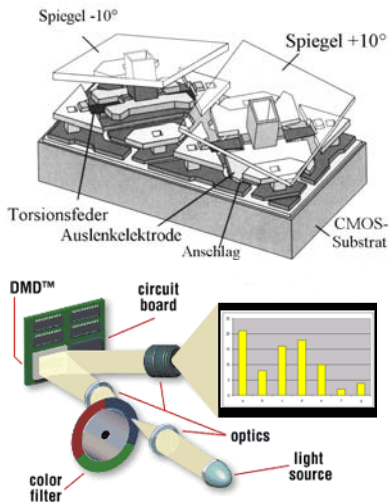


www.projektoren-datenbank.com/lcd.htm

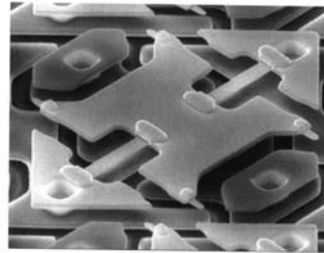
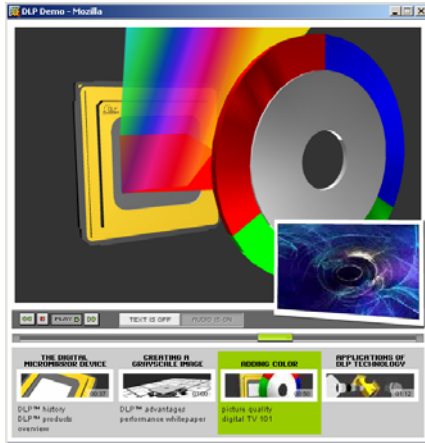


www.projectorpoint.co.uk/projectorLCDvsDLP.htm

DLP projector

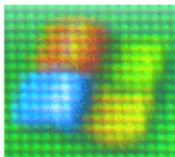


DLP projector (movie)



<http://www.dlp.com/>

Technological side effects



LCD



DLP

(image is a magnified portion of the start up icon)

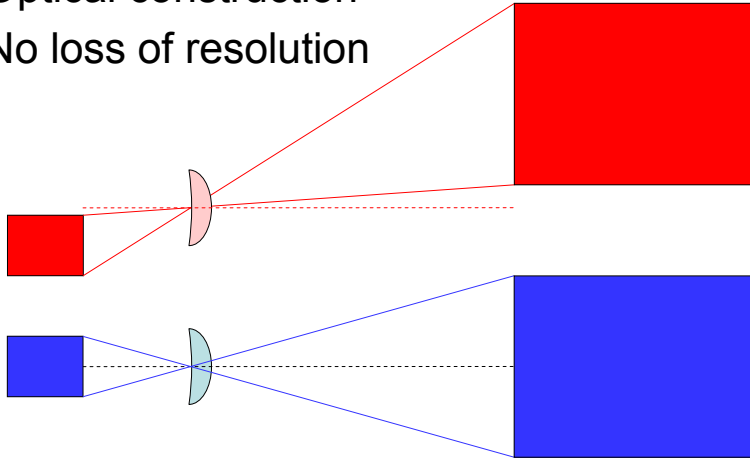
- Screen door effect
 - Caused by LCDs
 - Less prominent in DLP



- If a DLP projector is moved, color seams appear

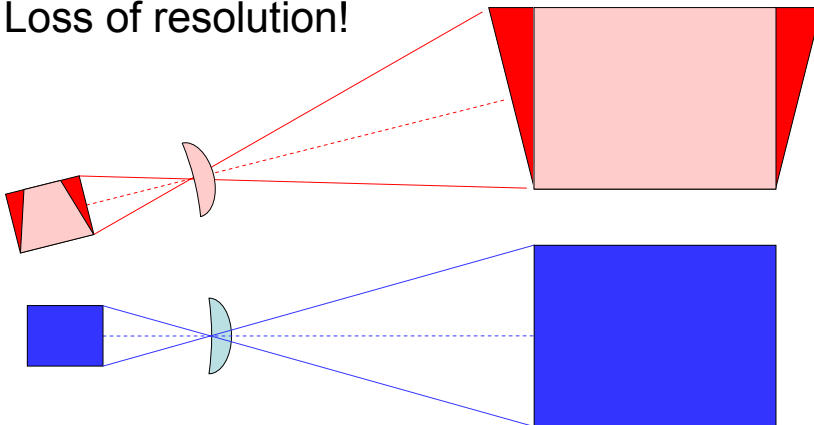
Lens shift

- Optical construction
- No loss of resolution

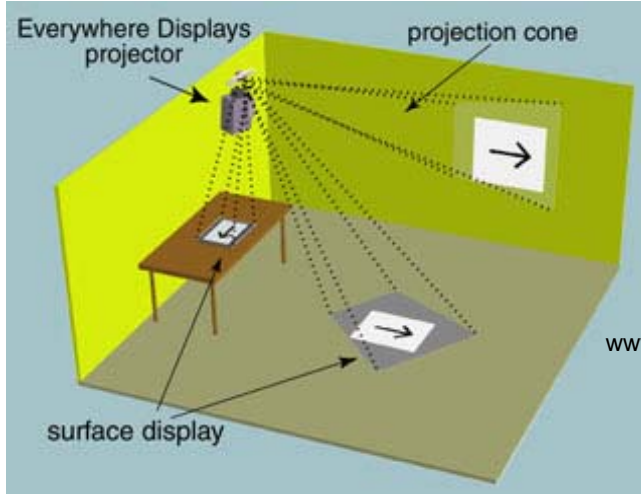


Keystone correction

- Computed correction
- Loss of resolution!



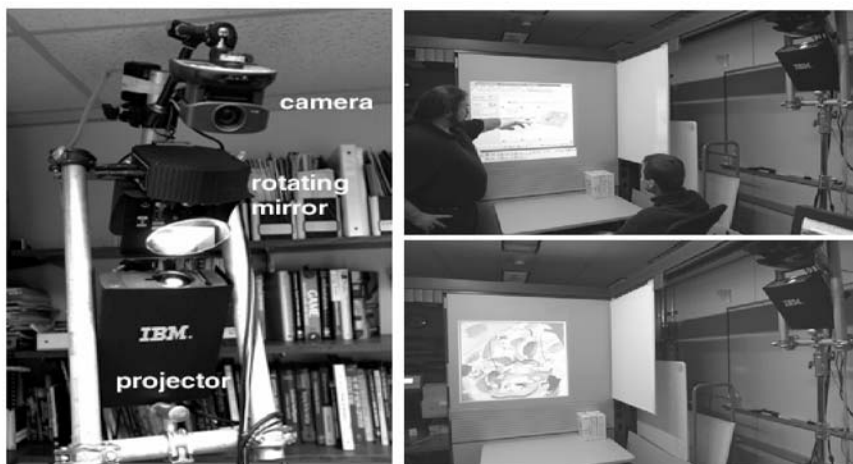
The Everywhere Display



Claudio Pinhanez

www.research.ibm.com/ed/

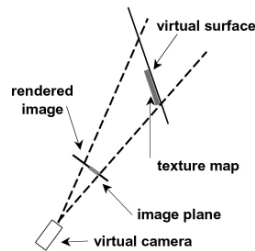
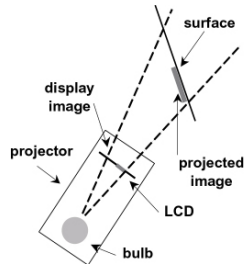
Everywhere display (cont.)



Components: a projector, a camera and a rotating mirror

Everywhere display (cont.)

- Correct distortions
 - Use the fact that camera and projectors are geometrically the same (optically inverse)
- Use standard HW components
 - 3D-Graphics board and VRML-world



REAL WORLD
Butz/Schmidt – Medieninformatik – LMU München – Vorlesung MMI – WS04/05

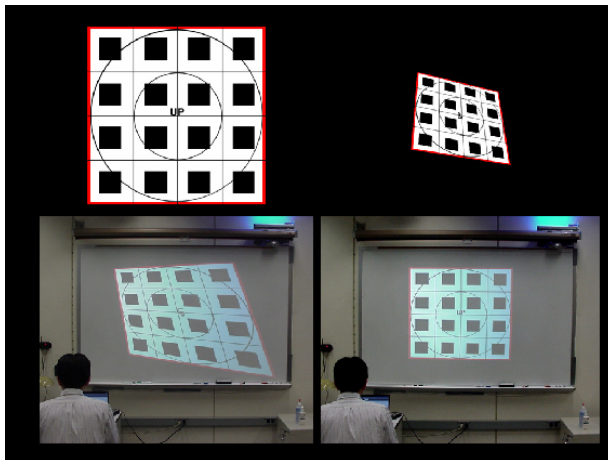
VIRTUAL 3D WORLD

2004-10-26 – 25

Everywhere Displays Project (IBM)

<http://www.research.ibm.com/ed/>

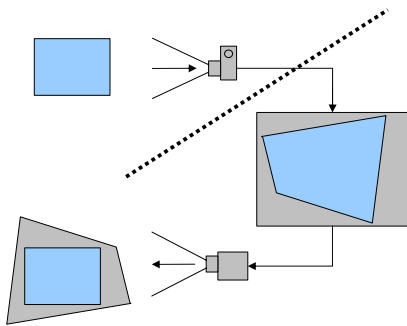
- Correct image distortion



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2004-10-26 – 26

Undistorting the projected image

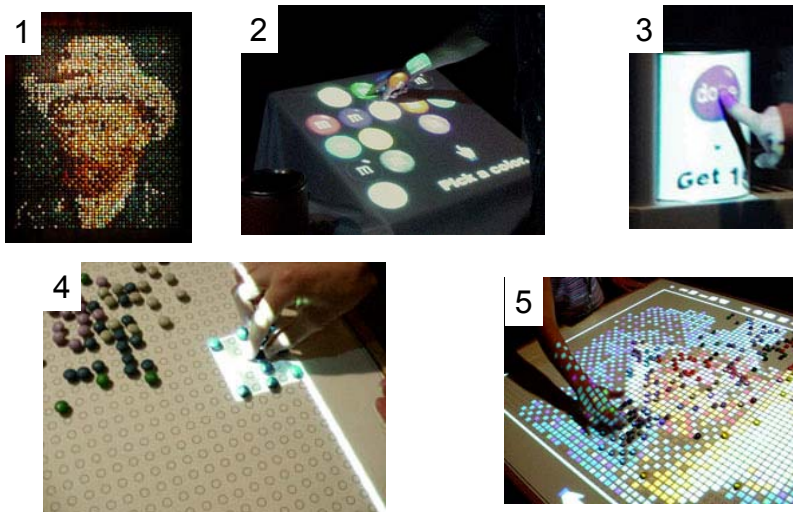


- Place original image in the 3D model
- Camera image shows it distorted
- Project the distorted image from 3D model with the real projector

– Distortions cancel each other out IF virtual camera and physical projector are in the same location

Everywhere display (cont.)

Collaborative experience at SIGGRAPH 2001



Everywhere display (cont.)



BLUESPACE office scenario

Everywhere Displays Project (IBM) Applications



<http://www.research.ibm.com/ed/>

SearchLight: Basic Idea

- Build a search function for physical objects
- A tool for directing the user's attention
- No 3D model of the environment



Ideas for realization:

- Optical markers for object recognition
- Highlighting by a projected spot

Step 1: Room Scanning



- Projector/camera unit moving and taking pictures
 - Until the whole room is covered
 - Neighbouring pictures slightly overlap
- Recognized marker IDs are stored with:
 - pan/tilt values when taking the picture
 - position of the marker in the picture

Step 2: Showing objects

- Retrieve object's marker ID
- Move unit to stored pan/tilt position
- Project a spot around the marker's position

