
SIGRAD
THINK BIG !

THINK BIG?

Usability of Large Display Environments

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Sports Event (NFL, taken from ESPN)

Concert (Bruce Springsteen)

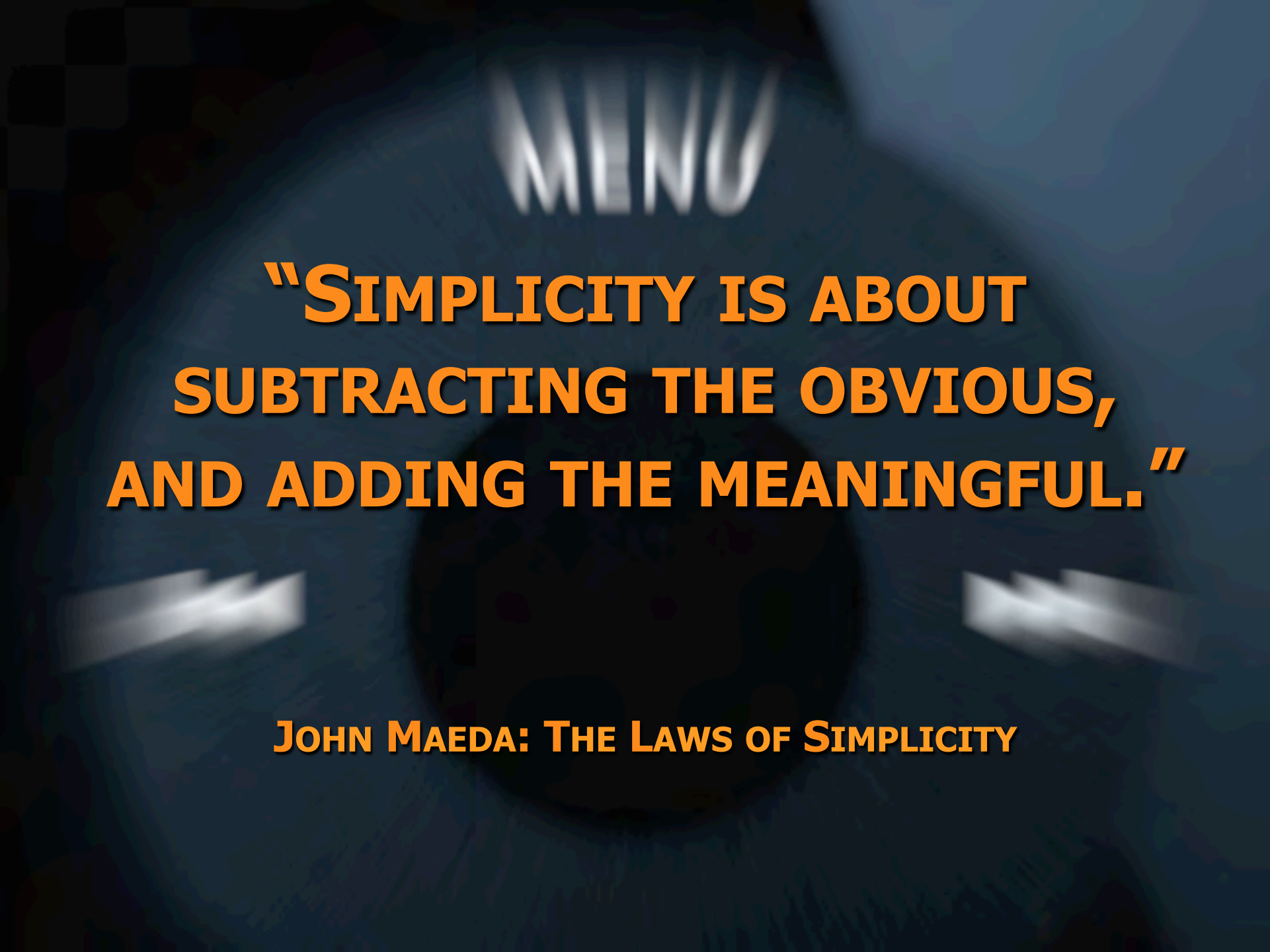
THINK BIG!

BUT HOW MUCH SIZE DO WE NEED?

Motivation

- Information Overload
  - Amount of data ever-growing
  - Promising Approach: Use of Large Displays?
- How Can We Use Large Displays Effectively?
  - 2D? 3D?
  - High resolution?
  - Usage Dependent on Application, User, and Funding
  - …
- Some Challenges
  - How can we improve 2D (e.g., get rid of the tiles)?
  - How can we bring more detail to 3D at a reasonable price?
  - How much size do we really need?

SIMPLICITY

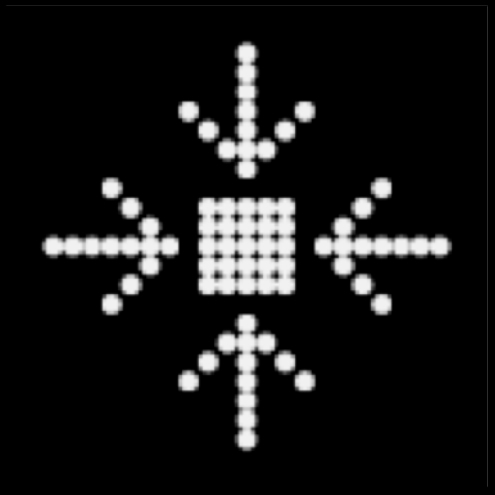


"Simplicity is about subtracting the obvious, and adding the meaningful."

John Maeda: The Laws of Simplicity

John Maeda's First Law of Simplicity

REDUCE



The simplest way to achieve simplicity
is through thoughtful reduction.

Reduce

- Fundamental questions
  - Where's the balance between simplicity and complexity?
  - How simple can you make it?
    vs. How complex does it have to be?
  - Simple usage of a product/service
    vs. Do everything that a user wants it to do
- Possible solution: reduction
  - When in doubt: remove
- Everything that can be removed is gone?
  - Additional methods ⇨ SHE (Shrink, Hide, Embody)

REDUCE

- SHE: Shrink
  - The smaller the object, the lower the expectations:
    "This little thing did all that?"
  - Example tools for shrinking: lightness + thinness

REDUCE

- SHE: Hide
  - Shrinking lowers expectations,
    hiding allows user to manage expectations himself
  - Example: Remote controls
    - In the 90's: hide less-used functions behind hidden door
    - Today: no longer popular
      ⇨ visible features attract buyers!

REDUCE

- SHE: Embody
  - Shrinking + hiding can cause loss of sense of value
  - Perception of quality becomes critical factor!
  - Real or believed quality?

But:
Can we talk about simplicity when thinking BIG?

HiRes Tiled Displays

HyperWall, UC Irvine: 200 MPixels


HyperWall, UC Irvine: 200 MPixels

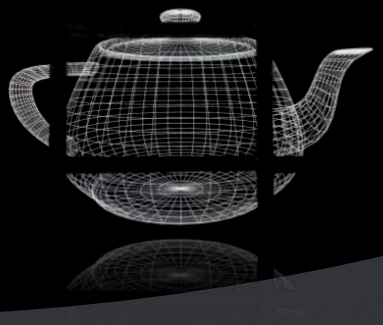
TU Kaiserslautern: 37 MPixels

TILED++

- Ni et al. [IEEE VR 2006]
  - Top ten research challenges in large high-resolution displays
  - Number 1: "Truly seamless tiled displays"
- Problem: Bezels cause discontinuities in visualization
  - Two obvious ways to deal with bezels: ignore or treat as overlay
  - Still unsolved: semantic loss
- New concept and implementation: Tiled++
  Augment bezel areas of hi-res tiled display with (low-res) projection
  - Result: semantic loss significantly reduced

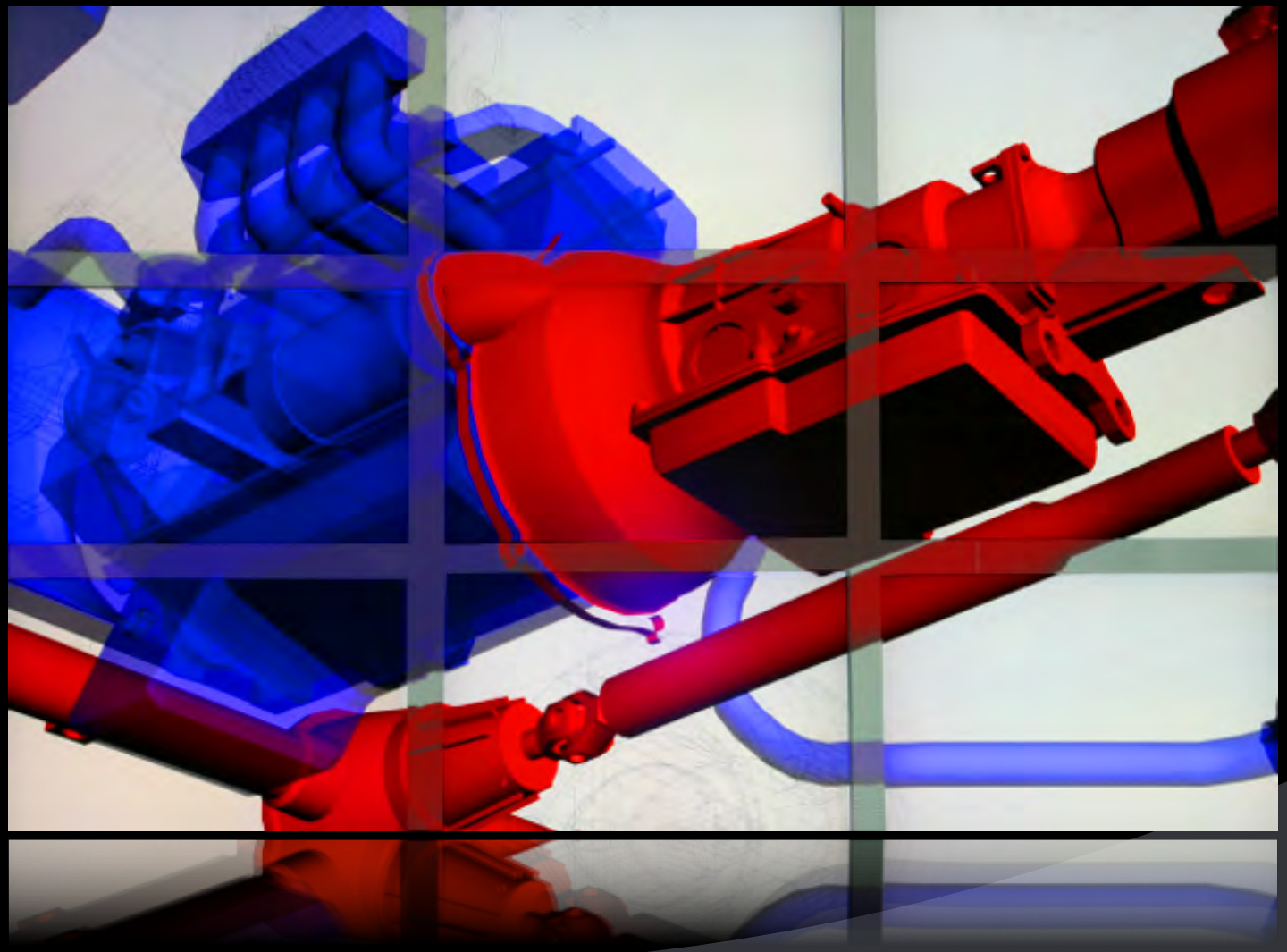
IGNORE

OVERLAY

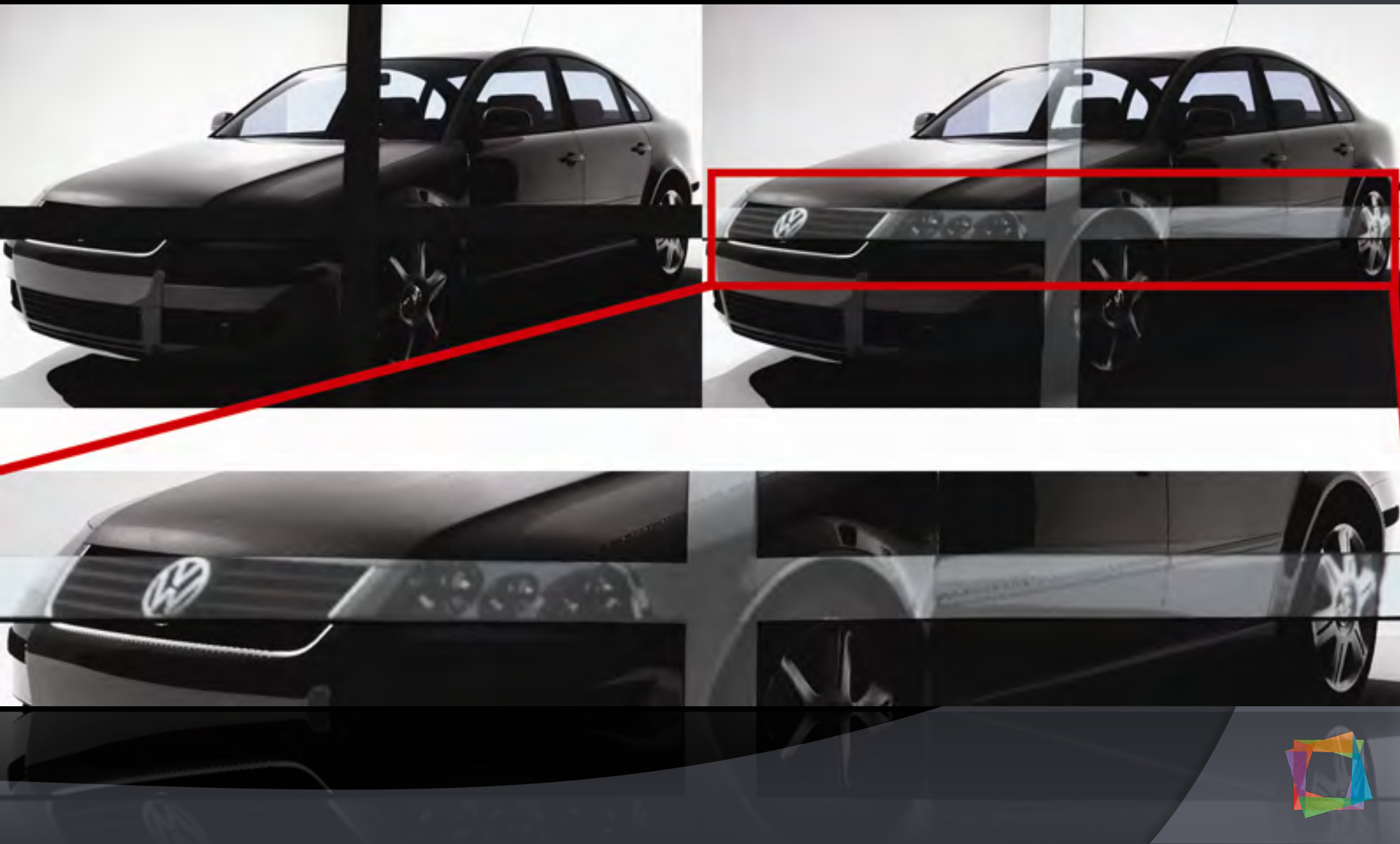


MF+C

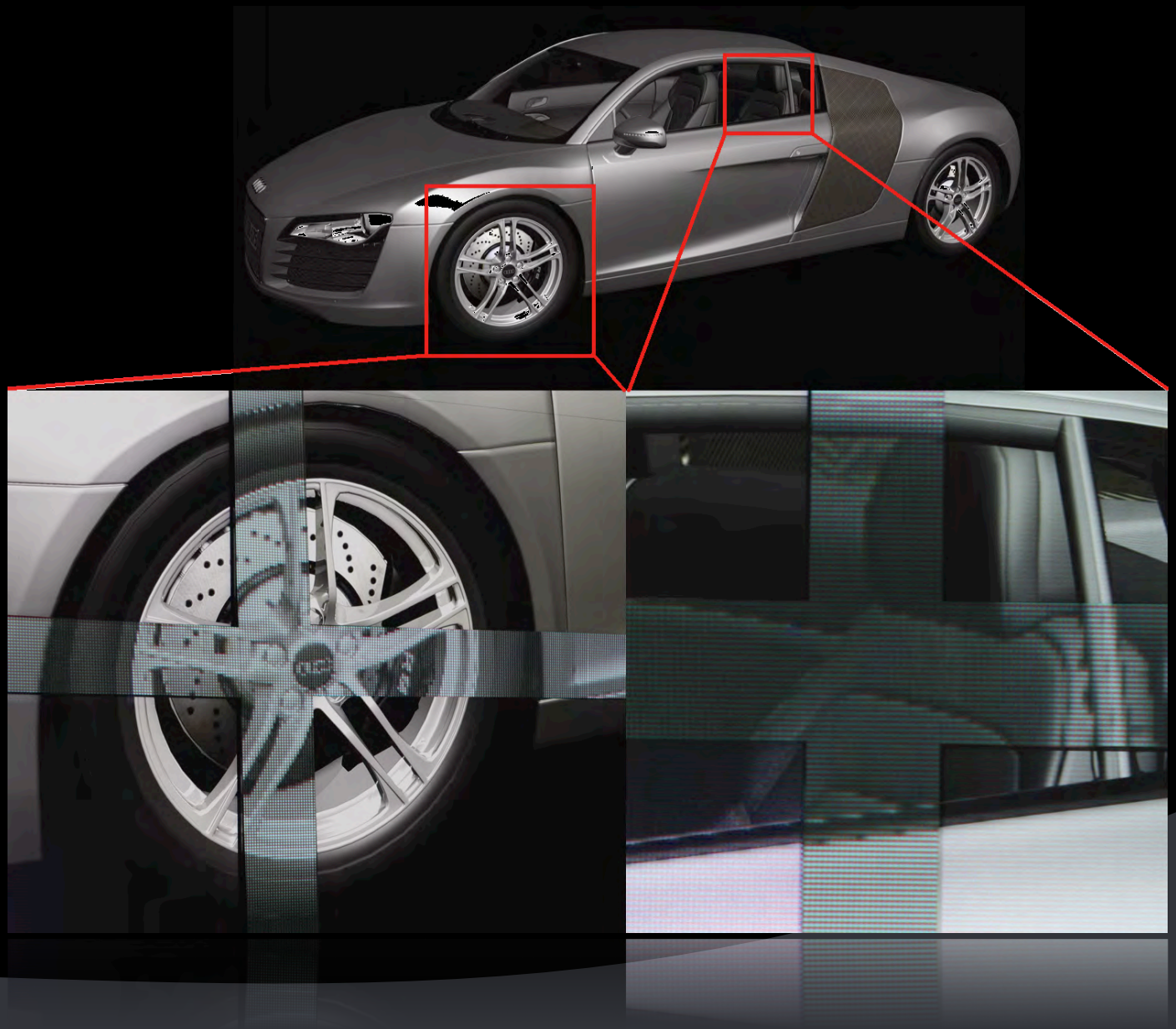
Tiled++



TILED++

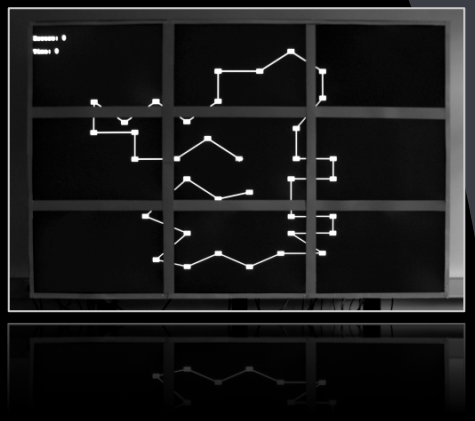


Tiled++

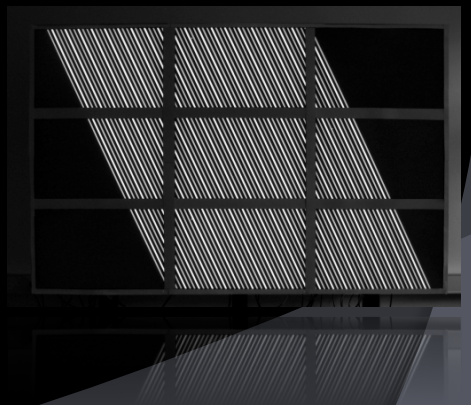


TILED++

- Evaluation: Hot wire game
  - Task: move cursor along predefined track
  - Variable: error rate (leaving area of tolerance)
  - Results
    - Tiled++ significantly better than *overlay* approach; overlay: 89% of errors occur at bezels
    - Tiled++ better than *offset* approach, but no significant difference

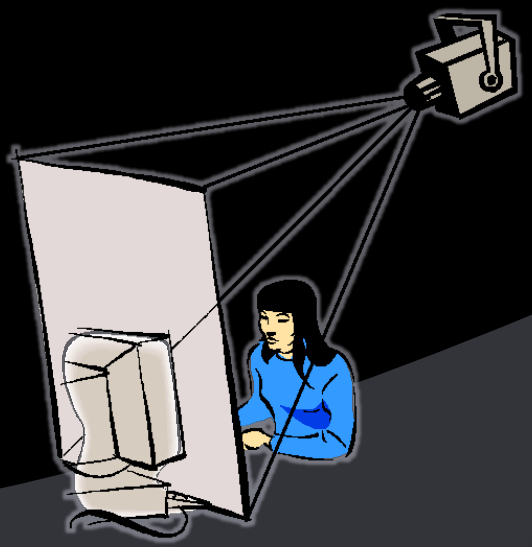


- Evaluation: Poggendorff illusion
  - Neurosciences: 2 collinear lines separated by 2 vertical parallels ⇒ failures of perception
  - Participants had to investigate problem, subjective feedback (questionnaire)
  - Effectiveness not a big issue (e.g. count lines)
  - Result: 90% consider Tiled++ most efficient



Focus+Context Screens

- Wall-size low-res display + embedded high-res display
- Customized software to display image content across both display regions
  - Scaling of image is preserved
  - Its resolution varies across the two display regions
- Content scrolled into focus region is viewed in higher detail
- Focus display behaves like a magic high-res lens
  - Physical continuity of the fisheye
  - But: no distortion

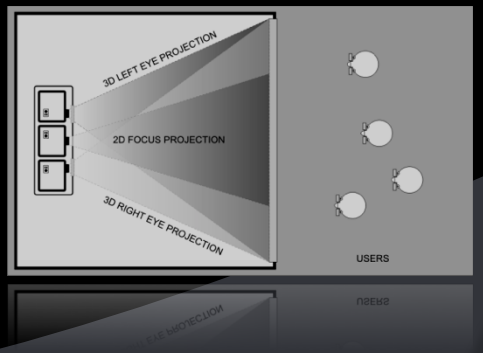



STEREOSCOPIC WALLS

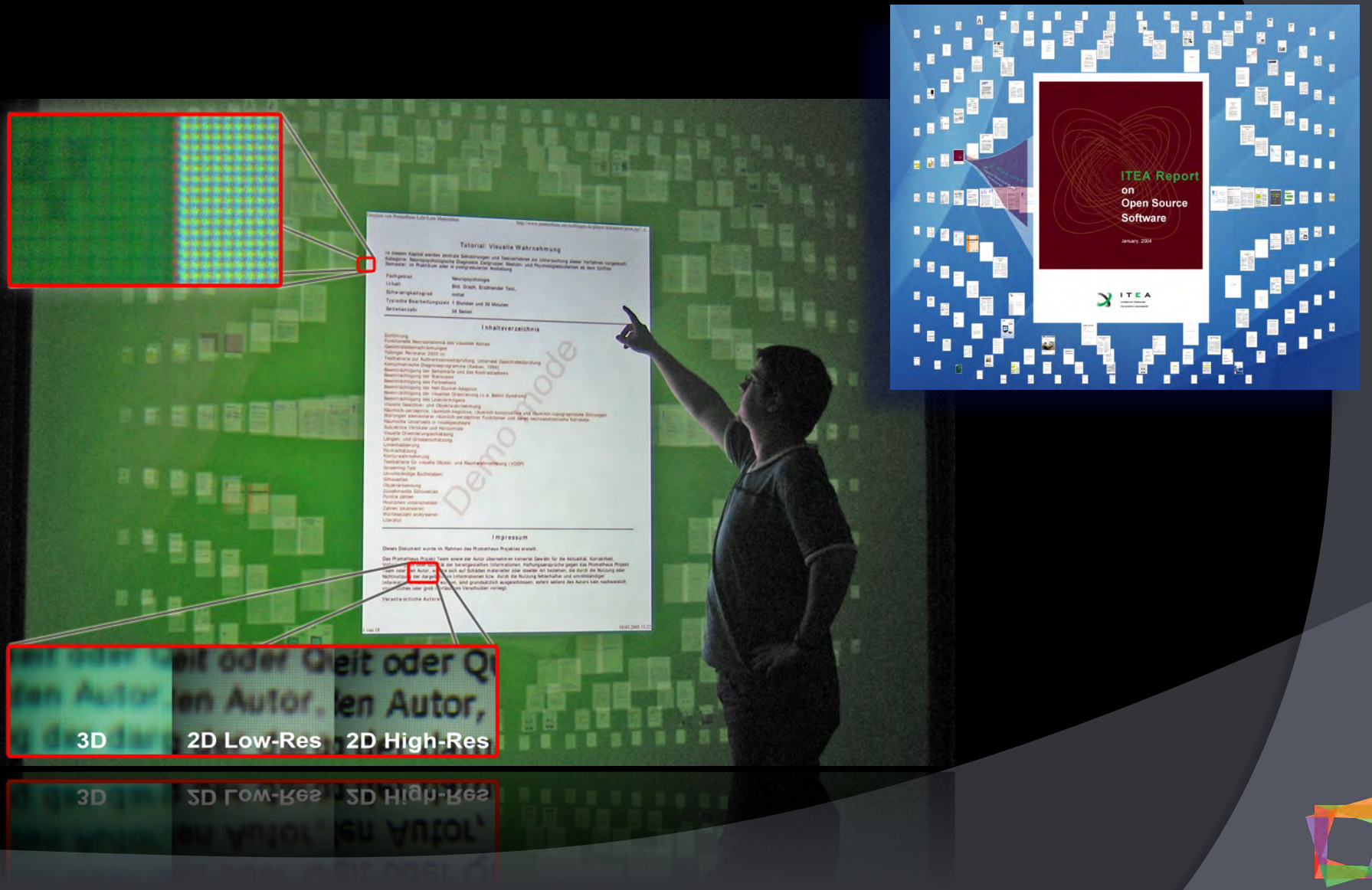
HEyeWall, IGD Darmstadt

Stereoscopic Environments

- General Problems
  - Even very good calibrations not at 100%
  - Lower resolutions: loss of details, bad readability
  - Higher resolutions: extremely expensive
- Ni et al. [IEEE VR 2006]
  - Top ten research challenges in large high-resolution displays
  - Number 2: "Stereoscopic large high-resolution displays"
- FIVE = 2D+3D Focus+Context Screen
  - Common stereoscopic projective system
  - Enhanced with third (high-res) projector
  - Result: Additional high-res 2D focus area

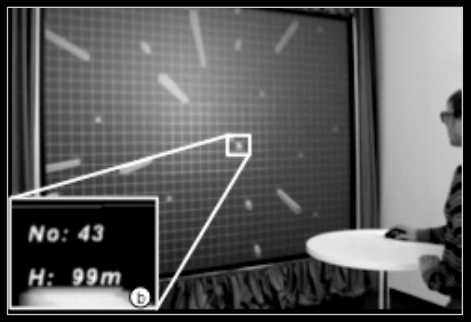


FIVE


ITEA Report
on
Open Source
Software
January, 2004
ITEA
Tutorial: Visuelle Wahrnehmung
Inhaltsverzeichnis
Impressum
Demo mode
3D
2D Low-Res
2D High-Res

FIVE

- Baudisch et al. [ACM UIST 2001]
  - "f+c screens implement regions of different resolution by combining multiple display units of different resolution"
- Our Extension of Baudisch's Definition
  - "different resolution and different dimensionality"
- Evaluation
  - Study 1: Visual search task on static scene
    - FIVE significantly faster than O+D, Pan&Zoom
  - Study 2: Dynamic scene: real-time flight simulation
    - FIVE has significant impact on error rate (compared to O+D)



Size + Simplicity Matter!

These simple and inexpensive solutions
need to be found and evaluated...

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Thank You!