From Single-Frame Rate to Multi-Frame Rate Systems

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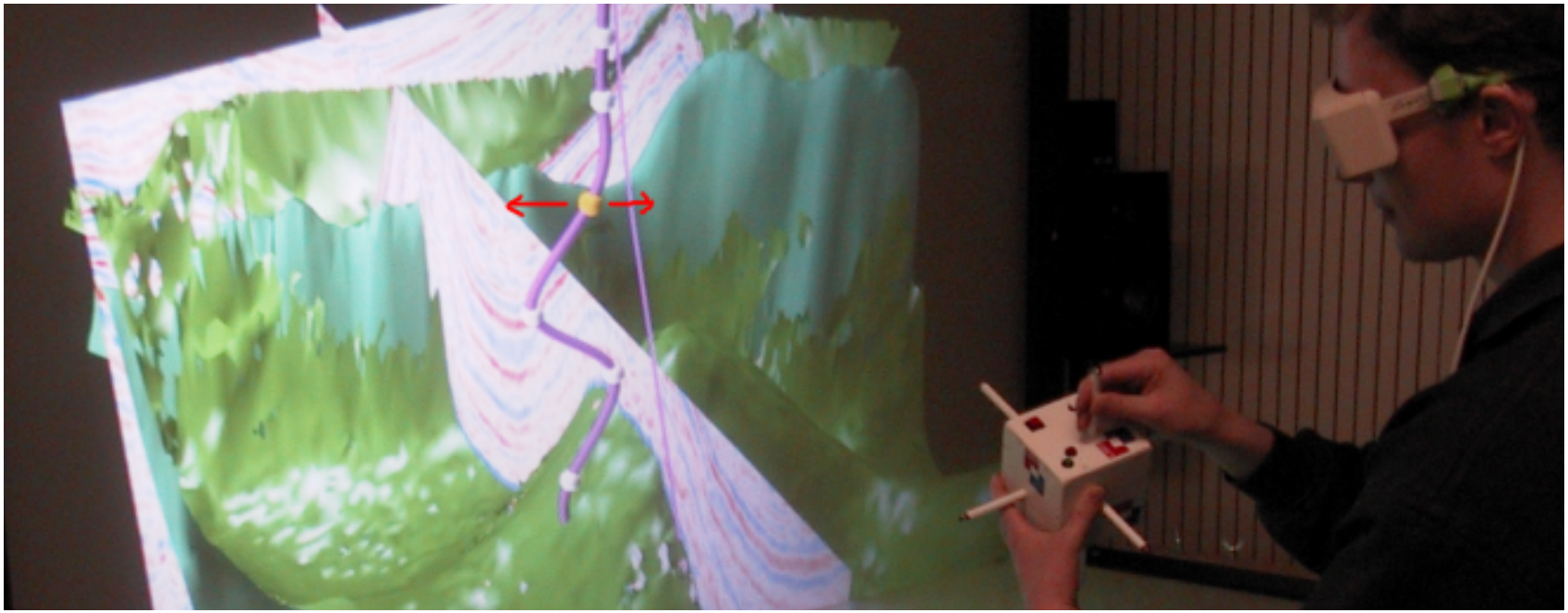
Observations for Complex Applications



High Frame Rates:

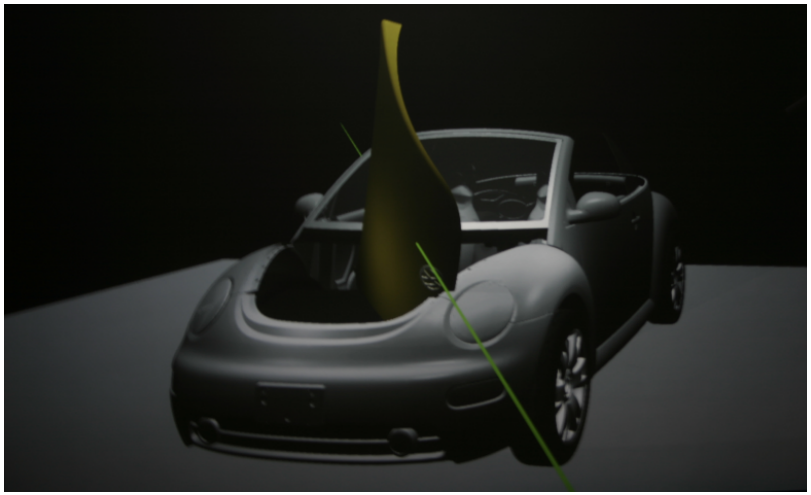
- Object manipulation
- System control

Low(er) Frame Rates:

- Head tracking
- Navigation

Multi-Frame Rate Basics

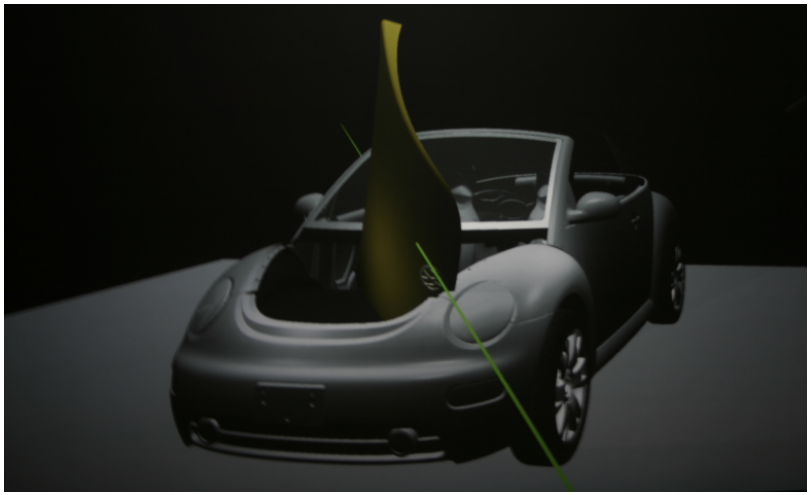
Slow client



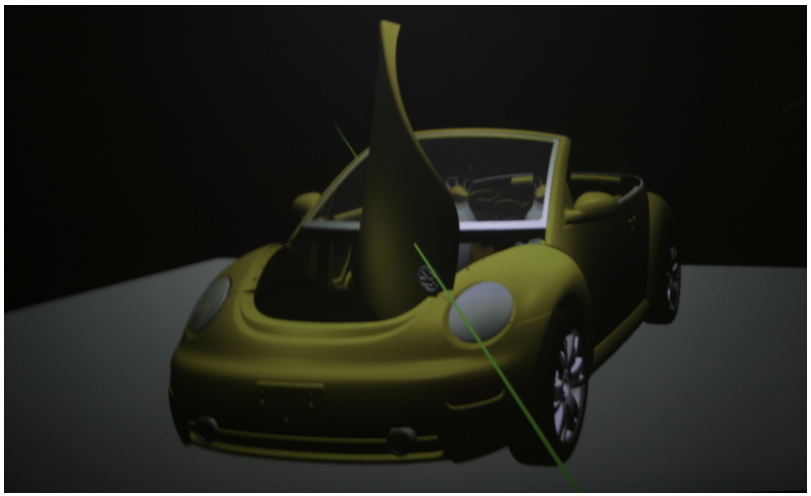
Fast client

Multi-Frame Rate Basics

Slow client



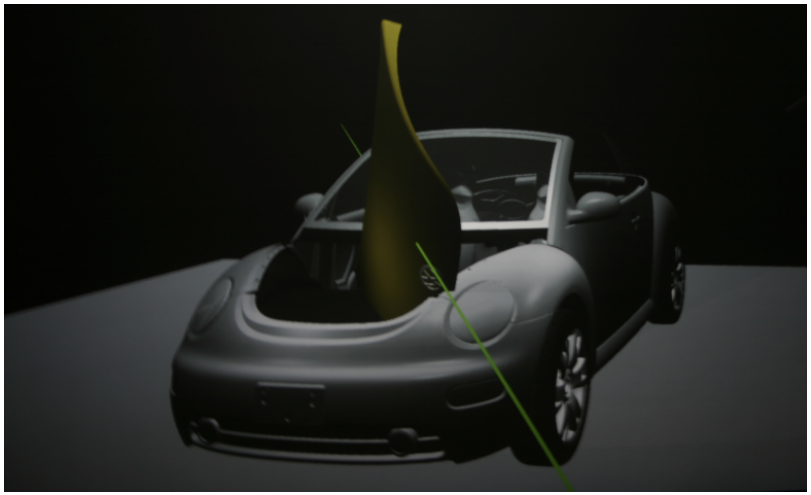
Fast client



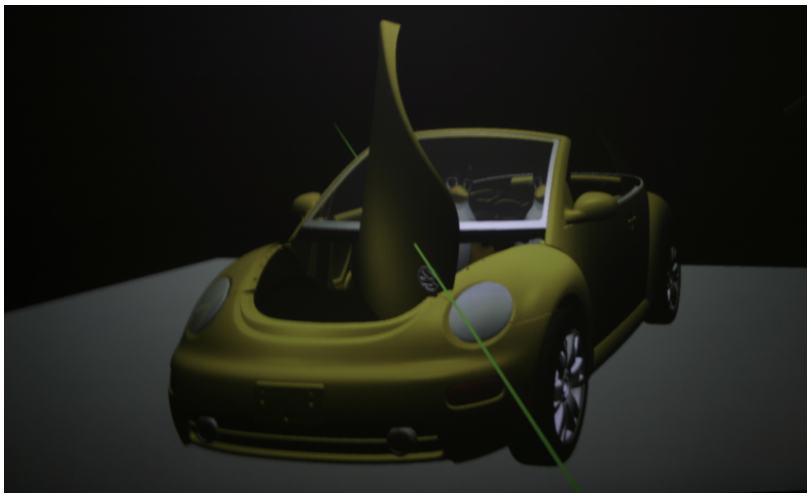
Digitally composed image

Multi-Frame Rate Basics

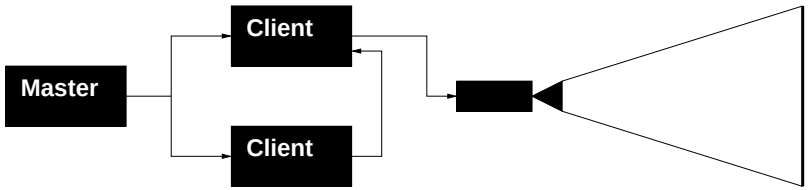
Slow client



Fast client

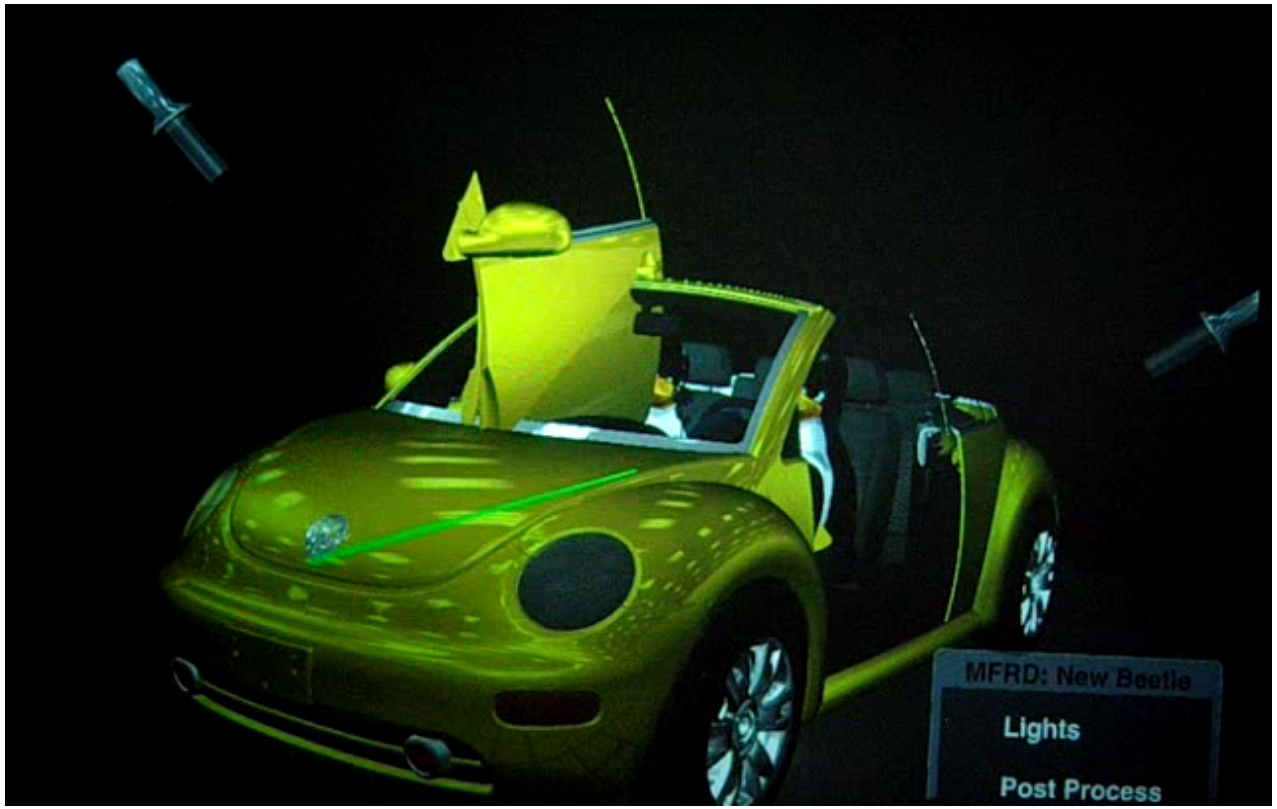


Digitally composed image



Digital composition setup

Video



Properties

+ Fast user interaction
+ Maintains visual quality
+ Advanced techniques
  - Interactive light manipulation
  - Volume rendering support

± Resource allocation

± Migration artifacts for “naïve” multi-frame rate rendering

± Navigation

System Requirements

- Object-level granularity
  - Frameless rendering $\rightarrow$ pixel-level granularity
  - Object-level granularity already supported by scene graphs
- Asynchronicity
  - Buffer + meta information (e. g. camera parameters, object ids)
  - Parallel, asynchron render threads
  - Sort-Last-support good starting point
- Orthogonality
  - Acceleration methods (e. g. LOD, occl. culling)
  - Parallel rendering techniques

Future Work

- Multi-frame rate shadows
- Multi-frame rate ray tracing
- Improving navigation support
  e. g. depth-image warping

Thank you for your attention.