Ubiquitous interactive inspection of 3D data

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Academia Europaea

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ViRVIG

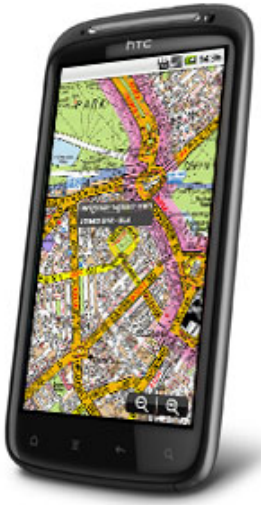
Ubiquitous interactive inspection of 3D data

Ubiquitous: from modern Latin ubiquitas (from Latin ubique 'everywhere', from ubi 'where'): Present, appearing, or found everywhere

Interaction everywhere

Ubiquitous interactive inspection of 3D data

Huge datasets
Small and mobile devices
Interactive inspection
Virtual visits



BMW Museum and mobile virtual tour

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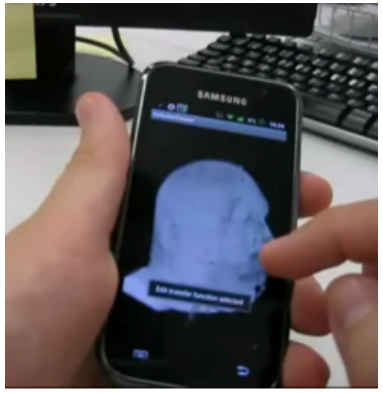
Interactive inspection

Telemedicine



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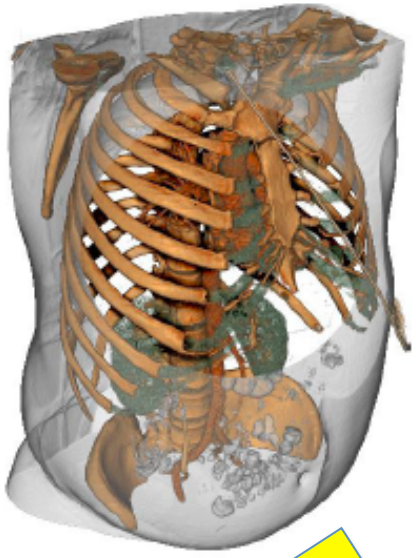
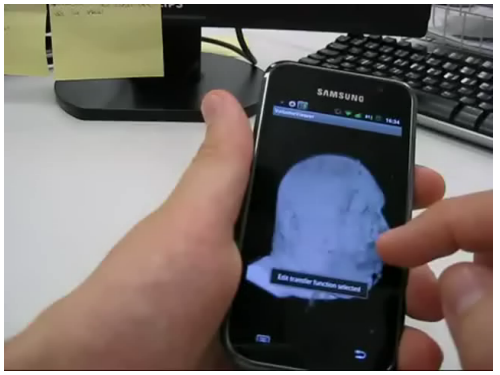
Interactive inspection

Telemedicine

- Cooperative inspection
- 3D shared patient data
- Collaborative diagnose





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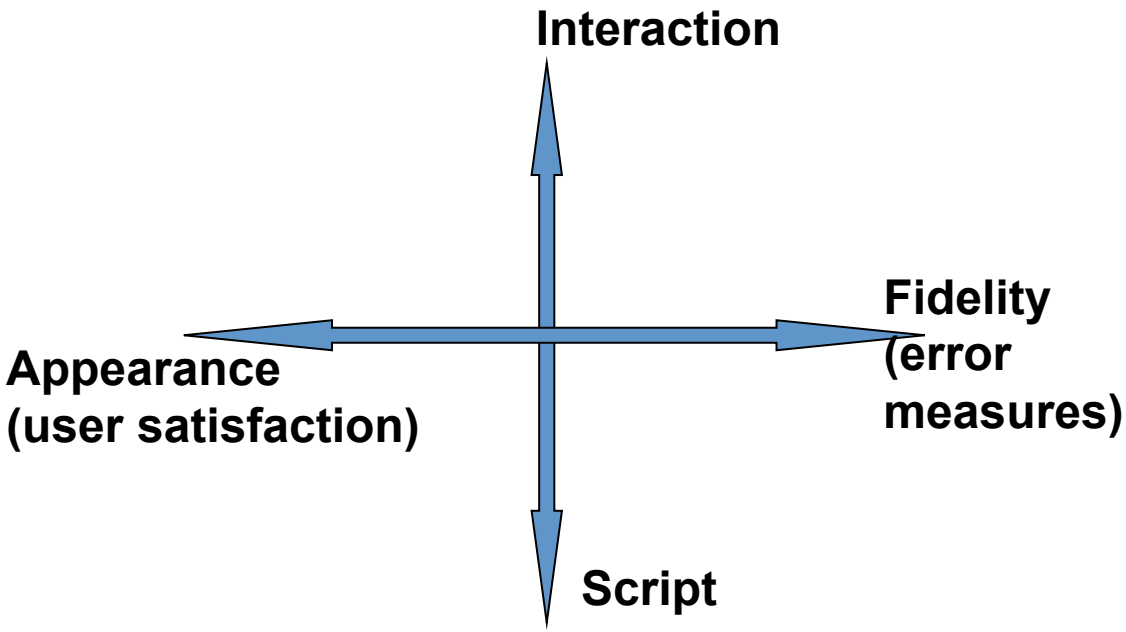

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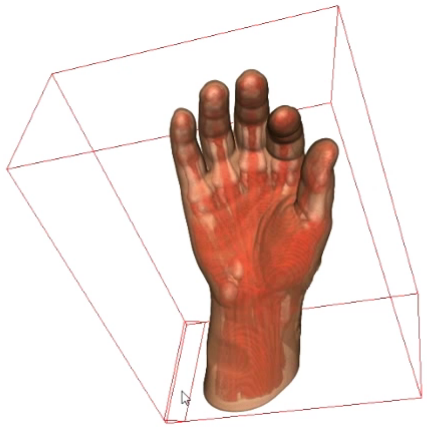
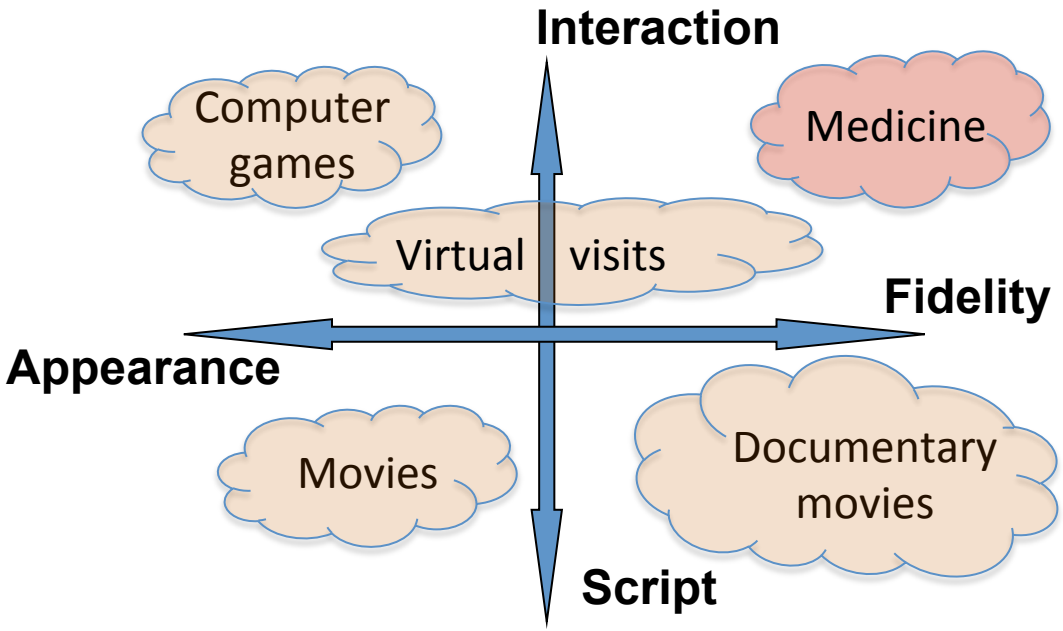


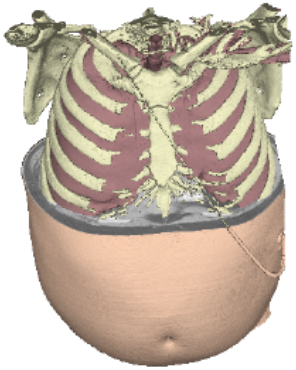


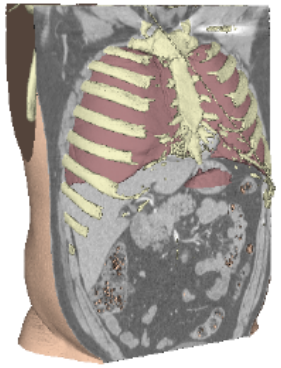
Requirements, challenges and solutions

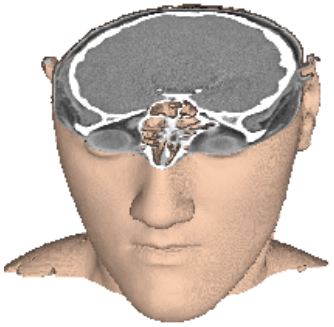
Interactive inspection
Fidelity
General datasets
Mobile devices

Huge dataset sizes
Small devices
Network bandwidth limitations
Interactive rendering

Data filtering
Perceptual metrics
Discrete space
Low-energy solutions
Greedy algorithms
Real-time
Lazy algorithms
Output-based

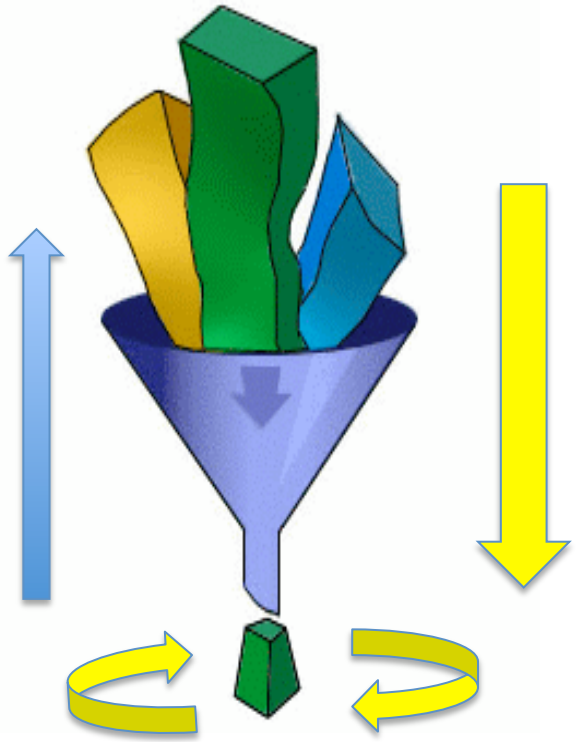




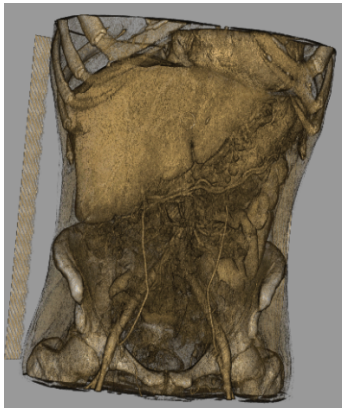


Challenges

Huge 3D data sizes
Small and mobile devices
Interactive inspection
Network bandwidth limitations



Constrained Optimization



Huge 3D data sizes
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$$Max\left[\ (1-\lambda)P(R(V',t),R(V,t))+\lambda\cdot\left(1-\frac{C_N(V)}{C(V)}\right)\right]\ \mid\ C(V')\leq\ Max\ Size$$

Some present solutions and trends

Low-energy solutions

Output-based data filtering

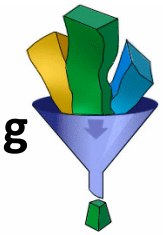
Real-time optimization

Perceptual metrics

Lazy algorithms

Some present solutions and trends

Output-based data filtering



- Preprocess
- Hierarchical representations
- Multi-resolution
- Compression

Low-energy solutions

- Software-based schemes
- Efficient algorithms
- Divide and conquer

Real-time optimization

- Dynamic front
- Discrete problem
- Knapsack

Perceptual metrics

- Discrete space, HSV
- Time coherence
- Pixels, colors, time
- Users

Lazy algorithms

- Time budget
- GPU updates

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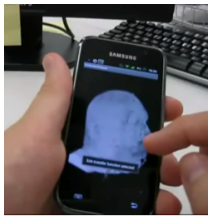

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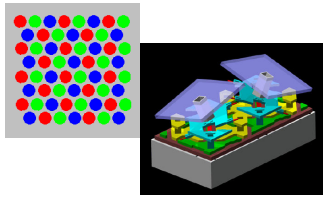

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Lazy algorithms

- **Time budget**
- **GPU updates**

Conclusions

Huge 3D datasets
Interactive inspection in small and mobile devices
Fidelity, error measures
Network bandwidth limitations

- Output-based data filtering
- Perceptual metrics
- Discrete space
- Low-energy solutions
- Real-time optimization
- Lazy algorithms