Visualization Process
## An overview of Vis Pipelines

Cmpt 767

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[Weiskopf/Machiraju/Möller]

Visualization Process
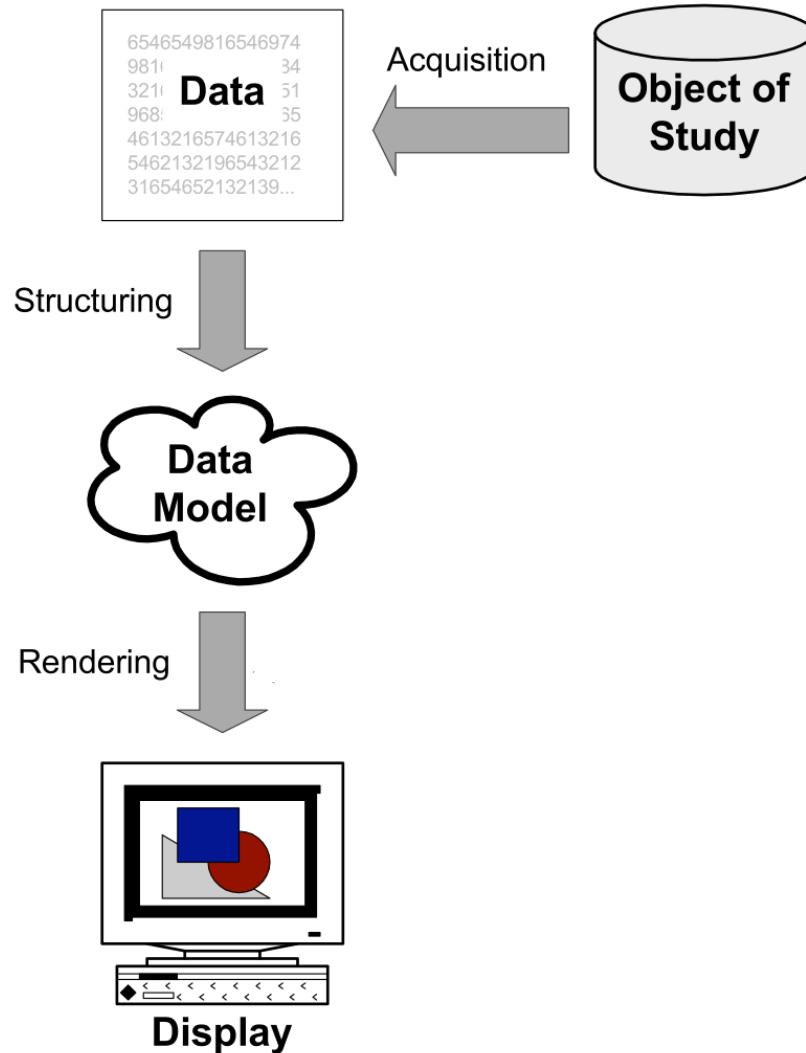
Visualization pipeline

Visualization Pipeline

simulation   **data bases**   **sensors**   *data acquisition*

raw data

filtering

vis data

mapping

graph. primitives:
• points
• lines
• surface
• volumes
attributes:
• color
• texture
• transparency

renderable representation

rendering

display images video   *interaction*
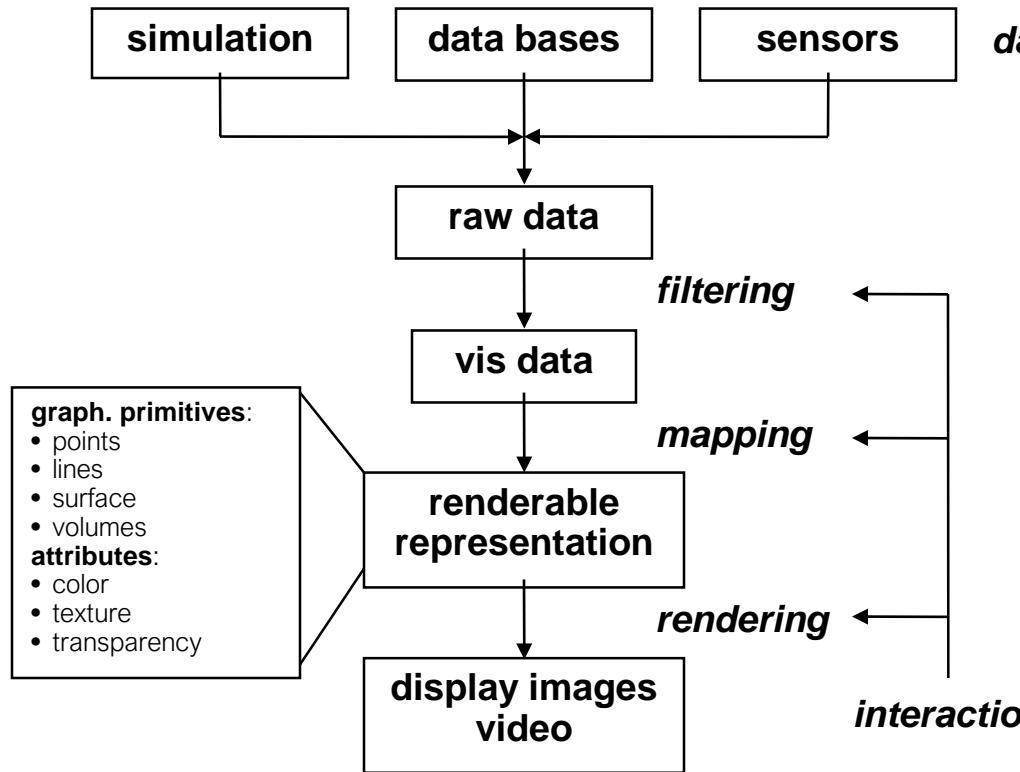
filtering
data -> data
• data format conversion
• clipping/cropping/denoising
• slicing
• resampling
• interpolation/approximation
• classification/segmentation

mapping
data ->graphical primitives
• scalar field ->isosurface
• 2D field ->height field
• vector field ->vectors
• tensor field ->glyphs
• 3D field -> volume
• highD -> 2D

rendering:
• geometry/images/volumes
• "realism" – e.g. : shadows, lighting, shading

4

Visualization Pipeline

- Example -- IRIS Explorer
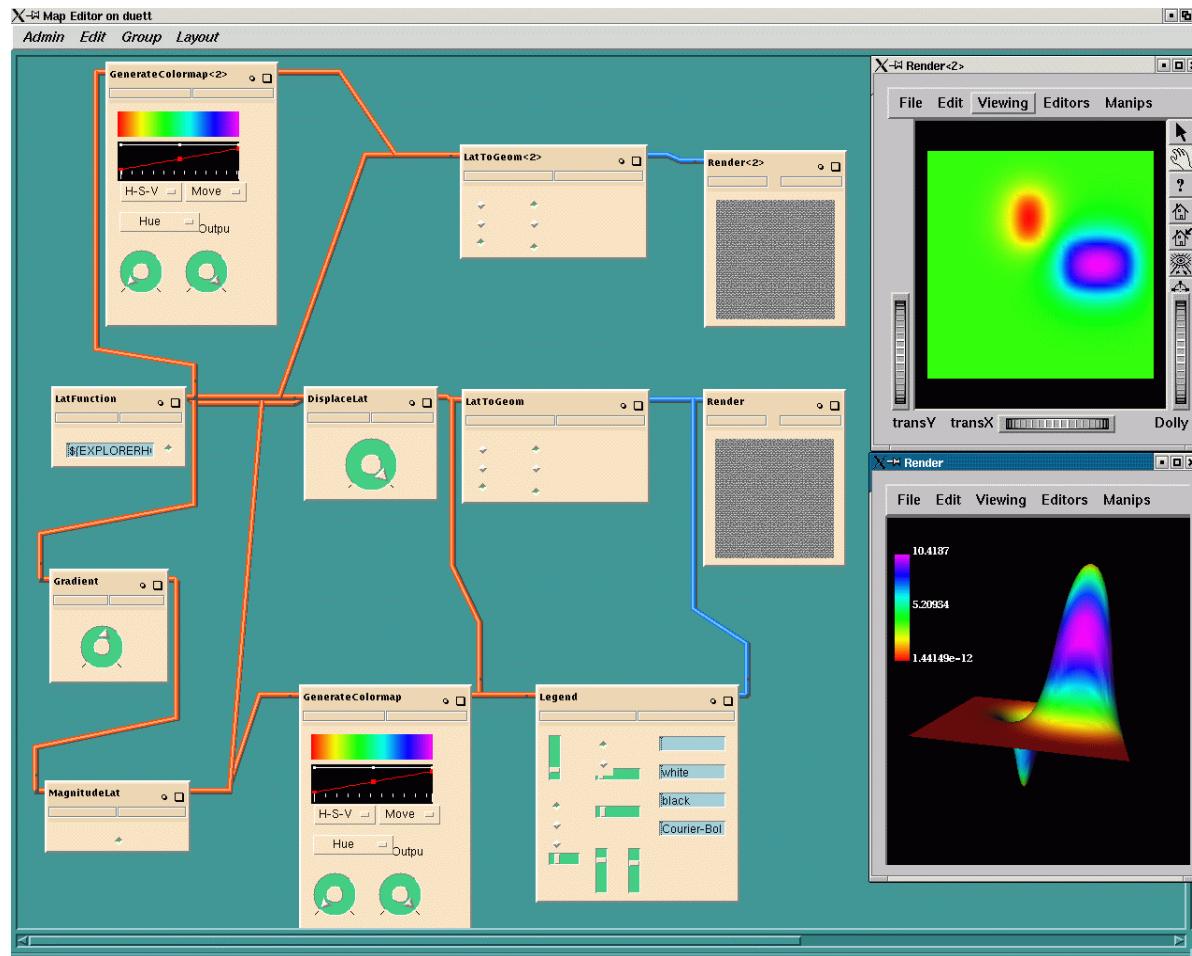
Visualization Pipeline
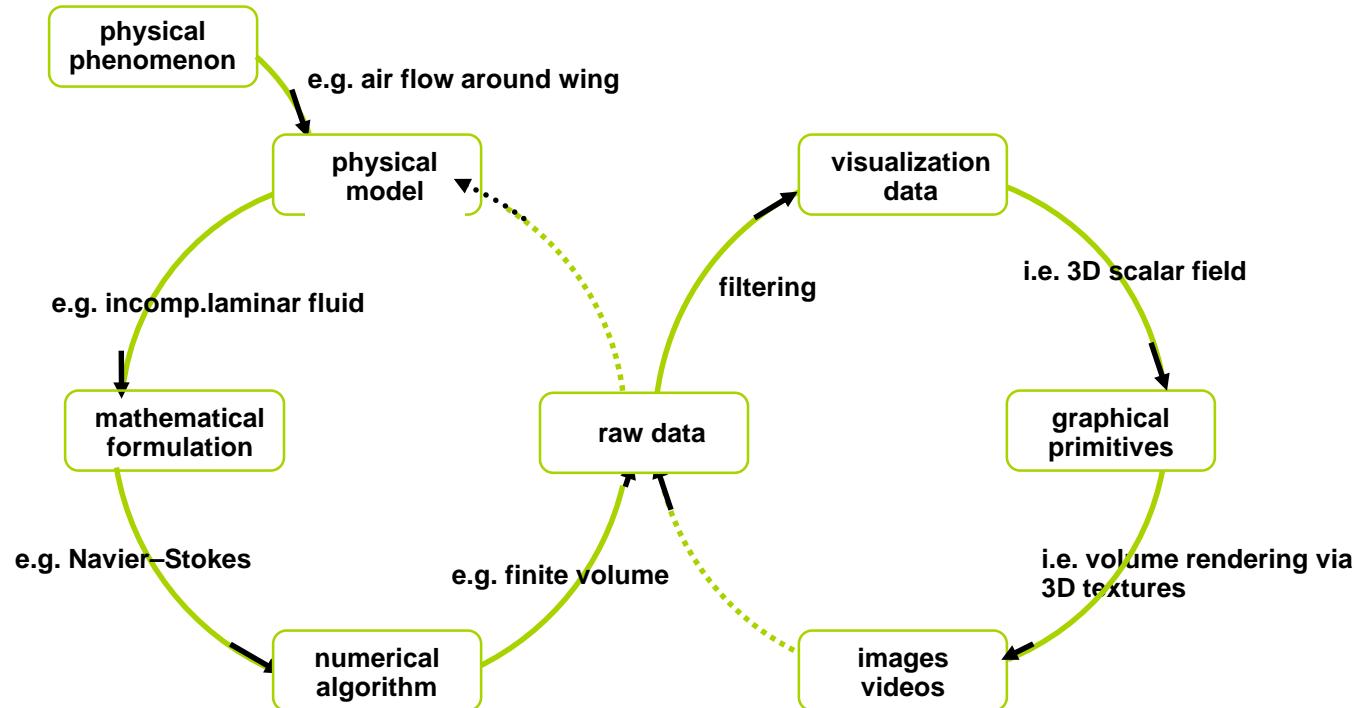
- Example: simulation of the flow within a fluid around a wing

```
physical
phenomenon
        e.g. air flow around wing

                physical
                model

e.g. incomp.laminar fluid

mathematical
formulation

e.g. Navier–Stokes

                numerical
                algorithm
                        e.g. finite volume

                                raw data

                                filtering

                                                visualization
                                                data

                                                        i.e. 3D scalar field

                                                                graphical
                                                                primitives

                                                        i.e. volume rendering via
                                                        3D textures

                                                images
                                                videos
```

Visualization Pipeline

- Example: simulation of the flow within a fluid around a wing

Flapping Mylar Wings (14.4 Hz)
AHPCRC, Stanford University

Pressure
100030
100020
100000
99980
99960

Time: 0.000000 s

https://www.youtube.com/watch?v=6TzYfeP5vTY
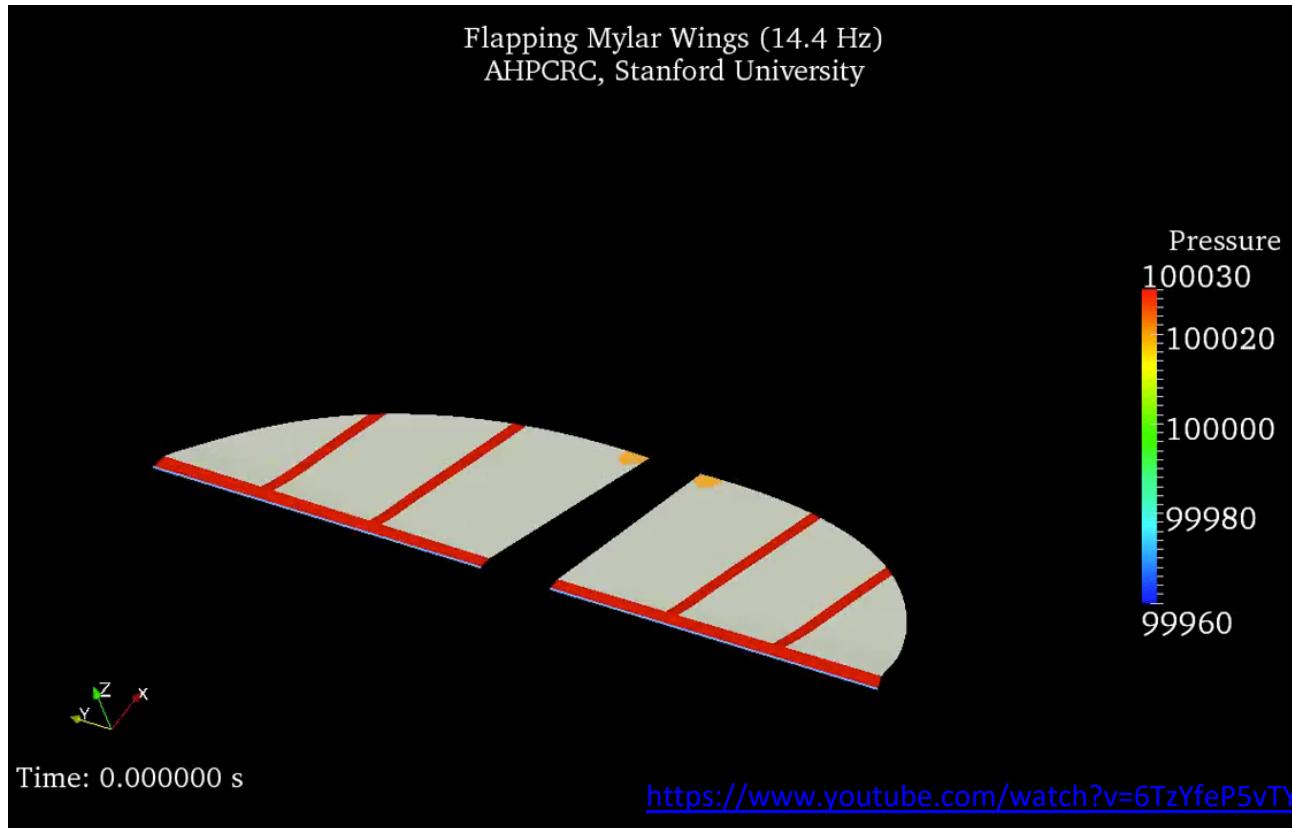
Pipeline Model

[Maneesh Agrawala]
[Tamara Munzner]

task

data
    physical type
        int, float, etc.
    abstract type
        nominal, ordinal, etc.

domain
    metadata
    semantics
    conceptual model

processing
algorithms

mapping
    visual encoding
    visual metaphor

image
    visual channel
    retinal variables
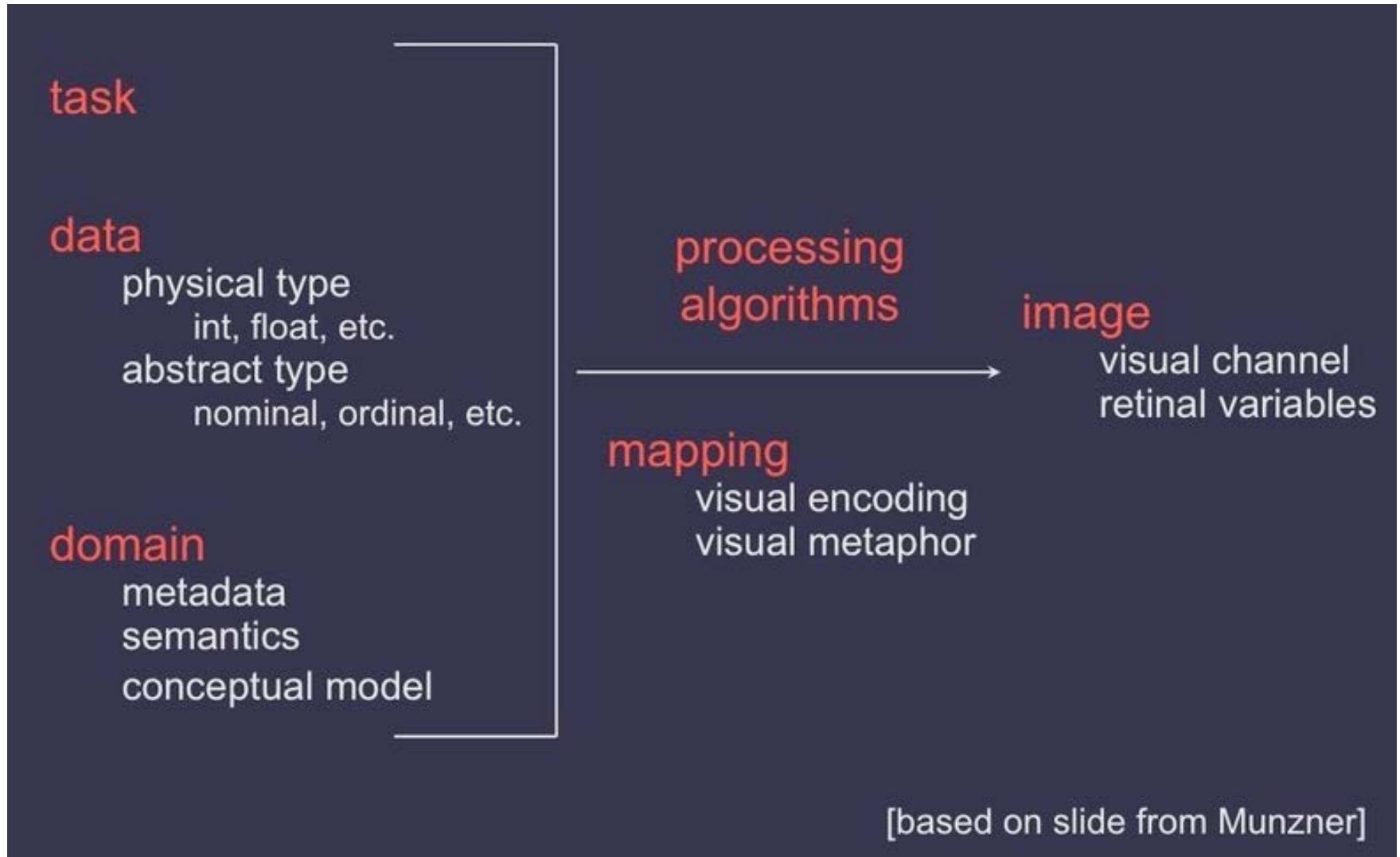
[based on slide from Munzner]

8

Pipeline Model
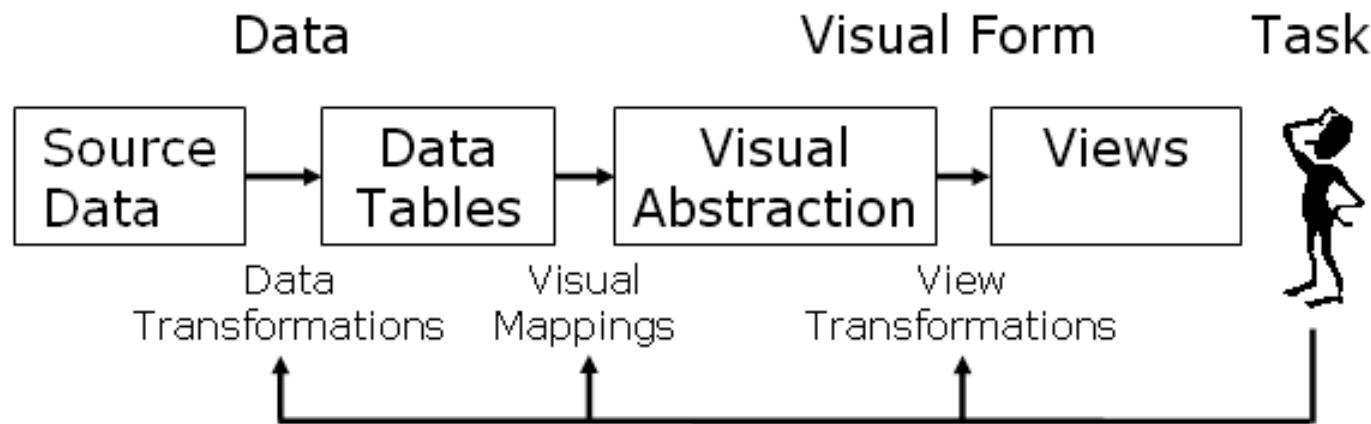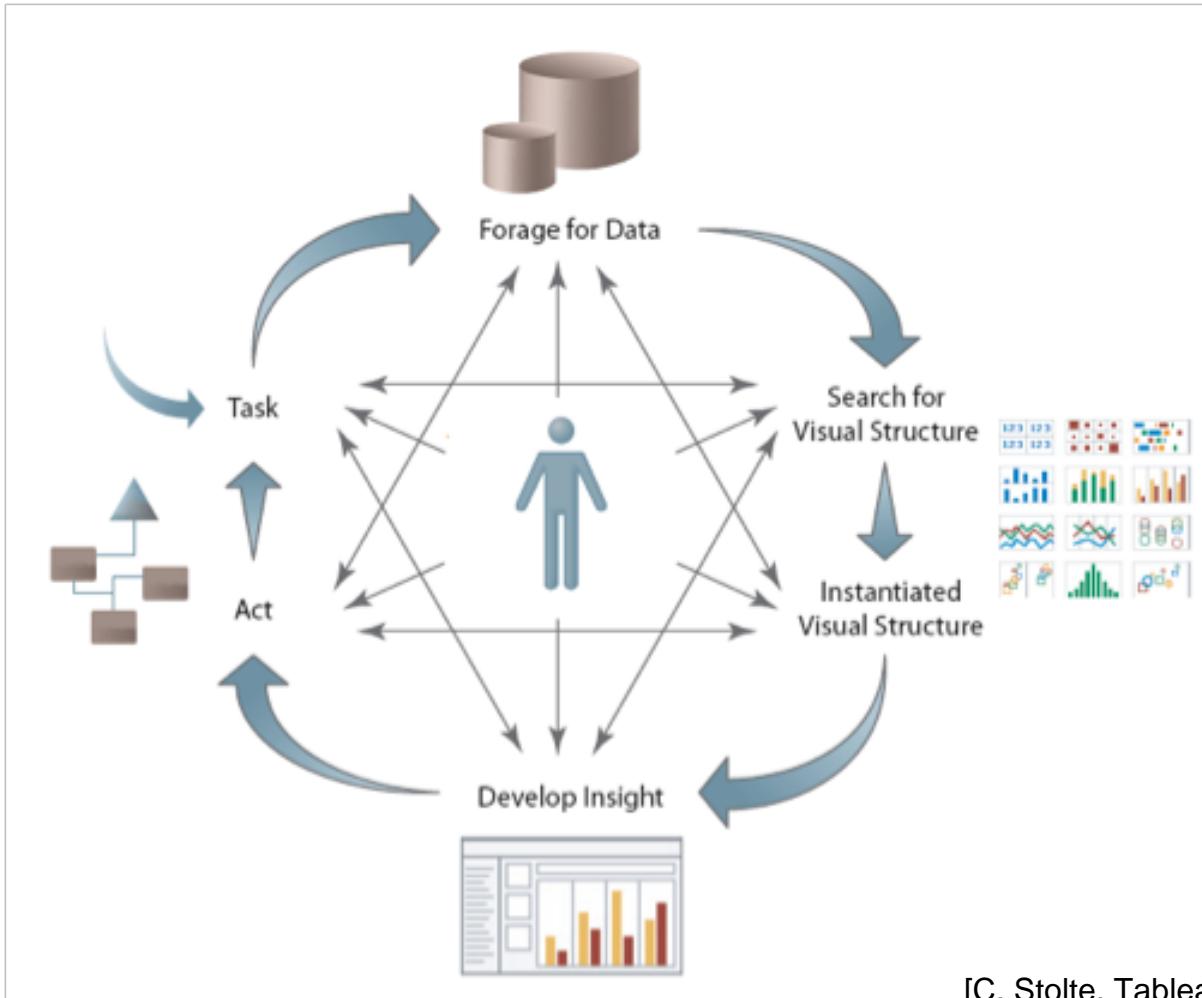
Cyclical Model

Cyclical Model

[J. van Wijk, The Value of Visualization]
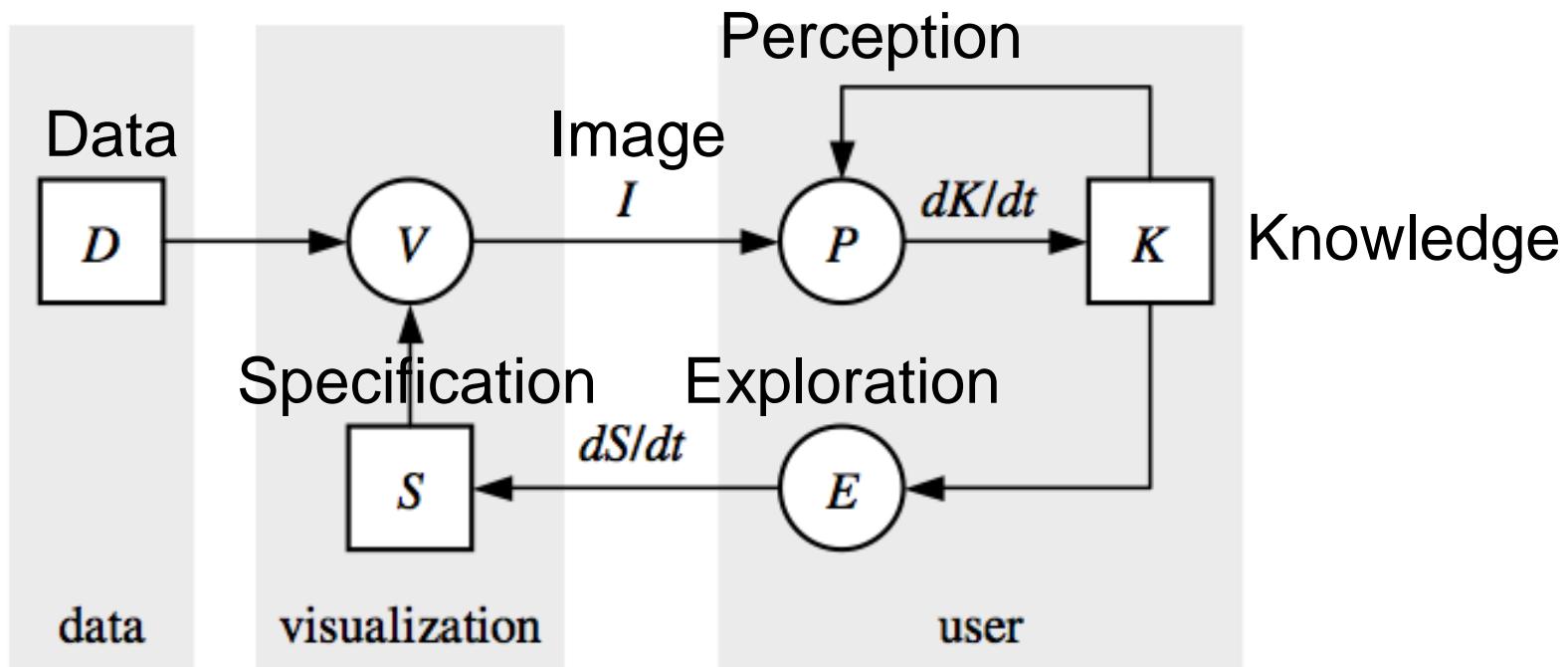
Figure 1: A simple model of visualization

Scenarios of Visualization
# In context of different tasks

# Scenarios

- Video/movie mode
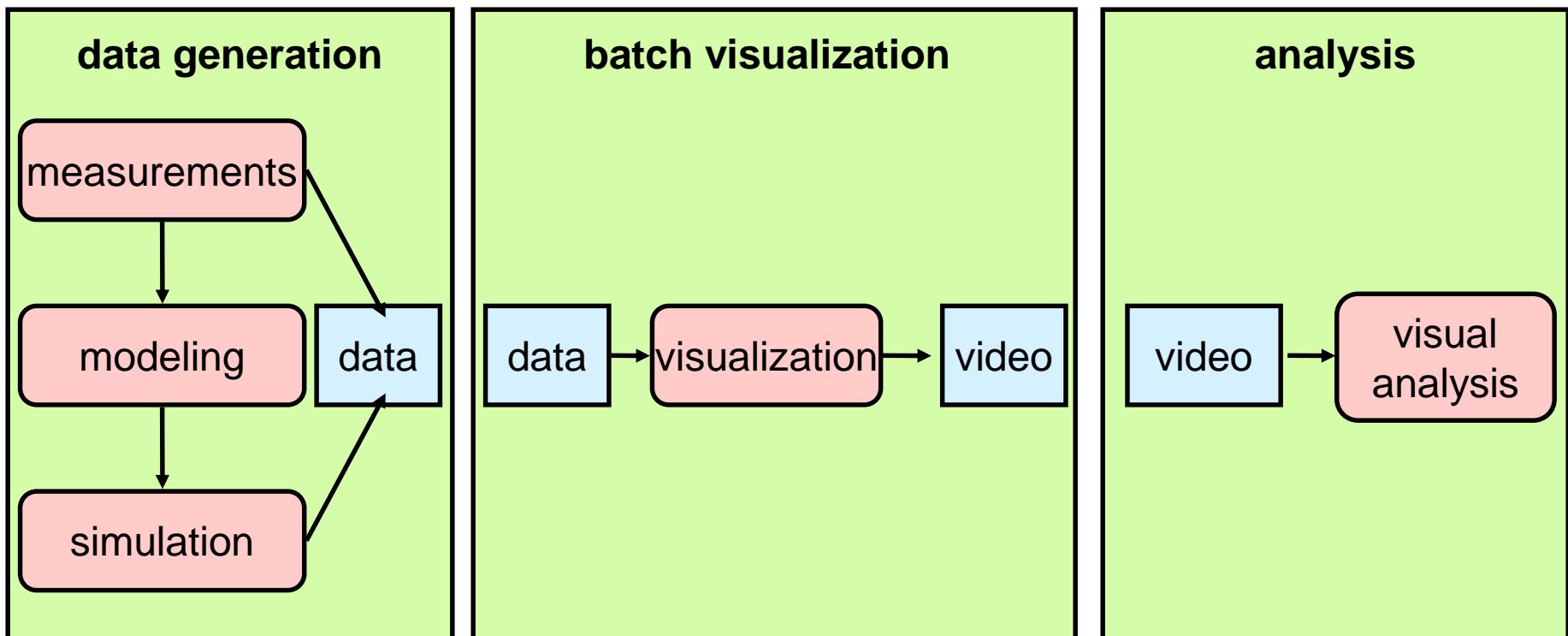
Scenarios

- Tracking
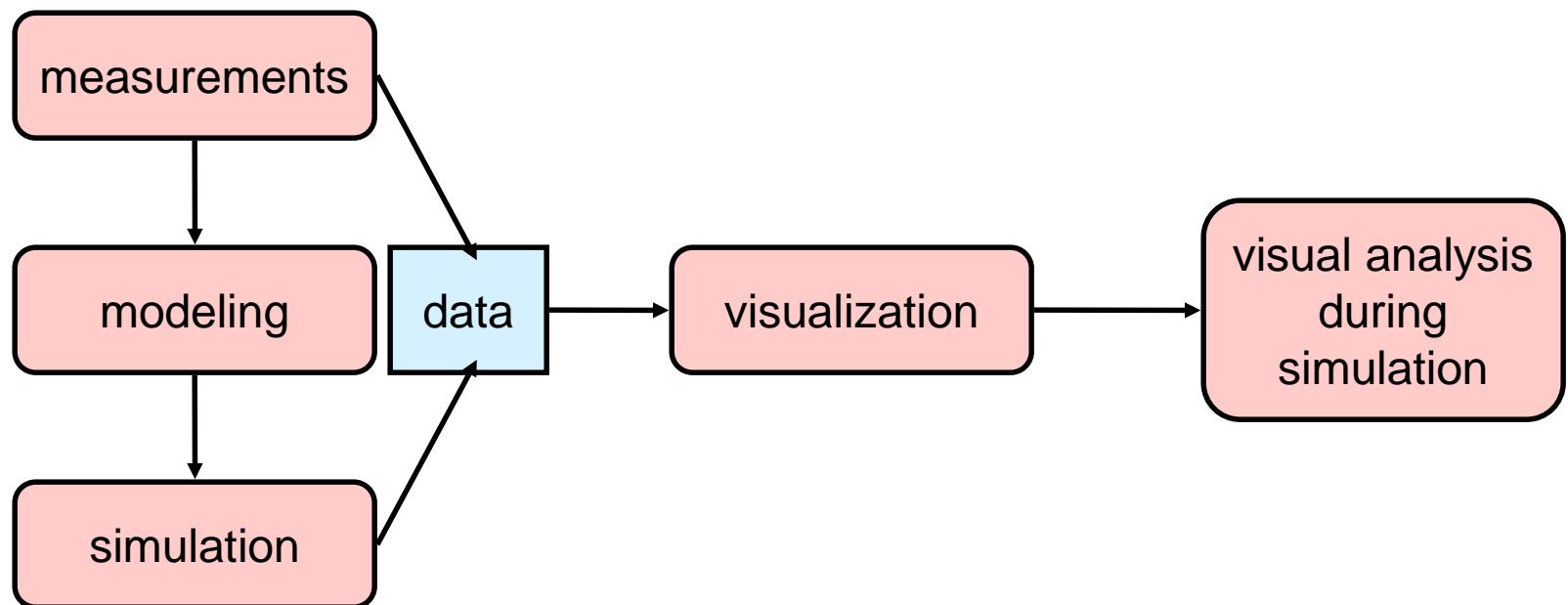
Scenarios

- Interactive post processing / visualization
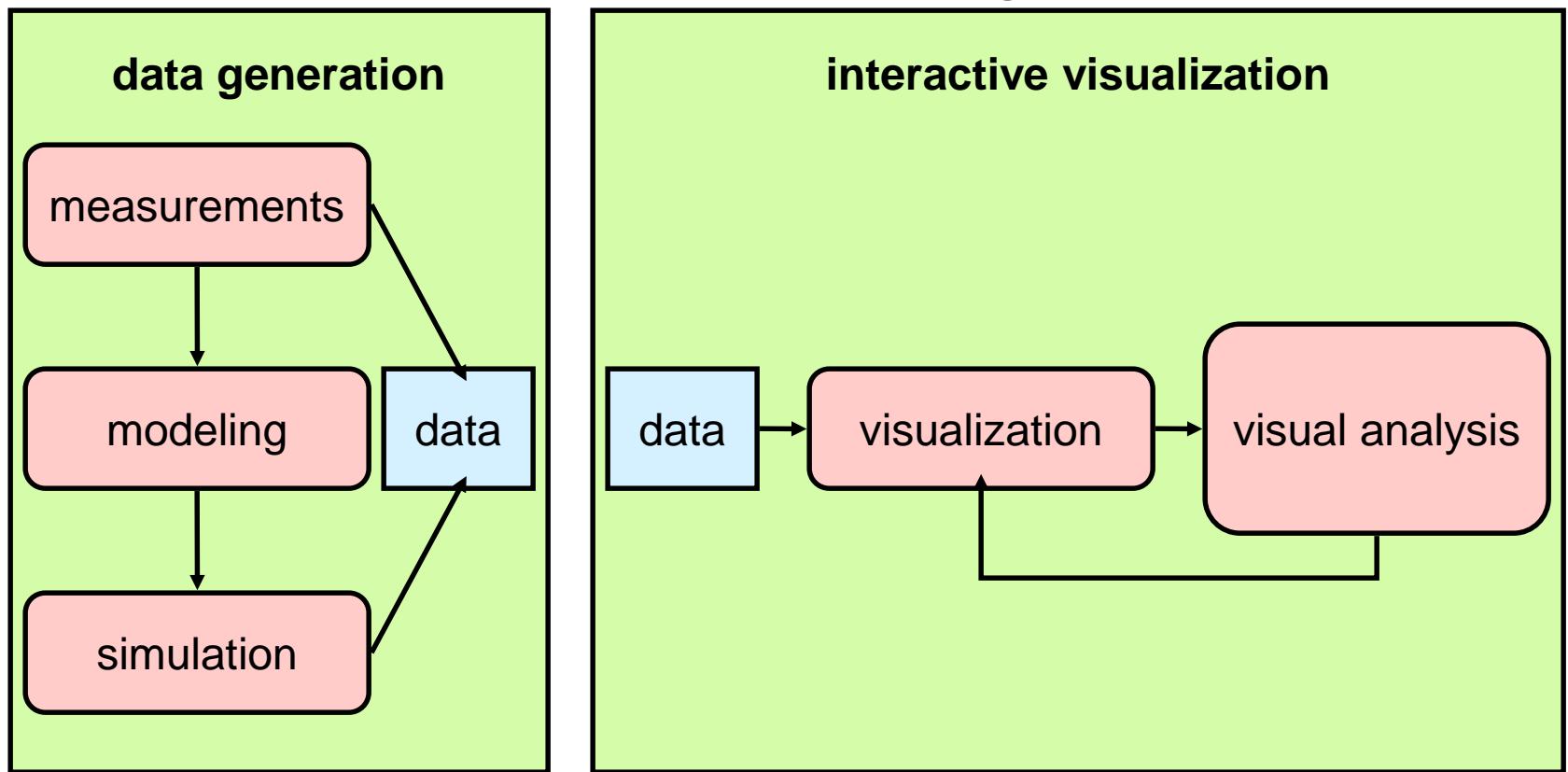
Scenarios

- Interactive steering / computational