Towards a Visualization Process Model for Online Visualization

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MOTIVATIONS

Existing models follow a pipeline of operators.
They can be adjusted before or after being applied, but not on the fly.

Nowadays applications and datasets ask for:

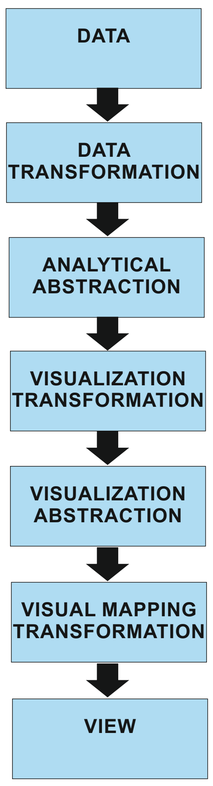
- supporting incremental data handling and incremental visualizations
- allowing the interaction with partial results adjusting parameters
- optimizing the visual analysis

OUR GOAL a new visualization model to address these needs that we term Online Visualization

BACKGROUND

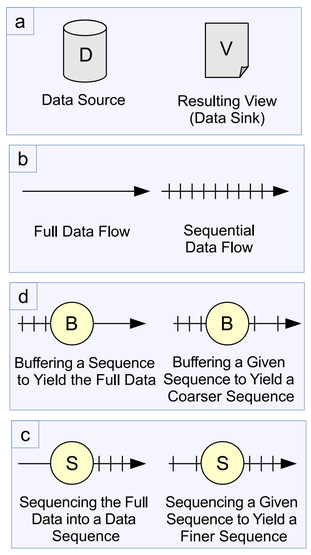
- Several disjoint visualization approaches deal with related aspects:
  - Out-of-core visualization (e.g., [1])
  - Streaming data visualization (e.g., [2])
  - Online dynamic graph drawing (e.g., [3])
  - Layered visualization (e.g., [4])
  - Progressive Visual Analytics (e.g., [5])
  - Parallel visualization (e.g., [6])
- These heterogeneous approaches can be subsumed under Online Visualization

COMMON VISUALIZATION MODELS (e.g. CHI)



THE ONLINE VISUALIZATION MODEL

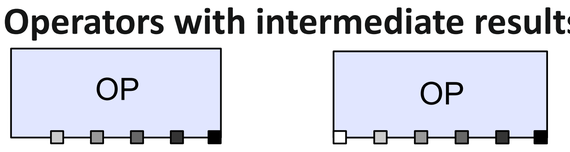
Enhanced Data Modeling



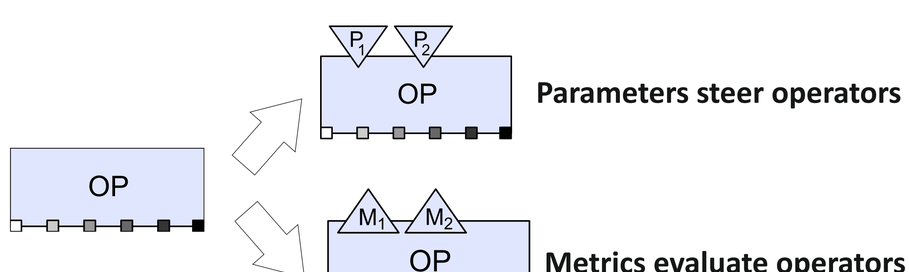
Enhanced Process Modeling

Monolithic Operators

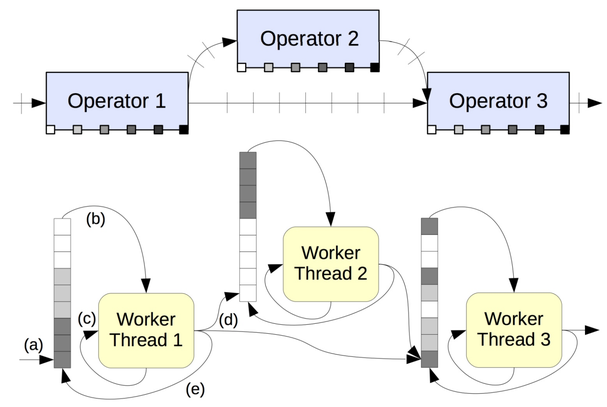
Operators with intermediate results



Metrics & Parameters



IMPLEMENTATION



Online Visualization can be implemented using priority queues and asynchronous threads[7]:

- (a) data chunks are added to the queue
- (b) retrieved by the worker thread that
- (c) iteratively computes better solutions
- (d) a good enough result is generated and passed on to subsequent threads.
- (e) If the result is not yet good enough to be final, it is again added to the queue

ONLINE VISUALIZATION INTERACTION & STEERING: A CASE STUDY

TASK (based on NTHSA FARS dataset): the user issues a query interacting with several sliders, setting a reference crash. The system computes similar crashes, plotting them on a density map

Common Visualization Model

- it is not possible to model and render intermediate results
- the slow response time makes the system not interactive system

Online Visualization Model

- it is possible to model and render intermediate results
- the quicker response time makes the system interactive

a: Mono **b:** Linear **c:** Non linear

METRICS VIEW 4

1 MODEL VIEW

VISUALIZATION VIEW
- It shows partial results immediately updated

2

3

SETTINGS VIEW
- changing parameters
- selecting metrics

a: Mono b: Linear c: Non Linear

Speed vs Accuracy

Comparison between two model's parametrizations:
- prioritizing speed
- prioritizing accuracy

Insights

Number of Active drunk people involved in crashes on Sunday's early hours: 0 (left), 1 (middle), 3 (right)

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