

SUPPORTING HANDOFF IN ASYNCHRONOUS COLLABORATIVE SENSEMAKING USING KNOWLEDGE-TRANSFER GRAPHS

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Domain Definitions

- Sensemaking** : A process that helps to bridge the gaps in understanding and find meaning in information.
- Handoff** : Explicit transfer of knowledge.
- Externalizations** : External representations of a persons thoughts.
- Partial Findings** : Developing incomplete analysis results.



Image by Igor Kopenitz

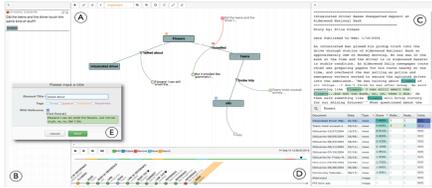
Knowledge Transfer Graph (KTGraph)

- Handoff of partial findings in asynchronous collaborative analysis** is challenging
 - Externalizations produced by analysts may not adequately communicate their investigative process.
- Knowledge Transfer graph (KT graph)** supports:
 - Explicit communication of progress and uncertainty with annotation
 - Implicit communication through playback of investigation histories

Design Considerations

- G1** : Support interactive externalizations.
- G2** : Encode analytic provenance.
- G3** : Facilitate common understanding.
- G4** : Provide interaction and analytic provenance.

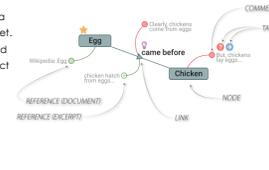
Panels: Linked Multiple Views of KTGraph



Graph Panel (A) to externalize investigation, **Comments Panel (B)** to review comments related to investigation, **Dataset Panel (C)** displays the dataset under investigation, **Timeline Panel (D)** enables investigator's to playback investigative history.

Graph Panel

- Allows an investigator to build a **2D graph** visualization of dataset.
- Nodes and links** can be created and labeled to encode abstract concepts or entities.
- Four basic **tags** represented by marks utilizing color and shape channels : To-do, Question, Important, Hypothesis.

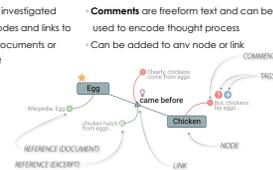


Dataset Panel

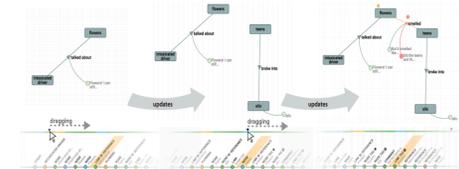
- Displays the data being investigated
- References** associate nodes and links to the source evidence (documents or excerpts) in the dataset

Comment Panel

- Comments** are freeform text and can be used to encode thought process
- Can be added to any node or link



Timeline Panel :



Session for each investigator; timeline shows the start and end of each session
 Implicit awareness of previous investigators partial findings: **Animated playback**

Analysis Summary

- What : Data**
 - 2D Network items (nodes), links, attributes
 - Temporal semantics: Animated playback
- Why : Tasks**
 - Analyze : produce annotations
 - Analyze : produce recordings
 - Search : explore handoff of partial findings
- How : Encode**
 - Knowledge Transfer Graph
- How : Facet**
 - Linked multiple views: panels
- How : Manipulate**
 - Navigate : elements of any historical state of the vis
- How : Reduce**
 - Filter : by time of session

Example Handoff Scenario

<https://www.youtube.com/watch?v=SEYcztOxxQ>

User Study

- Stegosaurus** document analysis challenge
- Phase 1** : studied activities of follow up analyst
- Phase 2** : studied activities of the starting and follow up analyst
- Compared **KTGraph** against **Baseline** graph

Results : Phase 1

- Between-subjects** design with 20 participants
- Performance Metrics: handoff score, debriefing score, key documents score
- Mean Handoff score** : 71% KTGraph compared to 50% Baseline
- Mean Debriefing score** : 71% KTGraph compared to 33% Baseline
- Key Documents score** : 51% KTGraph compared to 32% Baseline
- The results in Phase 1 demonstrate that KTGraph was more effective at supporting handoff than baseline

Results : Phase 2

- Between-subjects** design with 18 participants
- Divided participants into groups of 3, randomly assigned to Baseline or KTGraph
- Questionnaire provided to each participant to gauge **usefulness**
 - KTGraph and Baseline received similar ratings on usefulness

"The timeline definitely helps because it shows where [the investigation] started and what the thought process was and how [the graph] was developed." – Participant

Critique

- KTGraph Critique**
 - Graph visualization does not scale well
 - Workspace required manual organization
 - Allow investigators to link comments to references
 - Allow investigators to edit their own timeline
- User Study Critique**
 - Participants only included computer science or engineering backgrounds
 - User study would have been more effective if a within-subjects design was used

Works Cited

- J. Zhao, M. Glueck, P. Isenberg, F. Chevalier and A. Khan, "Supporting Handoff in Asynchronous Collaborative Sensemaking Using Knowledge-Transfer Graphs," in IEEE Transactions on Visualization and Computer Graphics, vol. PP, no. 99, pp. 1-1, doi: 10.1109/TVCG.2017.2745279
- <https://www.youtube.com/watch?v=SEYcztOxxQ>