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.
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=5iEyczTOvxQ
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


◦ https://www.youtube.com/watch?v=5iEyczTOvxQ