SUPPORTING HANDOFF IN ASYNCHRONOUS COLLABORATIVE SENSEMAKING USING KNOWLEDGE-TRANSFER GRAPHS

Jian Zhao, Michael Glueck, Petra Isenberg, Fanny Chevalier, Azam Khan

1

Presented by: Vanessa Putnam

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.

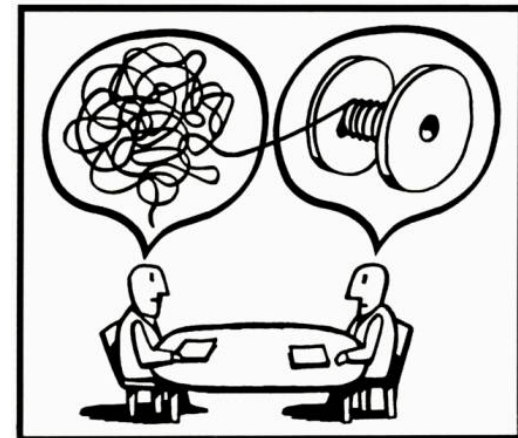- **Partial Findings** : Developing incomplete analysis results.

Image by Igor Kopelnitz

Knowledge Transfer Graph (KTGraph)

◦ **Handoff of partial findings in asynchronous collaborative analysis** is challenging

  ◦ Externalizations produced by analysists 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 he 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
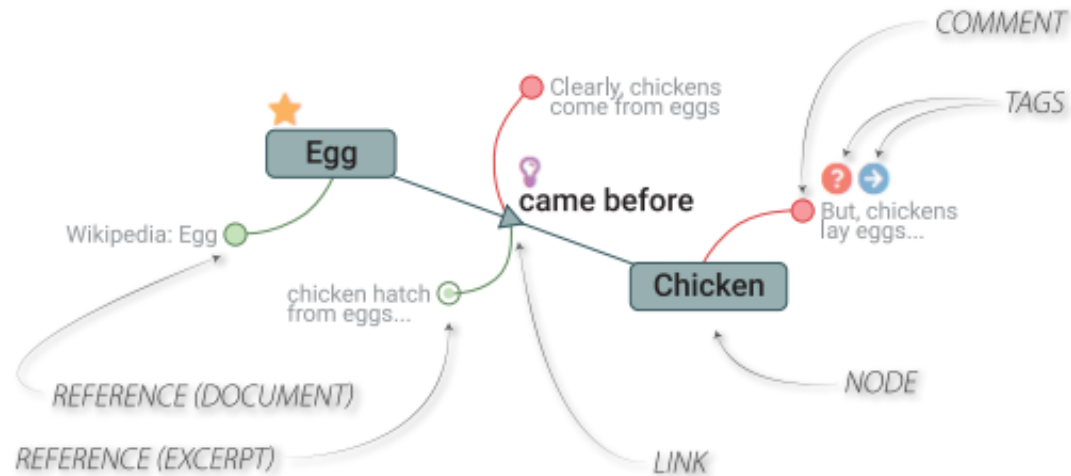 channels : To-do, Question,
  Important, Hypothesis.
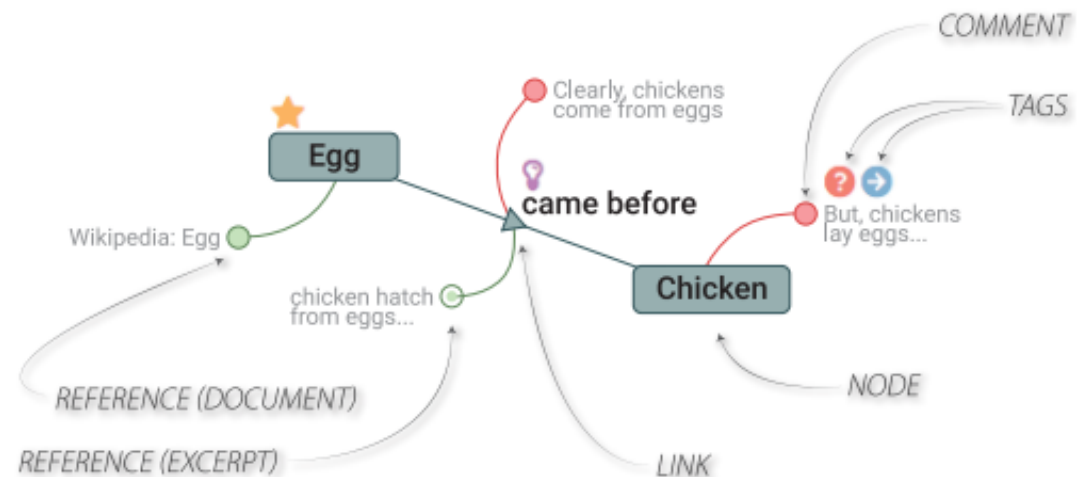
Dataset Panel

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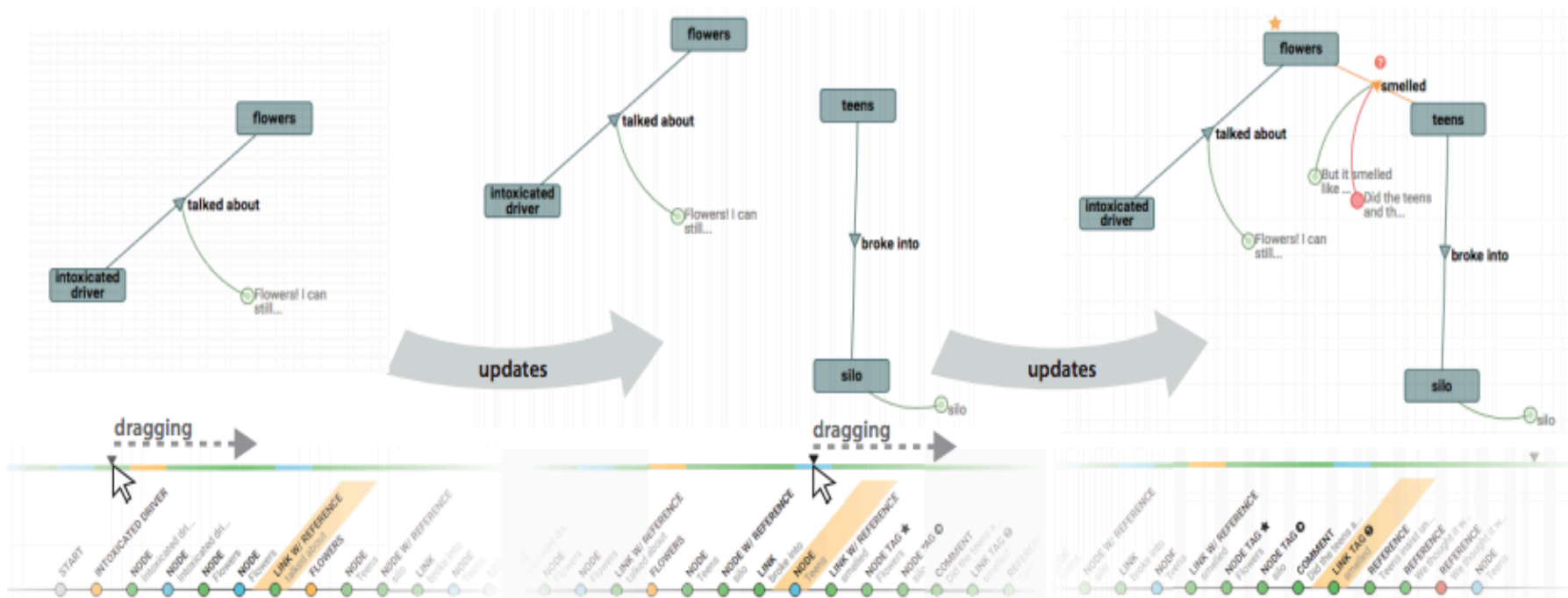
◦ **Session** for each investigator: timeline shows the start and end of each session
◦ Implicit awareness of previous investigators partial findings: **Animated playback**

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

◦ 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=5iEyczTOvxQ