Common ground in collaborative intelligence analysis: an empirical study


Dr. Sean Xavier Laurence
— The Joint intelligence Training Group, Royal School of Military Survey, THATCHAM, UK

Dr. Simon Attfield

Dr. Bob Fields
(— Middlesex University, London, UK)
Common ground
| Conversational grounding

- So what is Common Ground?
So a bit of Background info

— Intelligence analysis is much more than an individual activity.
— Using video offers a way to replicate non-verbal communicative cues in F2F communication.
— A shared visual workspace offers a common reference place to explore task artefacts interactively.

— An electronic bounded space with support for reciprocity, and for sharing, visualising, and interacting with task artefacts in real time.

— Laurence 2015
Motivation— What the study clarifies

- Prior use/impact studies of collaboration technology have focused on tasks that require physical handling.
Identical views of a shared visual workspace
Research Design

- 2x2 between-subject factorial design.

- Two independent variables — presence/absence of shared visual workspace and video;

- One dependent variable — conversational grounding effort.

- Two separate labs.

- Environment — iMac desktop units running the Cisco WebEx video conferencing software with integrated VoIP.

- Convenience sampling
  - 56 participants;
  - 2-member teams | 28 teams;
  - 25 undergrads | 31 post-grad;
  - 18 -48 age range.
Hypotheses

**H1.** Teams using shared visual workspace will construct repair-episodes at a lower rate than those without.

**H2.** Teams using video will construct repair episodes at a lower rate than those without.

**H3.** An association exists between shared visual workspace and video in terms of the rate of repair-episodes.

**H4.** The rate of repair-episodes will decrease as the task progresses.
Task 1: Assess if Farah has allegiance with a new terrorist cell network recently formed in his home town of Dissibad.

Task 2: Identify the five most plausible events or evidence from the intelligence data which supports any conclusion reached above.
### Data collection | analysis — Coding schema

<table>
<thead>
<tr>
<th>Codes</th>
<th>Code Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Some examples:</td>
</tr>
<tr>
<td></td>
<td><em>Should we go over Exhibit 52 — Um, just forget it.</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Understanding Check</th>
<th>(1). To code any utterance a person produces to check ‘self’ or the message recipient’s understanding of a previous utterance; or current state of understanding with respect to the task.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subcodes</strong></td>
<td><strong>Prior Action-Check</strong></td>
</tr>
<tr>
<td></td>
<td>(2). To code questions or phrases for checking whether a previous ‘action’ has been understood by another group member.</td>
</tr>
<tr>
<td></td>
<td>Some examples:</td>
</tr>
<tr>
<td></td>
<td><em>Do you see what I’m doing?; Did you see what I just shared?</em></td>
</tr>
</tbody>
</table>
## Coding schema — more excerpts

<table>
<thead>
<tr>
<th>Codes</th>
<th>Code Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduce-Dialogue</td>
<td>To code a new discourse unit — a new point, idea, topic, or information.</td>
</tr>
<tr>
<td></td>
<td><strong>Annotation Rules</strong></td>
</tr>
<tr>
<td></td>
<td>Excludes responses or utterances evoked or elicited by a person’s conversation partner.</td>
</tr>
<tr>
<td>5. Repair-Request</td>
<td>(1). To code a message recipient’s requests for the speaker to repeat, rephrase or simplify an utterance.</td>
</tr>
<tr>
<td></td>
<td>Some examples:</td>
</tr>
<tr>
<td></td>
<td><em>Sorry?; Excuse me?; Pardon?; I don’t understand; Say that again please</em></td>
</tr>
<tr>
<td></td>
<td>A1: Did Kris finally retake his Mth 401 exams?</td>
</tr>
<tr>
<td></td>
<td>A2: Huh? (*Repair-Request)</td>
</tr>
<tr>
<td></td>
<td>A1: Did Kris retake his Mth 401 exams afterwards? (*Repair)</td>
</tr>
<tr>
<td></td>
<td>A2: I have no idea</td>
</tr>
</tbody>
</table>
— Data analysis and results

2-Way ANOVA Results

H1 | main effect of SVW
(F(1,24) = 4.988, \( p = .035, \eta^2 = .172 \)).

H1 is supported

No main effect for video; and no interaction effect for the two independent variables.

H2 & H3 not supported
Other results
— Pearson’s correlation

Measuring the rate of repair-episodes against time period in the experiment.

- At T1, the rate of repair-episodes was higher; T1 was excluded from the Pearson’s correlation test.
- At T2 – T5, rate of repair-episodes progressively declines as task progresses.
- The relationship between the rate of repair-episodes and time period participants spent working on the task was statistically significant. ($\rho < .01; \rho = -.994; 2$-tailed).

H4 is supported
8 SVW applications

- To reduce talk effort
- To maintain awareness
- To authenticate presentations
- To facilitate deictic pointing referencing & for making representation
- To complete joint activities
- To introduce presentations
- For breakdown repair
- To monitor understanding
- To introduce presentations
- To monitor understanding
To maintain awareness

**Dialogue 1**

**Bob:** Erm, that can’t be right! I think what you meant to say there is Zarqawi and not Zabihir. Zabihir is the name of the town! What we said was that Bin al-Shibh and Zarqawi both frequented the museum regularly. You should change it.

**Alex:** OoH yes yes!
To minimise communicative effort

Dialogue 2

Alex: Have you come across someone named Rana Ba-seyl-rhat yet?
Bob: God! These names!
Alex: Let me see if I can write on this thing.
Bob: What was the name you said again?
Alex: Just look on the board, I'll show you there.

(He starts writing on the SVW; he draws a "square" shape over the text)

Bob: Aaargh! Okay! — “Rana Baseerat”.

© Middlesex University
To facilitate, introduce & complete a presentation.

**Dialogue 3**

**Bob:** Hang on a minute. Actually before you take this off the screen; — this chap here on this ITC statement — Abdul Amar Qazafi.

**Alex:** What about him?

**Bob:** Dude owns a farm where a terrorist bodyguard was arrested in 2007.

**Alex:** What dude? What farm?

**Bob:** "Abdul Amar" — number 7 on this ITC list you have up. One of my records here, he owns a farm that was raided by the counterterrorism team.

**Alex:** Hmm! Okay! Interesting!
Discussion

Our results are explained by …

- Differences in communication media affordances.
- Attenuation differences in media communication cues, visual cues and awareness nuances, etc.
- A collaborative framework with fewer visual and communication cues generally increases the effort towards grounding — vice versa.
Conclusion

**Drawbacks:**

- Catch 22s — Intelligence domain studies issues.
- Possible existing affiliations between group members.
- Making broad generalisation from a student sample.

**Future research:**

- Explore the performance differences of the intelligence tasks.
- Explore if a positive correlation exists between prior experience with svw and rate of repair-episodes.
Arguments for creating new model

- No one model fits all.
- Substantial differences in code categorizations and their definitions.
- Codes intended for use with specific units of analysis in mind
- Codes created for use with specific data types e.g., threaded discussions, chat, etc
- Contexts and tasks types for which they were designed may not be suited.
- Often contain numerous ambiguities which it makes it harder to distinguish them.
- Often lacked classifications that can be quantifiable and compared across media conditions.

Pros for our coding schema

- Implemented strong annotation rules for our coding schemas.
- Independent raters obtained homogenous results, which demonstrating that their understanding and interpretation of the annotation rules and codes were similar.