



Towards an Understanding of Shared Understanding in Military Coalition Contexts

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Overview

- Shared understanding seems to be a construct of considerable importance to coalition operations
 - identified as ITC hard problem area.
- But what does the term ‘shared understanding’ actually mean?
- How should we define shared understanding?
- How should we distinguish shared understanding from shared situational awareness (SAA) and shared mental models (SMM).



Aims

- Improve our understanding of understanding and shared understanding.
- Explore the differences between:
 - understanding, situation awareness and mental models
 - shared understanding, shared situation awareness and shared mental models
- Propose reasons why shared understanding is important for military coalitions.
- Identify areas for future research.



Understanding Understanding

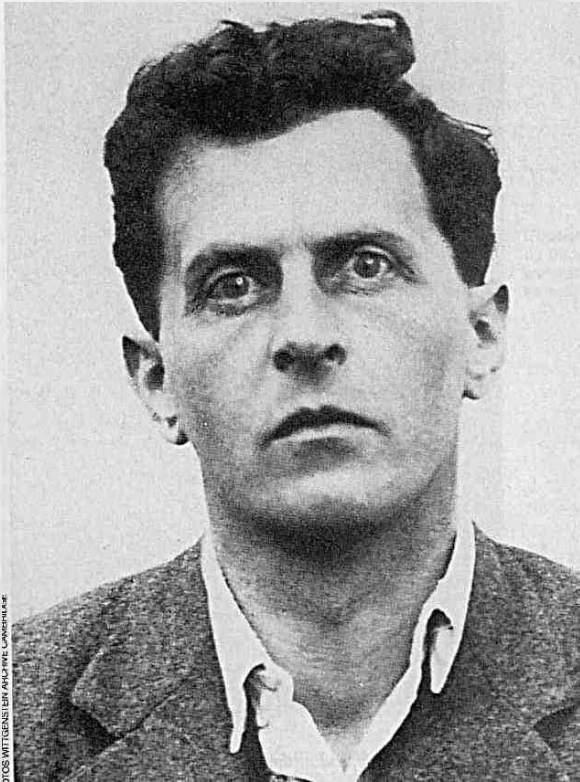
“to understand understanding is a task to be attempted and not to be achieved today, or even tomorrow”

- Paul Ziff (1972)

- Approach
 - review ideas of later Wittgenstein
 - examine how the term ‘understanding’ is used in different contexts
 - perception, language, intentional actions, situations
 - explore why it is difficult to understand understanding



Understanding and Ability



- Wittgenstein
 - understanding is akin to an ability
- Categorization Errors
 - understanding is not a feeling or experience
 - understanding is not a mental state
 - understanding is not a mental process



Sensory Sensemaking

- Perception depends on more than an ability to detect stimuli; it also depends on an ability to make sense of them – **to understand them**.
- Surgical interventions often restore visual sensation but not ‘sight’
 - Oliver Sacks – *To See and Not See*
- **“To see one must have visual impressions that one understands”** (Noë, 2004)
- Phenomenal experience is predicated on a knowledge of ‘sensorimotor dependencies’.



Understanding in Action

- The understanding of intentional action.
- Ability to predict, account and explain other people's actions
- Mental simulation and mirror neurons:
 - neurons that are active when we perform an action are also active when we observe others doing the same action
 - the basis of empathy?
 - the basis of language understanding?





Language Understanding

- Understanding a language is a matter of being able to do things.
- Understanding is akin to an ability:
 - to understand a sentence is to be able to do things that involve the sentence, e.g. to apply it correctly, to paraphrase it and to respond to it in appropriate ways
 - to understand a word is, inter alia, to be able to use it correctly



Situational Understanding

- Understanding of situations
 - evidenced by an ability to explain how the current situation, or elements thereof, came to be as they are
 - evidenced by an ability to predict how the current situation may develop or evolve in the future
- Predictive and explanatory capabilities seem to be driven by a knowledge of causal relationships
 - an ability to ‘see more than meets the eye’
- Seeing more than meets the eye may be common to many types of understanding.



What is Understanding?

- Understanding is NOT a feeling, a state, or a process.
- Understanding is **similar** to an ability....
- ...but it is not identical to an ability.
- Understanding is evidenced by our descriptive, explanatory and predictive successes regarding the object of understanding, but there does not seem to be any firm basis for saying that understanding is a particular form of ability, e.g. an ability to predict or explain something.



Shared Understanding?

- Shared understanding is an ability (or something similar to an ability) that is common to multiple agents.
- But commonality of abilities does not seem to require commonality of performances
 - the performances manifesting understanding may be many and varied
- Shared understanding is often seen as important for ‘unity of effort’
 - clearly, in this case, the performances of specific coalition elements will not be the same – it is more their complementarity or compatibility (relative to some goal) that is important
- Perhaps similarity of performances is sufficient but not necessary for conclusions about shared understanding.



Mental Models

- Mental Models (MMs):
 - “...mechanisms whereby humans are able to generate descriptions of system purpose and form, explanations of system functioning and observed system states, and predictions of future system states” (Rouse & Morris, 1986)
- Notion of mental models is clearly related to our notion of understanding.
- MMs can, we suggest, be cast as an **enabling mechanism** for understanding.
- MMs provide a mechanistic realization of the specific performances that warrant ascriptions of understanding to an agent.
- MMs are not identical to understanding because abilities cannot be reduced to their vehicles.



Situation Awareness

- Situation awareness
 - “...the perception of the elements in the environment within a volume of space and time, the comprehension of their meaning and the projection of their status in the near future.” (Endsley, 1995)
- SA seems to subsume understanding
 - perception, comprehension and projection.
- SA is best conceived of as a particular form of understanding - dynamic situational understanding (DSU).
- DSU is evidenced by descriptive, explanatory and predictive performances that may be driven by MMs.
 - provides us with a potential theoretical integration of SA, MM and understanding(?)



SA and Understanding

- Disputes about SA, e.g.
 - state/process duality
 - possibility of implicit SA
- We can resolve these disputes by casting SA as a form of understanding:
 - SA is neither a mental state nor a mental process because understanding is neither a mental state nor a mental process
 - SA is neither implicit or explicit because understanding is neither implicit nor explicit
 - folks on both sides of the debate are mistaken



SU and Military Coalitions

- The importance of shared understanding:
 - improved group/team performance
 - better coordination, efficient decision-making
 - optimal use of limited communication assets
 - coalition environments are often resource-constrained environments in which power overheads and network traffic must be kept to a minimum
 - If shared understanding improves the efficiency of inter-agent communication (perhaps reducing the need for communication altogether), it may contribute to the optimized use of limited network assets
 - improved psychoaffective outcomes
 - SU may be a key ingredient of what it means for someone to be regarded as a ‘team player’
 - promotes group cohesion, solidarity and trust



Future Work

- How should we operationalize shared understanding?
 - probably need situation-specific operational characterizations
- How do we measure, assess and evaluate shared understanding?
 - need to specify what would constitute sufficient grounds for the ascription of shared understanding
- What are the relevant objects of understanding?
 - plans, goals, situations, agent capabilities
- What kind of interventions might be used to improve shared understanding?
- What about machine understanding?



Summary

- Understanding is akin to an ability.
- Shared understanding is a commonality of abilities that may be ascribed based on similarity of performances.
- Commonality of performances does not seem **necessary** for shared understanding – complementarity may be more important in coalition situations.
- SA is a form of situational understanding that may be realized by mental models – requires a productive reconceptualization of the SA construct.