Communicated Concreteness

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In this paper I introduce the idea of communicated concreteness, a principle for communication.

Alice wants to communicate a binary relation[1] efficiently to Bob. Alice and Bob are allowed to help each other in advance and use whatever sophisticated mathematical languages that might improve communication. They can also make trade-offs and pragmatic choices, or even have biased preferences.

The problem is that there is no optimal algorithm for doing such kind of communication. Alice and Bob need a way to think about binary relations that lets them reason about efficient communication without having a complete or optimal theory. They have two choices:

1. Label data with meta-data about the communicated state (Communicated Meta-Labeling)
2. Modify data with semantics about the communicated state (Communicated Concreteness)

Alice and Bob decide to modify the binary relation being communicated to represent the state of what is needed to communicate. Instead of keeping track of e.g. `f(a, b)` is communicated, they modify `f` into a new version `f’` such that `f’(a, b) = true` means `f’(a, b)` needs to be communicated, while `f’(a, b) = false` means that `f’(a, b)` does not need to be communicated.

For example, Alice might send Bob a message that the binary relation is reflexive[2]. She updates `f’` such that `f’(a, a) = false` for any `a`, because it is no longer needed to communicate this knowledge to Bob. This action is called **comreflexivity** and differs from antireflexivity in the truth semantics.

Another example: Alice tells Bob that the binary relation is transitive[3], so there is no point to tell Bob anything that can be inferred using the transitive property. Therefore, **comtransitivity** is a rule:

$$f'(a, b) \land f'(a, c) \Rightarrow \neg f'(b, c) \land \neg f'(c, b)$$

This rule is proved by contradiction: If `f’(a, b)` and `f’(b, c)`, then transitivity implies `f’(a, c)`. Since `f’(a, c)` needs to be communicated and `f’(a, b)` is true, comtransitivity implies `¬f’(b, c) ∧ ¬f’(c, b)`.

Since there are two possible ways of encoding this state, they are called *The Normal Communicated Concreteness* and *The Joker Communicated Concreteness*, based on the ideas introduced in the paper “Catuṣkoṭi Communication”[4].

The Normal	**The Joker**	**Communicated Concreteness**
true	false	Something that needs to be communicated
false	true	Something that does not need to be communicated

This name “Communicated Concreteness” comes from the fact that one truth value is biased toward a “concrete” state of communication, while the other truth value is based toward an “abstract” state of communication. The concrete truth value is preserved relative to the original message before starting transmission, while the abstract truth value takes on multiple semantical meanings over time.

References:

[1] “Binary relation”
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https://en.wikipedia.org/wiki/Binary_relation

[2] “Reflexive relation”
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[3] “Transitive relation”
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[4] “Catușkoți Communication”
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https://github.com/advancedresearch/path_semantics/blob/master/papers-wip/catuskoti-communication.pdf