# Marker versus filter: Team focused interaction in complex cognitive representation models

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## 1 Research idea and context

In real world scenarios, there are many cases where collaborating participants have to identify a single entity or even a small subset of entities from a large information collection (e.g. a team of astrophysicists tries together to find all exoplanets close to our solar system). Supporting interactive systems use shared cognitive representation models as a key component of collaboration [2]. Such models are beneficial since the abstract nature of relevant concepts is represented in a shared space visible to all team participants. In order to use shared cognitive representation models the participants' conceptions have to be synchronized continuously. This process of semantic co-creation occurs during communication between two or more people, when human cognitive representation models of the topic of discussion converge [1].

Cognitive representation models used in shared manner between multiple participants can become complex (e.g. a geographic map depicting more than thousand cities). Team focused interaction is an approach to handle complex situations by keeping communication about a target more focused [7]. The question arises whether we can get more easily a state of semantic co-creation based on team focused interaction? Linguistic constraints enable flexible coordination that dynamically limit some degrees of freedom, leaving other unconstrainted [6]. Further linguistic constraint tools implement services that relate in someway to the usage of linguistic constraints (e. g. marker). If some city in the middle of a map needs to be identified by a participant based on the description of another participant, long textual descriptions are required to pinpoint the correct town on the map. Such complex linguistic constraints are inefficient to write and to read. Here, a shared marker on top of a cognitive representation model

allows iterative refinements to simplify navigation [1]. The current marker position provides visual evidence for the describing participant about what has been understood correctly by the acting participant. A shared marker can be anything (like shared gaze, shared mouse or shared location), which can be used in shared space or cognitive representation model as a spatial indicator [4]. If these models include multiple hundreds or even thousands of objects, it might be questioned if only moving a marker in the shared space is sufficient. In our work, we introduce the concept of filtering, as an extension of a marker into referring expression tasks. Based on the current marker position, a filter additionally reduces the search space in the surrounding area. While there are different metaphors of filtering, we are only interested in a metaphor of "topic filter" and a "relevance filter". These filters are most critical even in practice of information retrieval. The relevance filter metaphor selects a subset of random towns in an area around the positioned marker. In contrast, the topic filter metaphor shows the complete map but removes towns around the current marker position. Both filters reduce the number of available context dependent options [8]. Based on these two examples, the goal is to observe the progress towards semantic co-creation in setting where using a linguistic constraint tool is a free decision up to the team.

## 2 Study design and postulated hypothesis

Typically, team focused interaction is applied in complex identification tasks having high perceived decision complexity where a single user would fail. It has been shown that an increasing decision complexity has a negative influence on the task performance [3]. Further, if the decision complexity becomes too low, the benefit of a linguistic constraint tool cannot be observed anymore [7]. The emergence of using linguistic constraints seems to be controlled based on the perceived decision complexity as a control parameter. To date, however, such an emergence could not be observed and hence it needs to be questioned if the team focused interaction hypothesis is conditionally true.

In a pilot study we assess the teams' use of a shared marker and a variety of configurations of decision complexity [5] indicated by the number of random cities (10, 25, 100, 250, 1000, 2500). We hypothesize that, there is a value curve of a linguist constraint tool based on a given decision complexity. This curve determines if such a tool becomes useful in a given situation of collaboration. We apply a well-known location target identification task [1], based on a geographic map as a shared cognitive representation model. This task characterizes an easy-to-use cognitive representation model, the observation on the degree of semantic co-creation moment-by-moment, and the flexible configuration of the map structure, which influences systematically the perceived decision complexity. In our experimental task two participants have to identify a target location, which is only known to a third participant. This triad setup makes shared marker useful even if it is not shared with the describing participant. The results of this pilot

study evaluate the emergence of semantic co-creation in analytical manner based on a so called time-distance-plot [1]. We observed that the shared marker condition requires more coordination effort by the actor. Based on high marker-actor distance, we can conclude that the marker becomes not as helpful as in shared marker conditions. Towards a comparison between marker and filter (independently of the type of filter), we cannot observe any difference. In future work, we have to separate adding a circle around a marker as a first additional constraint level on top of a marker and even then on a next level how filtering itself can help as further constraint tool. Despite this limitations, the presented pilot study provides a further hint, that team focussed interaction becomes helpful to achieve semantic co-creation based on shared cognitive representation models.

## References

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