# Note on binding of an association particle to semantic particles

D. Gueorguiev 11/25/21

## Primitive semantic particles

Let us consider two primitive semantic particles - and connected through association particle (link) .

--------

The particles and are represented by their semantic signatures and . The association link is represented with its association matrix and semantic significance vector .

The association matrix captures the affinity force between the particles and at the time of constructing the compound structure involving those particles. Note that the magnitude of affinity force between the particles may change as their semantic positions and signatures are altered in the future. A change in the affinity force at a future moment may change the matrix of the association link between the altered particles. Altering the semantic position of a particle will require reevaluating the semantic links of this particle with the relevant enclosing contexts.

The association matrix has the following structure:

where the pairs denote all relevant property pairs where the left property belongs to and the right property belongs to . Let us denote with the set of property indices which belong to and with the set of indices which belong to . Then and . Note that the map is many-to-many. That is, the same index may appear multiple times with different and the same index may appear multiple times with different . The property association matrices have the following structure:

So is a two-column matrix of size with non-zero regions in each column denoted by the vectors where and . The non-zero regions and are also known as the ***active regions*** of the association link between the two properties and at time . For details refer to [Note On Binding Of An Association Property to Semantic Properties](https://github.com/dimitarpg13/aiconcepts/blob/master/docs/NoteOnBindingOfAssociationPropertyToSemanticProperties.pdf).

The binding force between the two -particles is conveyed through the Association Particle which exposes the active regions which are to be considered. The binding force is given with the expression:

Here denotes the binding force between a pair of property regions. The set denotes all properties of which are included in . Similarly, the set denotes all properties of which are included in . The notation reflects the fact that the property pairs contributing to the total binding force is filtered by the chosen in property pairs.

In other words, the Association Particle is acting as a filter which selects which property pairs are relevant and will contribute to the binding force between and .

Obviously will be smaller or equal than the binding force created by considering all property pairs without an Association Particle acting as a mediator and a filter:

where is given as

### Accounting for Semantic Significance vector when calculating binding force between two semantic particles

The Semantic significance vector of the association between two V-particles does not impact the binding force between the particles. The Semantic Significance is a mechanism for selecting the most semantically significant thought (semantic structure) under specific circumstances from a set of candidates and this concern is orthogonal to the integrity of the semantic structures.