Connecting Semantically Related Structures

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Let us start with the V-particles V_k, V_1 and V_2 which are not composite and are ***related*** semantically. How to connect them?

```
   V_k              V_1              V_2
  /   \            /   \            /   \
V_1   V_2        V_2   V_k        V_1   V_k
```

What does it mean for two primitive V-particles V_1 and V_2 to be *related* semantically? Note that there is a difference between the terms *related semantically* and *semantically close*. The difference will become clear with the discussion here.

----needs clarification – should we do quantization in terms the new compound property color or energy level makes more sense

There should be sufficient attraction force $F^a(V_1, V_2)$ between them in at least one of the possible connectivity DAGs.

But what is this mysterious attraction force? How is it represented? Let us denote by G the smallest DAG which includes both V_1 and V_2.

~~The engagement of the V-particles in a parent-children ensemble is based on the property ***color***. The property ***color*** is a compound property of primitive V-particles. ***Color*** is made of a specific set of property keys forming a ***color basis***. Each primitive V-particle has a subset of property keys from the color basis. The parent-children ensemble like the ones depicted above are possible only when the colors of the participating particles are matching the expected color for the position (tree node) of each particle in the ensemble.~~

For each V-particle there are defined the following intrinsic quantities:

- Information content
- Valence

Information Content of a particle

//TO DO

Note on particle Valence

These are number of property subsets on each of which another particle may lock onto.

Let us take the example:

```
    am
  /     \
I       Dimitar
```

Let us denote with $\mathfrak{P}_1$ the property set of the verb which have gathered all properties dealing with subject matters – these are the properties which describe the plurality of the verb, the point of view, and the kind subjects from semantical standpoint allowed to lock on this verb. Similarly, we denote with $\mathfrak{P}_2$ the properties of the verb which deal with object matter (the recipient of the verb action). In general for each V-particle we can have a finite number of property sets with a different A-particle latching onto each of them. The k sets $\mathfrak{P}_1, \mathfrak{P}_2, \ldots, \mathfrak{P}_k$ from now on will be denoted as *Valence Sets*. Once one of the valence sets is occupied (i.e. locked onto by an A-particle) it may impose additional constraints on the properties related to the free *valence sets* and thus influence the choice of A-particle locking onto a free *valence set*. The maximum number of *valence sets* associated with a V-particle is an intrinsic property of the particle and it will be named *Valence*; for particle V will be denoted with $|V|$. Each V-particle "knows" when a connection (A-particle) has locked onto its properties and maintains an internal state of the occupied number of *valence sets*. The relative position of the two particles in the semantic graph will depend on the value of the property Valence × Information Content for each of them. This property from now on will be known as *Particle Mass* and denoted by M:

$Particle\ Mass = Valence \times Information\ Content$ or in symbol notation:

$M_V = |V| \times IC$

The notion of semantic valence

//TODO

The notion of a mass of semantic structure

//TODO

The notion of effective mass of a semantic structure and of the particles within it

//TODO

The parent has the largest value of Valence × Information Content

Let us have the structures S_k, S_1 and S_2 which are close semantically. How to connect them?

```
   S_k            S_1            S_2
   / \            / \            / \
 S_1  S_2      S_2   S_k      S_1   S_k
```

```
---- S_1 -----------> S_2 <-
|    |     AS_1      ^     |
|    |_______________|     |
|          AS_2            |
|          ...             |
|__________________________|
           AS_k
```

$AS_1, AS_2, \ldots, AS_k$ – directed association links connecting S_1 to S_2

The structure of an association link

Association link connects two V-particles on two different semantic structures.