Execution of Semantic Structures

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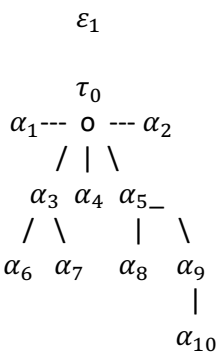
Execution Space

Execution Space is a metric space which has different number of dimensions than that of Semantic Space. All execution structures reside in Execution Space. Each executable semantic structure is mapped to a *target point* in execution space which is adorned with a semantic signature and mass. Each target point in execution space serves as a point of attraction to the relevant Execution Particles which will form a final Execution Structure converging around the target point.

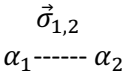
Definition: *Target point*: a point in Execution Space which is mapped to a centroid of a Semantic Structure in Semantic Space. It will be denoted to with the Greek letter τ with appropriate subscript (from Greek στόχος). Each target point has a mass in execution space $\mathfrak{m}_\tau$ and semantic signature represented by its semantic signature matrix $ssig(\tau)$.

Executive Particles and Executive Structures

Execution of semantic structure is achieved through aggregation of *Executive Particles* around a *target point*. Every structure in execution space can be represent as an n-arry tree rooted in a *target point*. Executive particles can be *primitive* or *compound* ones. Every compound executive particle is an executive structure and it can be expressed as a tree of primitive executive particles.
Every primitive executive particle can be represented as a tree of primitive executive atoms as shown on the figure below. The structures in Execution Space will be denoted with small cap Greek letters. The primitive executive particles will be denoted with the letter ε with appropriate subscript (from Greek εκτελώ ***execute***). The executive atoms will be denoted with the letter α with an appropriate subscript (from Greek άτομο).



Each arc connecting two executive atoms is assigned *executive significance* vector $\vec{\sigma}$ (Greek σημασία) with appropriate subscript.



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Executive Atoms

Each executive atom α is represented by a signature matrix $asig(\alpha)$. Each column in $asig(\alpha)$ is mapped to an *Executive Action* δ_i (Greek δράση). Thus

$$asig(\alpha) = [\delta_1\ \delta_2 \ldots \delta_i \ldots \delta_n]$$

Therefore, each atom can be thought of as a sequence of executive actions performed atomically. Recall in the discussion on the concept of *Semantic Aspect* we mentioned that the semantic aspect is mapped to a (length, direction) pair in Semantic Space. We denoted the length as *Aspect type* and the $K-1$ coordinates which are encoding its direction as *Aspect value*. We allowed the semantic Aspect Types and Values to be *continuous* and we introduced *Aspect Type and Value Matching functions* Φ and Θ which allow us to compare semantic aspects and establish closeness between them. Through the concept of semantic aspect we have defined a continuum of semantic meanings and can establish closeness which is necessary for inferring new semantic structures and performing semantic parsing. The problem is that we cannot afford the convenience of continuum when dealing with executive structures.

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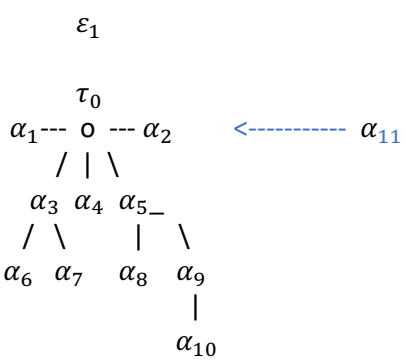
Creation of Execution Structures

Creation of Primitive Execution Particle

Let us consider a target point τ_0 in Execution Space represented by its mass $\mathfrak{m}_{\tau_0}$ and semantic signature matrix $ssig(\tau_0)$. From all already constructed atoms we select the one with the largest attraction force toward τ_0.



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Inference in Execution Space

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