Execution of Semantic Structures

D. Gueorguiev   5/6/2022
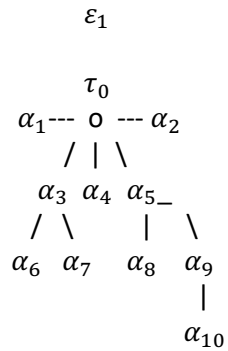
Execution Space

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 $ssig(\tau)$.

Execution Particles and Execution Structures

Execution of semantic structure is achieved through aggregation of *execution particles* around a *target point*.   Every structure in execution space can be represent as an n-arry tree rooted in a *target point*. Execution particles can be primitive or compound ones. Every compound execution particle is an execution structure and it can be expressed as a tree of primitive execution particles.

Every primitive execution particle can be represented as a tree of primitive execution atoms as shown on the figure below. The structures in Execution Space will be denoted with small cap Greek letters. The primitive execution particles will be denoted with the letter ε with appropriate subscript (from Greek εκτελώ *execute*). The execution atoms will be denoted with the letter α with an appropriate subscript (from Greek άτομο).

$$\varepsilon_1$$

```
          τ₀
 α₁--- o --- α₂
      / | \
   α₃ α₄ α₅_
  / \      | \
α₆  α₇   α₈  α₉
              |
             α₁₀
```

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

```
    σ⃗₁,₂
α₁------ α₂
```

//TODO

Execution Atoms

Each Execution 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*.

//TODO

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.

```
        ε₁

        τ₀
α₁--- o --- α₂      <----------- α₁₁
    / | \
  α₃ α₄ α₅_
 / \     |  \
α₆  α₇  α₈  α₉
             |
           α₁₀
```
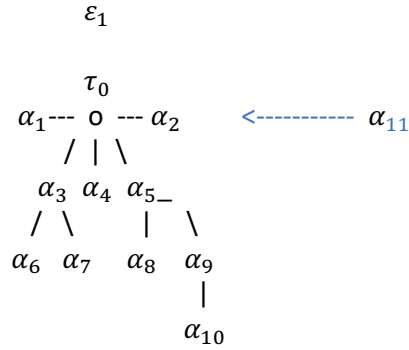
//TODO
Inference in Execution Space

//TODO