ASP triangles: sketching the Artificial Intelligence of a mobile platform

ASP triangles are a tool that we introduced to formalise and facilitate a design approach used to develop the on-board Artificial Intelligence (AI) of a mobile autonomous platform. Their value lies in **taking into account the couplings and interactions between macroelements** characterizing the platform and the mission context, similarly to the paradigm shift introduced in aerospace structures by the development of aeroelasticity. The goal is to achieve a continuous **coevolution** process, optimizing the interplay between co-operating factors.

In particular, they are a graphical representation of the decisional structure underlying the iterative process leading to the final, operational architecture. **Each vertex of the triangle represents an aggregate of subcomponents that can be altered or designed.** These macroelements have been chosen to be **Action, Scenario and Perception** (Fig. 1).

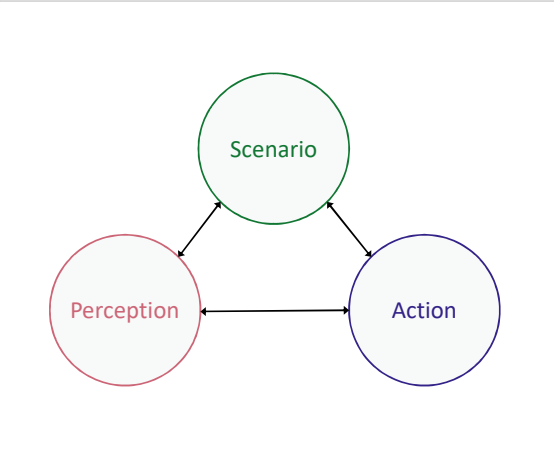

Figure 1 – An ASP triangle

Scenario describes the environment within which the platform operates, considered up to a certain degree a designable entity. Perception concerns the acquisition and initial manipulation of information enabling AI processes. Lastly, Action denotes any physical change induced on the platform, its sensors and its actuators by internal or external factors. Each vertex can be seen as the composition of two layers: **representation** and **structure**. Structure describes the physical properties of the vertex, representation its necessarily approximated model within the AI.

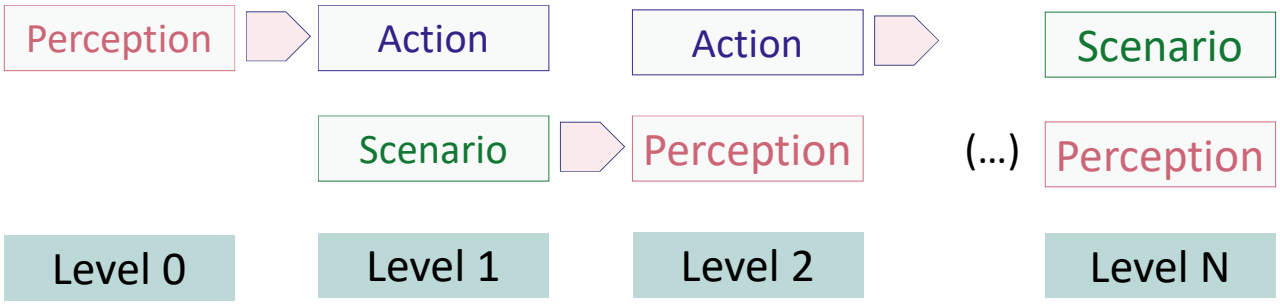

Figure 2 – Methodological Flow

To use an ASP triangle, the designer selects a starting vertex and designates it as Level 0. All the decisions and adjustments falling under the sphere of influence of that particular module are taken and made, and their underlying rationales registered. The designer then selects the remaining two vertices, promotes them to Level 1, observes the effect of the Level 0 decisions on them, and evolves them consistently with the augmented set of constraints.
A new starting vertex is then selected from any of the two Level 1 ones, and the process of adaption/selection is iteratively repeated until a satisfying architecture configuration has been reached.

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