Upward refinement operators for conceptual blending in the description logic EL++

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Publication Type: Journal Article

Year of Publication: 2018

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Journal: Annals of Mathematics and Artificial Intelligence

Volume: 82

Edició: 1-3

Paginació: 66-69

ISSN: 1573-7470
Conceptual blending is a mental process that serves a variety of cognitive purposes, including human creativity. In this line of thinking, human creativity is modeled as a process that takes different mental spaces as input and combines them into a new mental space, called a blend. According to this form of combinational creativity, a blend is constructed by taking the commonalities among the input mental spaces into account, to form a so-called generic space, and by projecting the non-common structure of the input spaces in a selective way to the novel blended space. Since input spaces for interesting blends are often initially incompatible, a generalisation step is needed before they can be blended.

In this paper, we apply this idea to blend input spaces specified in the description logic $\mathcal{EL}^{++}$ and propose an upward refinement operator for generalising $\mathcal{EL}^{++}$ concepts. We show how the generalisation operator is translated to Answer Set Programming (ASP) in order to implement a search process that finds possible generalisations of input concepts. The generalisations obtained by the ASP process are used in a conceptual blending algorithm that generates and evaluates possible combinations of blends. We exemplify our approach in the domain of computer icons.