

The distributed version of the Interval Geometric Machine*

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Based on the set of transfinite ordinal numbers, an extension of the Interval Geometric Machine [3], called Distributed Interval Geometric Machine (DIGM), is presented. This constructive model of distributed interval systems allows the modelling of non-determinism and two special types of parallelism: the temporal parallelism, with infinite memory and infinite processes defined over array structures, operating in a synchronized way; and the spatial parallelism, with a transfinite global memory shared by transfinite interval processes distributed in an enumerable set of Geometric Machines, synchronized in the time. We take use of the advantages of Girard's Coherence Spaces [2] to obtain the domain-theoretic structure of the DIGM model. The coherence space of transfinite computational processes, denoted by $\mathbb{D}_{2\infty}$ is built over the coherence space of elementary transfinite processes, which are single coherent subsets of tokens (actions labelled by positions of a geometric space) associated to an instant of computational time. Following the methodology suggested in [6], the completion of the space $\mathbb{D}_{2\infty}$ ensures interpretations of temporally and spatially infinite computations. Each coherent set of indexed tokens in $\mathbb{D}_{2\infty}$ provides a description of the constructors (sequential or parallel products, deterministic or non-deterministic sums) of a distributed process and select the machines used in its performance. The language $\mathcal{L}(\mathbb{D}_{\infty})$ [4, 5] induced by the interpretations obtained in the space $\mathbb{D}_{2\infty}$ is considered. Over that language it is possible to sample the semantic analysis of

concurrent and distributed interval systems interpreted in such model. We applied this framework to introduce a semantic modelling for the algorithms of the interval tessellation model [1] for the categorization of geographic regions, used to obtain reliable topographic segmentation.

References

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