Interval-valued computations without the product operator

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Abstract. In [1] a new model for analog computations was introduced, namely the Interval-valued computation, where the computation is executed on so-called interval-valued bytes, which are special subsets of interval [0,1) rather than a finite sequence of bits. The allowed set of computational operators on these values were motivated by the operators usually applied to finite sequences of bits, namely, Boolean operators and shifts, furthermore, a rather specific kind of "magnification" operator, named there fractalian product.
In [2] and [3] a $PSPACE$-complete problem was solved by a linear interval-valued computation. This solution depends on the possibility of construction of interval-values with arbitrarily small components and this step needs the application of the product operator. In this article we show that omitting this operator still results in a computational device with a high computation power. Namely, we will demonstrate this by establishing that the finite-variable satisfaction problem of propositional formulae is still decidable by an effective interval-valued computation without any application of the product operator.

Keywords: Continuous space machine, Analog computation, Computing with interval-values, Massively parallel computing

References

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