Map of the algorithm „Self-organization of Vectors“

This is a map \( \tau \) from \( (\mathbb{R}^n)^k \rightarrow (\mathbb{R}^n)^k \). Vectors are coupled by the dot product \( r \cdot dr \).

The smallest unit of the algorithm is a pair of points with the transformation \( \mathbb{R}^n \times \mathbb{R}^n \rightarrow \mathbb{R}^n \times \mathbb{R}^n \).

Given vectors: \( r_1, r_2, r_{12}, dr_{12} \in \mathbb{R}^n \) with \( r_{12} = r_2 - r_1 \); \( |dr_{12}| = 1 \).

The map \( \tau \) depends on two scalars \( e \) and \( s \) with \( e \geq s \).

First calculation of next \( dr_{12} \).

For \( |r_{12}| \leq e \) then \( dr_{12} = \text{constant} \).

For \( |r_{12}| > e \) then \( r_{12} \wedge dr_{12} = s \) and \( r_{12} \cdot dr_{12} > 0 \).

Then calculation of the new positions of the two points

\( \tau(r_1) = r_1 + dr_{12} \), \( \tau(r_2) = r_2 - dr_{12} \).

The map \( \tau \) extends to a map \( (\mathbb{R}^n)^k \rightarrow (\mathbb{R}^n)^k \), defined for a list of \( k \) points, via a principle of superposition.

Given vectors: \( r_1, r_2, \ldots, r_k, dr_{ab} \in \mathbb{R}^n \) with \( r_{ab} = r_b - r_a \); \( |dr_{ab}| = 1 \), where \( \{ab\} \) are the chosen pairs of points.

First calculation of all next \( dr_{ab} \).

For \( |r_{ab}| \leq e \) then \( dr_{ab} = \text{constant} \).

For \( |r_{ab}| > e \) then \( r_{ab} \wedge dr_{ab} = s \) and \( r_{ab} \cdot dr_{ab} > 0 \).

Then calculation of the new positions of all points by superposition

\( \tau(r_i) = r_i + \sum dr_{[ij]} \) with \( dr_{[ij]} = -dr_{[ji]} \) where \( i = 1, 2, \ldots k \).

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