

origin

K : constraint

M : a generating matrix, with two parts (M_0 : lattice generator and M_1 : primitive sphere centers)

Λ : a lattice

Convex particle

A particle i is specifies by $\mathbf{K}_i = (\mathbf{R}_i, \mathbf{r}_i)$. A translation by \mathbf{t} is given by $(\mathbf{R}_i, \mathbf{r}_i + \mathbf{t})$. Similarly, a rotation is given by convXR , where \mathbf{R} is a dd orthogonal matrix. Let P be the set of configuration parameters of any convex particles. We define a generating matrix of the packing as a $(d + (d + 1)p) \times d$ matrix M whose first d rows are a set of generators of Λ and whose remaining rows are the vectors in the set P . 要注意这里 \mathbf{R} 是按列还是按行, 此处默认按列吧。

For periodic packing, The set of all vertex matrices of polytopes in the packing is the Minkowski sum,

$$\Lambda + P = \left\{ \mathbf{b}_0 M_0 + \mathbf{Y} : \mathbf{b}_0 \in \mathbb{Z}^d, \mathbf{Y} \in P \right\} = \left\{ \mathbf{b} \mathbf{M} : \mathbf{b} \in \mathbb{Z}^d \oplus E_p \right\}$$

where M ($\mathbf{M}_0 + \mathbf{R} + \mathbf{r}$) is a generating matrix of the packing, and E_p is the set of coordinate permutations of the p -dimensional vector $(1, 0, 0, \dots, 0)$.

For any nondegenerate matrix M , only finitely many independent exclusion constraints are violated or are even remotely close to being violated. We call those constraints the relevant exclusion constraints (let there be n of them), and we define a matrix A whose rows \mathbf{a}_{2i-1} and \mathbf{a}_{2i} are the vectors \mathbf{b}_1 and \mathbf{b}_2 related to the i th relevant exclusion constraint.

Exclusion constraint: K_{2i-1} and K_{2i} do not overlap.