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Lattice-like ball packings in the Nil and Sol spaces

Abstract. The **Nil** and **Sol** geometries are two of eight homogeneous Thurston 3-geometries

$$\mathbf{E^3}, \mathbf{S^3}, \mathbf{H^3}, \mathbf{S^2 \times R}, \mathbf{H^2 \times R}, \widetilde{\mathbf{SL_2R}}, \mathbf{Nil}, \mathbf{Sol}.$$

In [Sz07] we have determined the densest lattice-like geodesic ball packing to a type of **Nil** lattices. In [Sz08] we have considered the densest lattice-like translation ball packing to the fundamental **Sol** lattices. The notions of lattices in **Sol** and **Nil** spaces are introduced by P. Scott in [S].

In this talk we investigate the lattice-like ball packings in the **Nil** and **Sol** spaces, introduce the notions of the lattices and parallelepipeds. Moreover, in **Sol** geometry we study the relation between **Sol** lattices and lattices of the pseudoeuclidean (or Minkowskian) plane. We have determined the densest lattice-like ball packing to some types of **Nil** and **Sol** lattices.

We are going to use the affine model of the **Nil** and **Sol** spaces through affine-projective homogeneous coordinates [M97] that gives us a way of investigating and visualizing homogeneous spaces.

References

[M97]   Molnár, E. The projective interpretation of the eight 3-dimensional homogeneous geometries. *Beiträge zur Algebra und Geometrie (Contributions to Algebra and Geometry)*, **38** (1997) No. 2, 261–288.

[S]   Scott, P. The geometries of 3-manifolds. *Bull. London Math. Soc.*, **15** (1983) 401–487. (Russian translation: Moscow "Mir" 1986.)

[Sz07]   Szirmai, J. The densest geodesic ball packing by a type of **Nil** lattices. *Beiträge zur Algebra und Geometrie (Contributions to Algebra and Geometry)*, **48** (2007) No. 2, 383–398.

[Sz08]   Szirmai, J. The densest translation ball packing by fundamental lattices in the **Sol** space, *Manuscript to Beiträge zur Algebra und Geometrie (Contributions to Algebra and Geometry)*, (2008).