Lattice Coverings with Translation Balls in Sol Geometry –Abstract–

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The eight Thurston geometries make up an important and still heavily studied area of mathematics. This thesis work first has a look at the projective model of the geometries (first in 2-dimensions, then in 3). Then it summarizes the most important structures of the one of these geometries, the *Sol* geometry, mostly focusing on translation curves, translation spheres and lattices, particularly the fundamental lattice.

Then we study lattice-like coverings of the space with congruent translation balls. In order to do this, we also have a look at the circumscribed spheres of translation tetrahedra and the convexity of the translation spheres. We prove that a translation sphere in **Sol** is convex in an Euclidean sense, if for its radius: $r \leq \frac{\Pi}{2}$. With the help of an algorithm we calculate the locally optimal lattice-like covering with congruent translation ball for multiple fundamental lattices of the **Sol** space, in order to find a minimal covering density.

This question of ball covering, together with ball packings plays an important in crystallography and so they are heavily studied in all eight of the Thurston geometries.