

0.1 The Lorentz group

The Lorentz group is the $O(1, 3)$ group.

0.1.1 Symmetries of the Lorentz group

We can do the usual 3 rotations, however there are additional 3 symmetries, making the Lorentz group 6-dimensional.

These are the Lorentz boosts.

A symmetry has:

$$t'^2 - x'^2 - y'^2 - z'^2 = t^2 - x^2 - y^2 - z^2$$

We consider the case where we just boost on x , so $y = y'$ and $z = z'$.

$$t'^2 - x'^2 = t^2 - x^2$$

Or with c :

$$c^2 t'^2 - x'^2 = t^2 - x^2$$