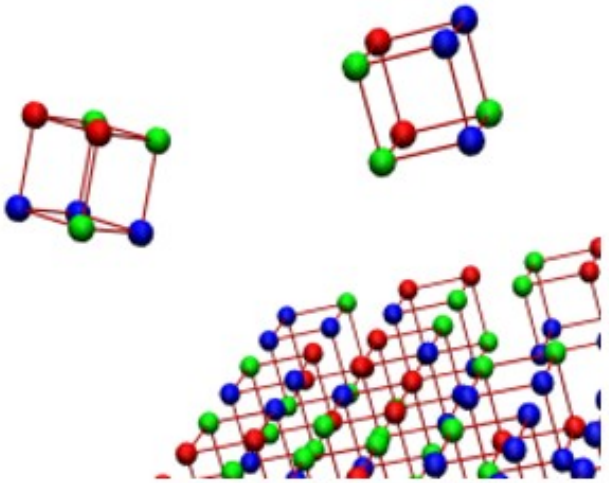
Colouring Objects and symmetry group actions

Michael Kreutz and Mats Olthoff



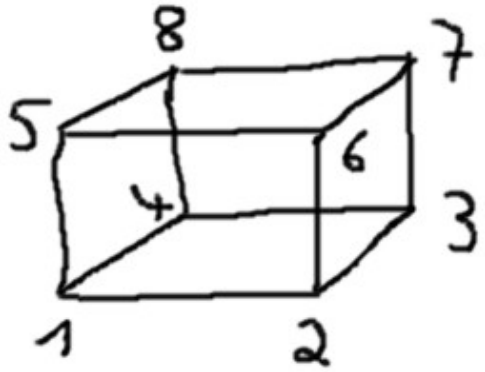
Visualisierung in der Mathematik I

by Dr. Charles Gunn

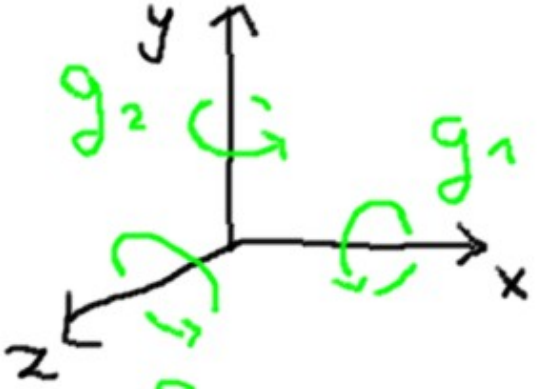
TU Berlin, WS 2013/14

Introduction

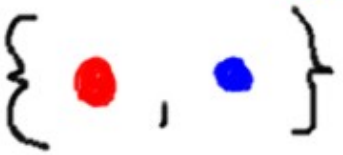
Mathematical object



Group actions

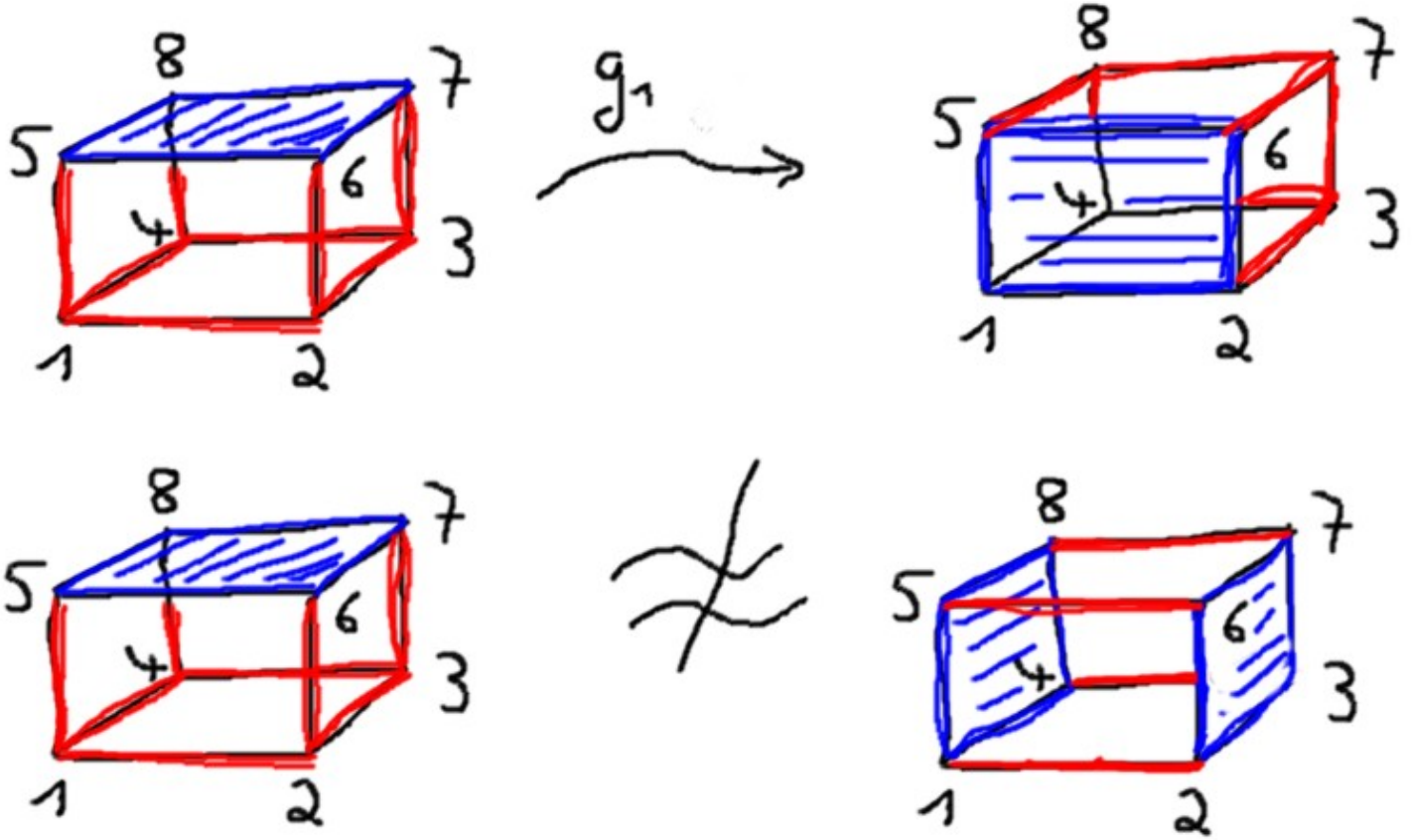


Colours



Problem

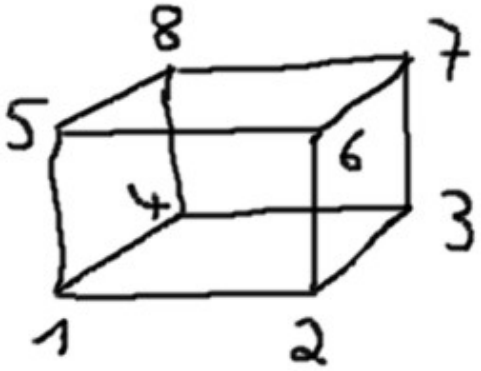
Colour mathematical object



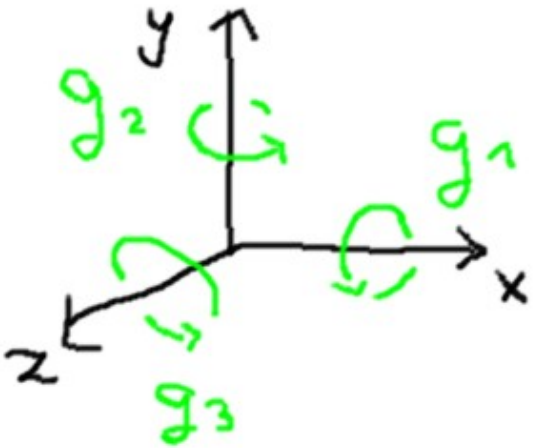
Implementation

Visualisation

Datastructure



$\longleftrightarrow$ (1,2,3,4,5,6,7,8)

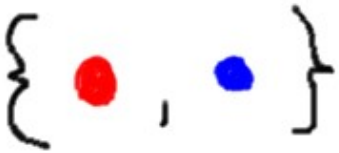


$\longleftrightarrow$

$g_1 = (4,3,7,8,1,2,6,5)$

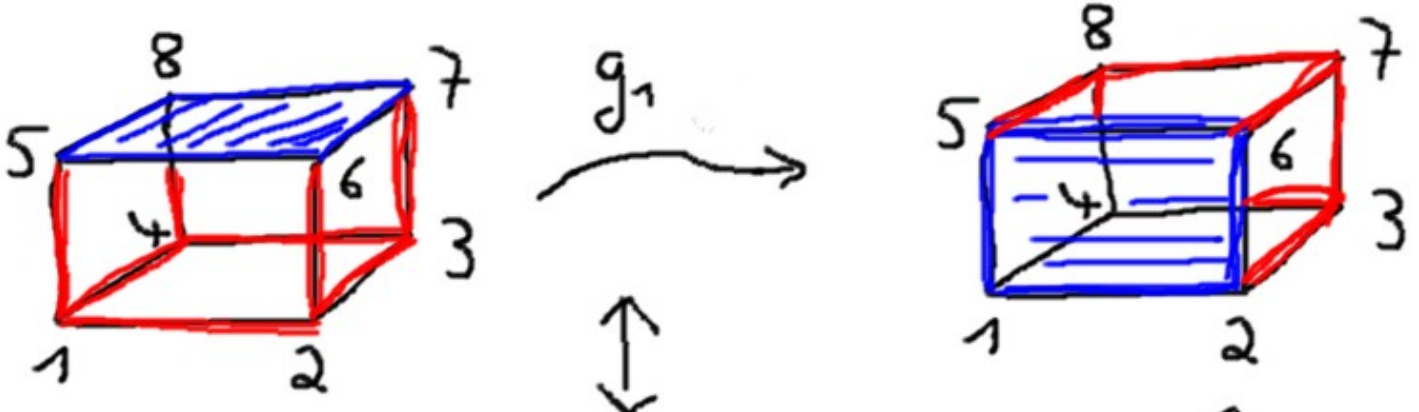
$g_2 = (2,3,4,1,6,7,8,5)$

$g_3 = (2,6,7,3,1,5,8,4)$



$\longleftrightarrow$ (1,2)

Implementation 2



(4,3,7,8,1,2,6,5)

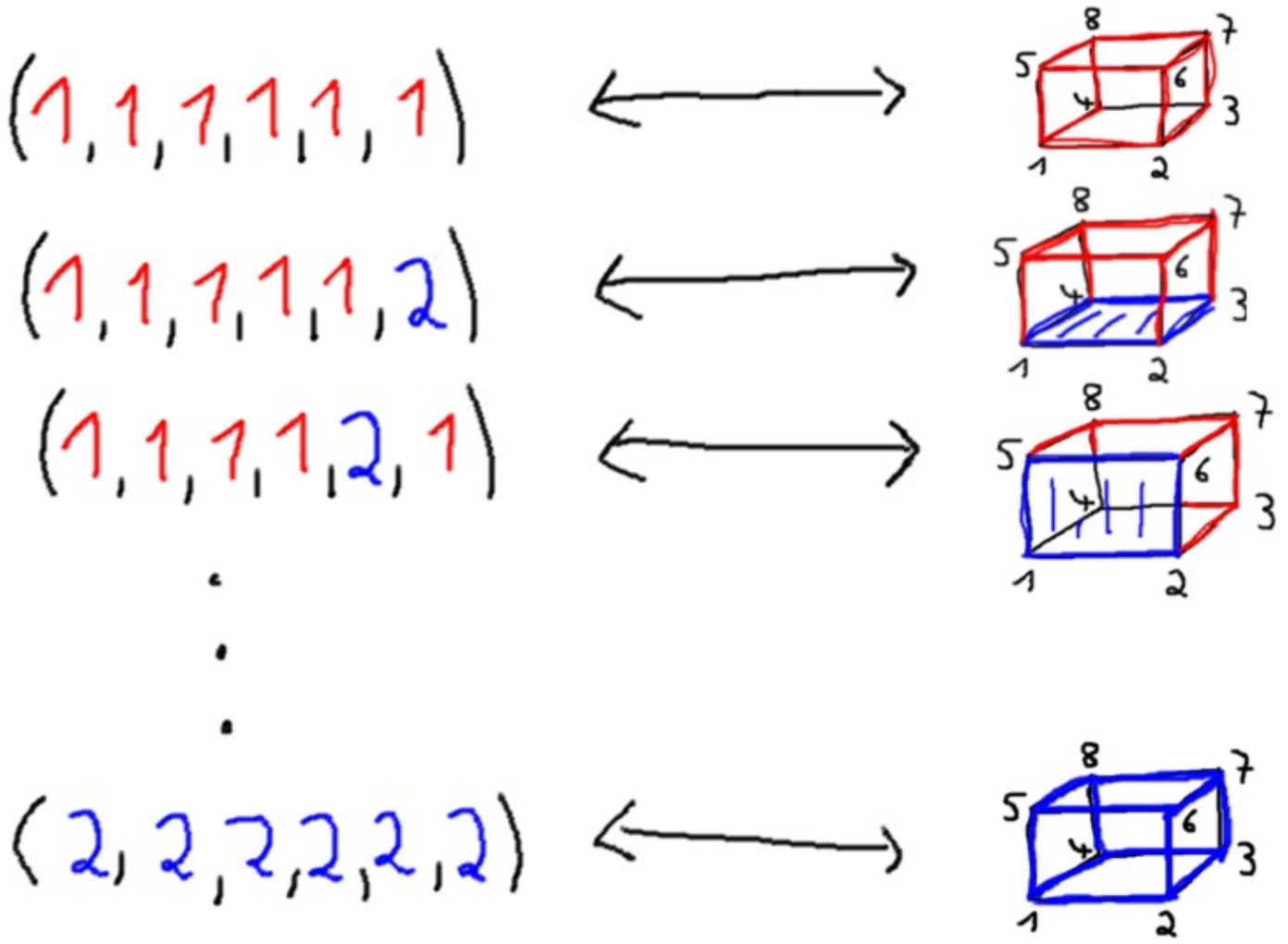
(1234, 1256, 1458, 2367, 3478, 5678)

g_1 ⇝ (4378, 4312, 4815, 3726, 7865, 1265)

= (1234, 1256, 1458, 2367, 3478, 5678)

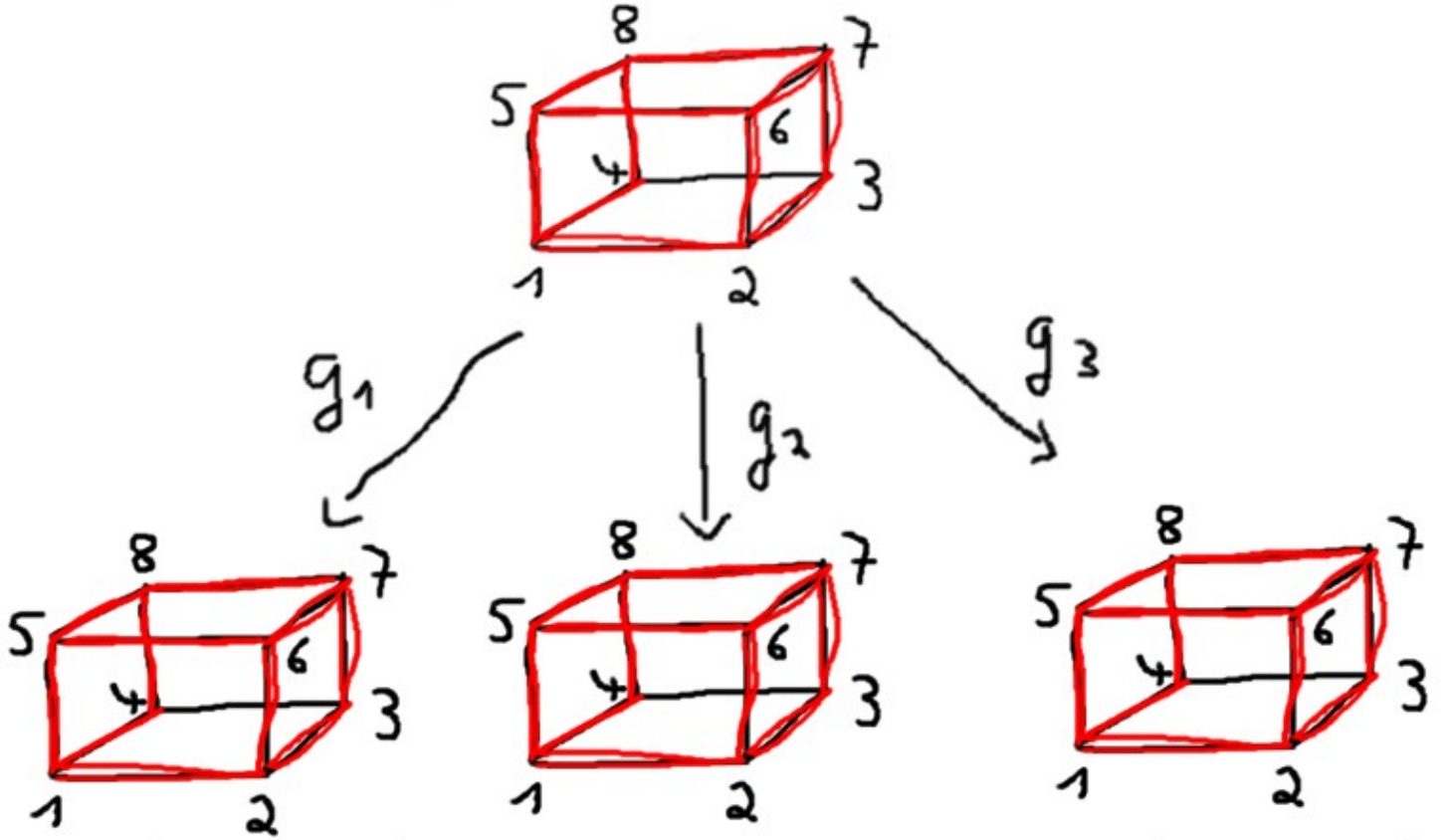
Creating Orbits

1. Create List L with all coloured objects



Creating orbits 2

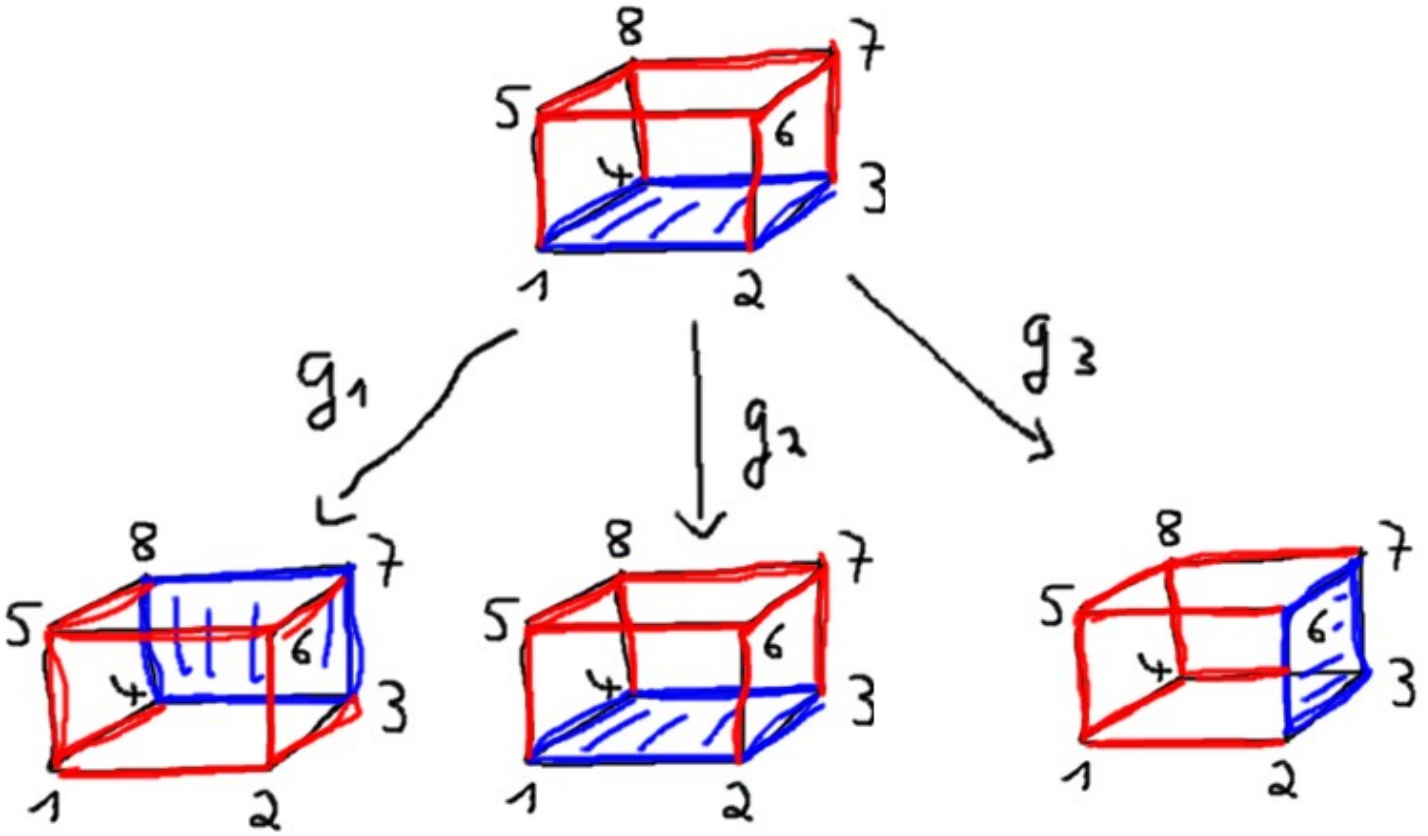
1. Create List L with all coloured objects
2. Take first object of L and remove it



Objects are not in L ⟶ orbit complete

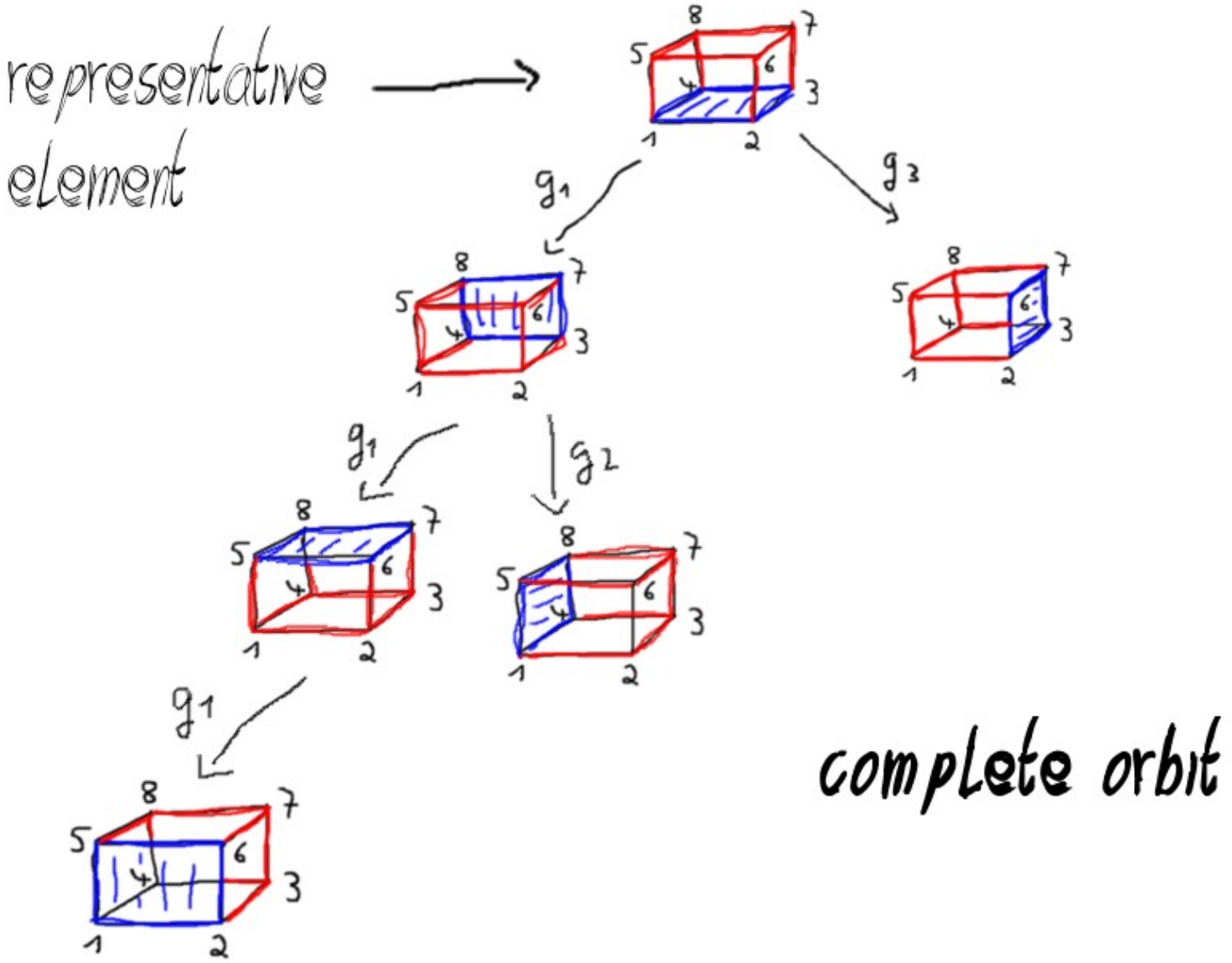
Creating orbits 3

1. Create list L with all coloured objects
2. Take first object of L and remove it

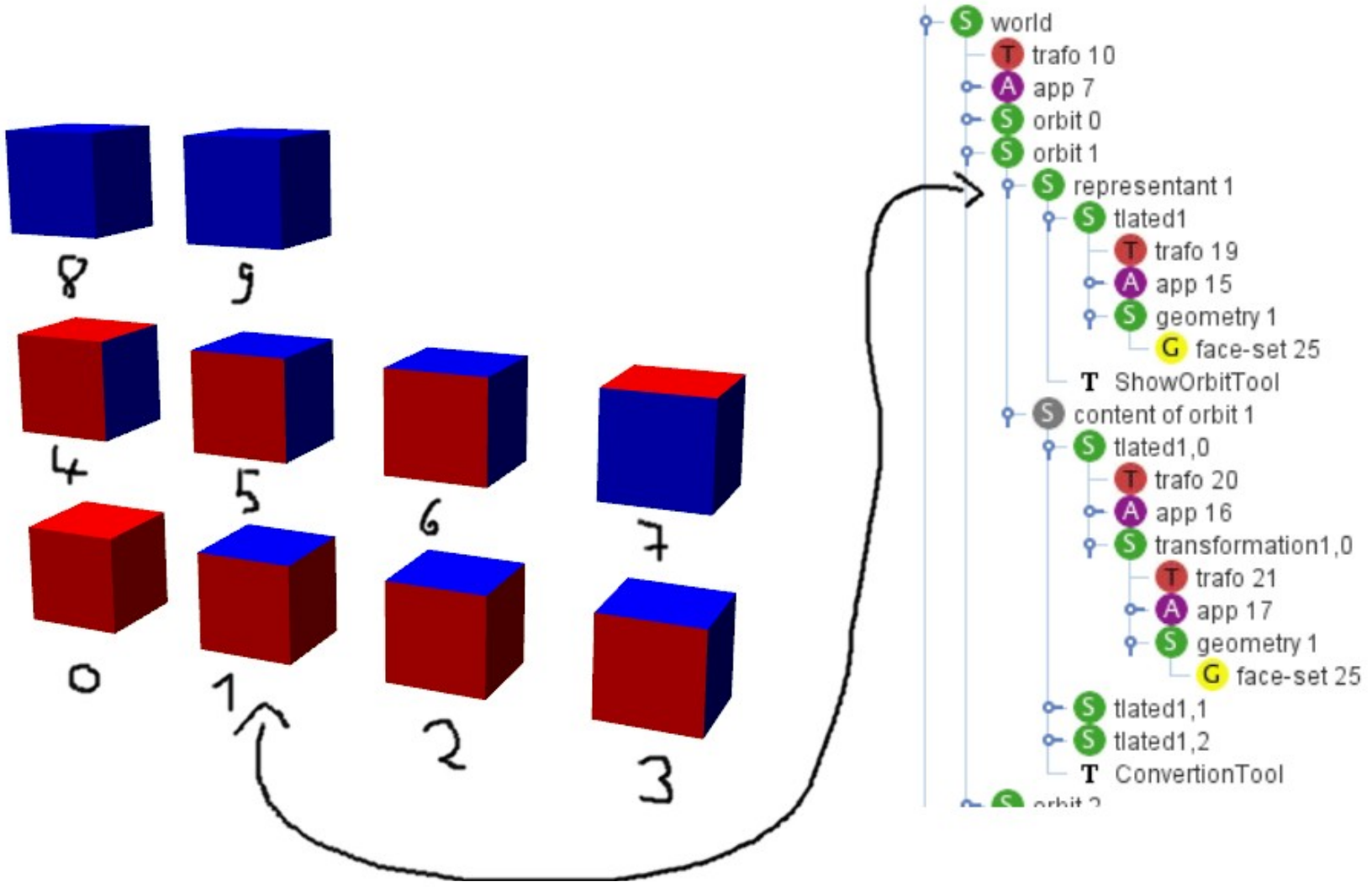


Continue with objects that are in L

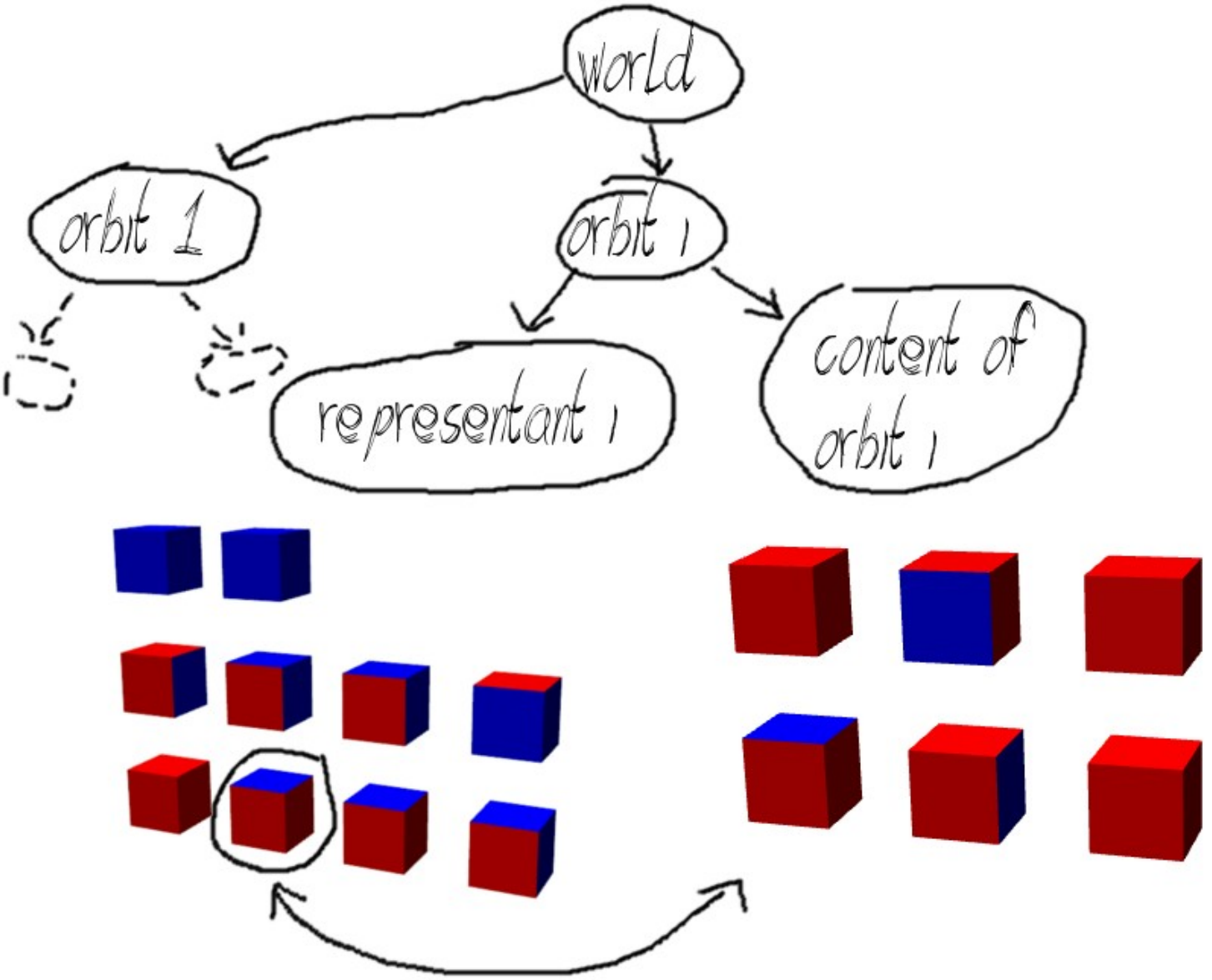
Creating orbits 4



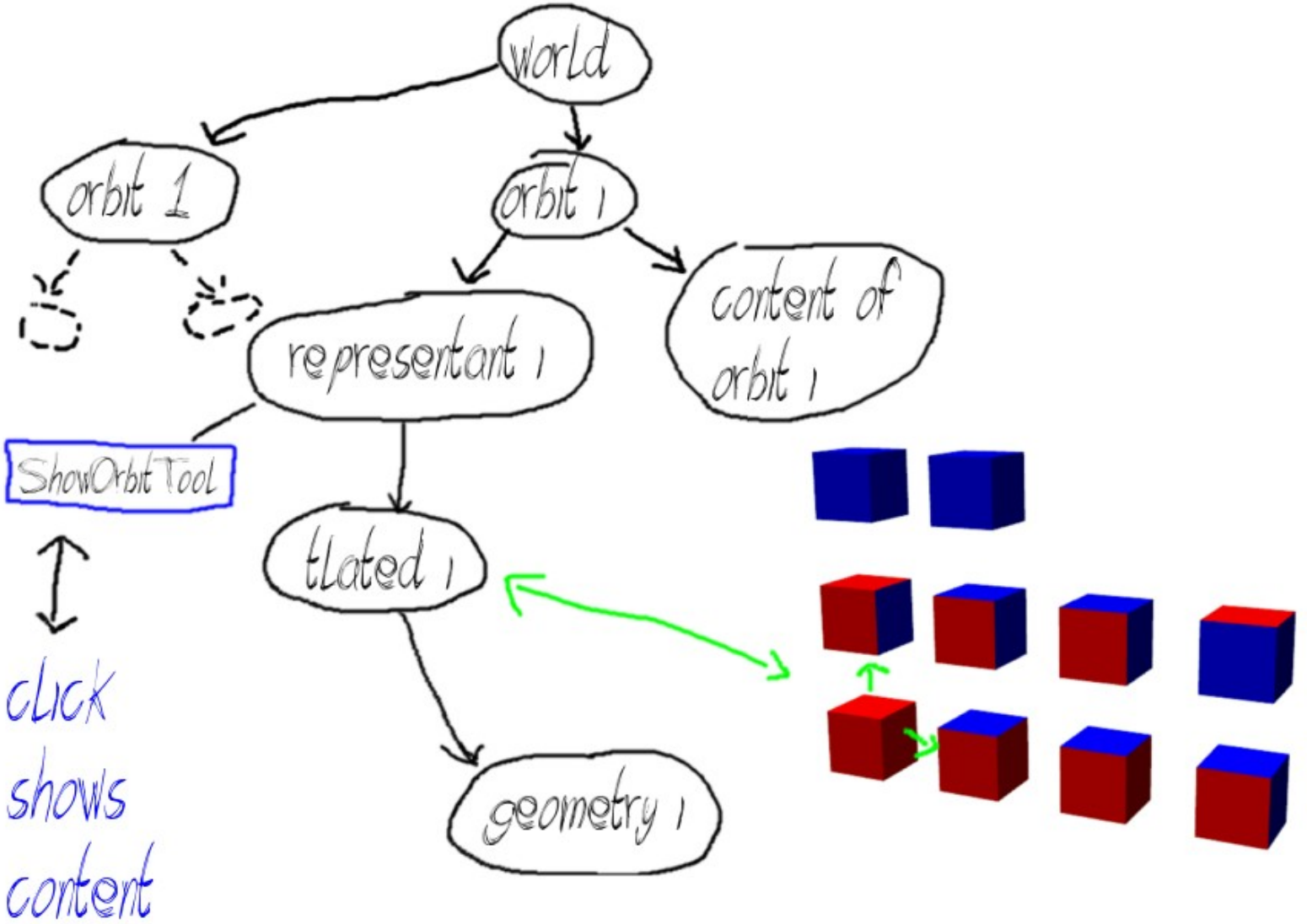
The Scene Graph



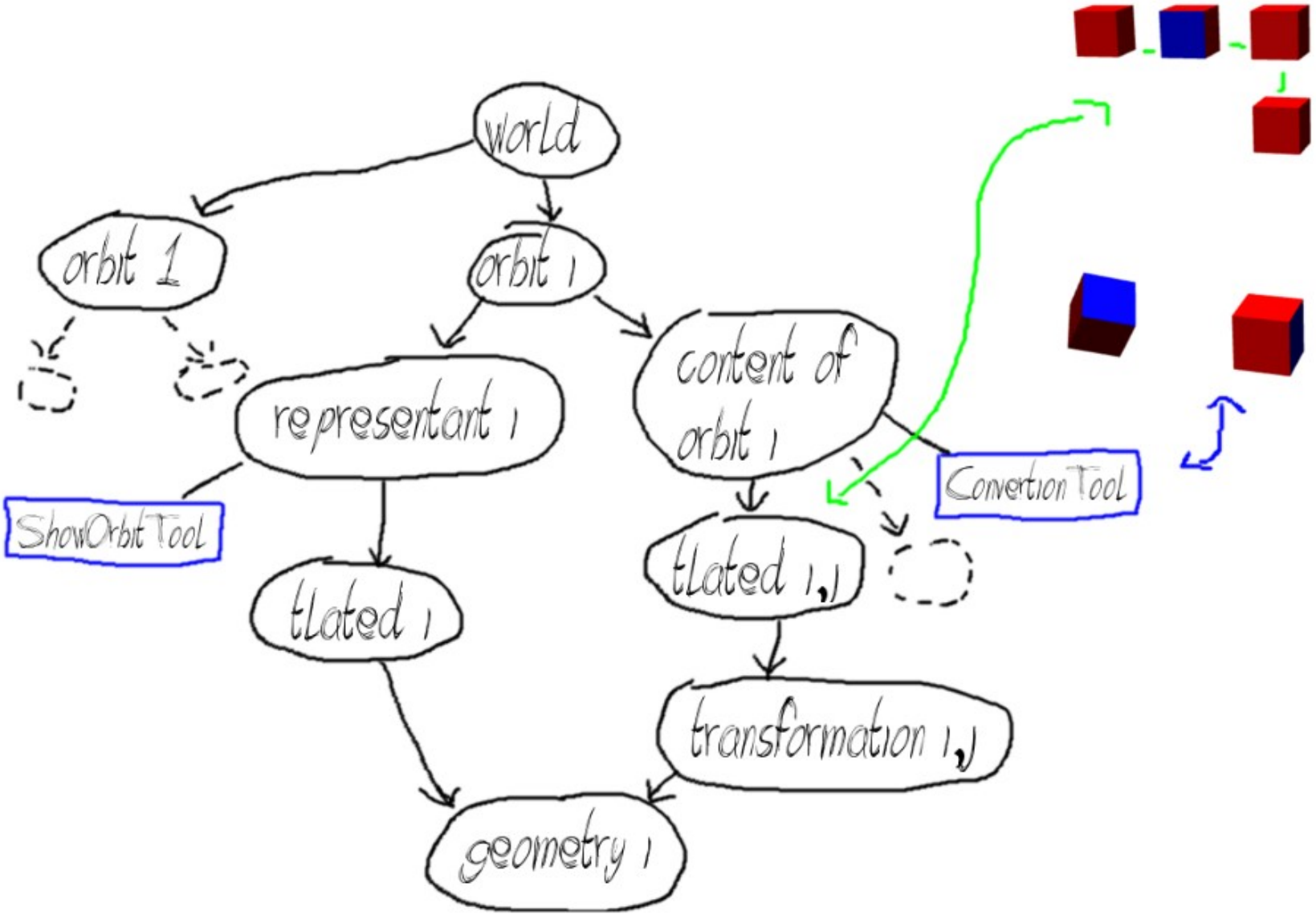
The Scene Graph 2



The Scene Graph 3



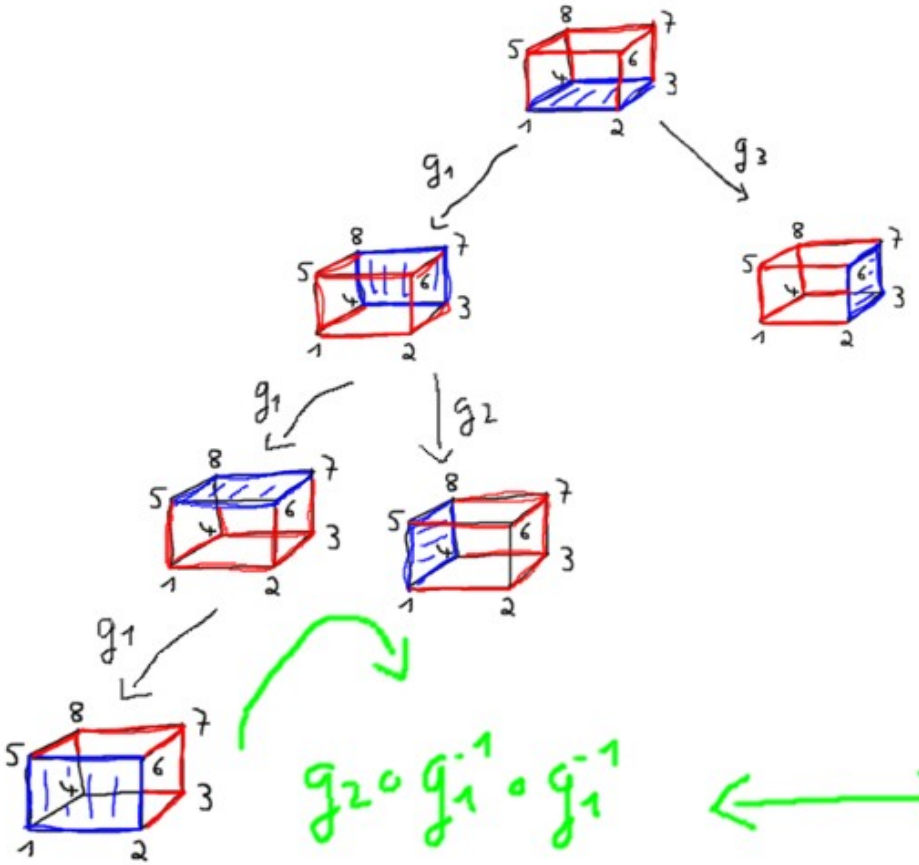
The Scene Graph 4

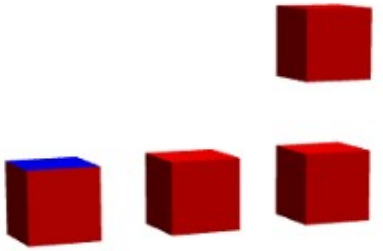


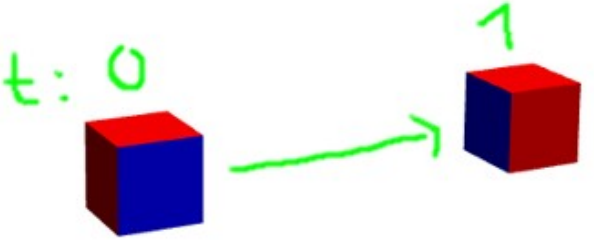
Conversion tool

visualization

jReality







$g_2 \circ g_1^{-1} \circ g_1^{-1} \quad \longleftrightarrow \quad t=0: M_{g_1} \cdot M_{g_1} \cdot M_{g_1}$

$t=1: M_{g_2} \cdot M_{g_1}$

Thank you for your attention!