Introduction to Computational Topology
Summer semester 2018

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Exercise Sheet 6

Exercise 6.1: Vertex and chain maps (4 Punkte)

A simplicial map f between simplicial complexes K and L maps each vertex of K to a vertex of L in such a way that the vertices of a simplex in K are mapped to the vertices of a simplex in L. Prove that

$g(\langle v_1 v_2 \dots v_d \rangle) := \langle f(v_1) f(v_2) \dots f(v_d) \rangle$ if all $f(v_i)$ are different and $:= 0$, otherwise,

defines a chain map from the chain complex of K to the chain complex of L, and thus a homomorphism of the homology spaces.

Hint: Ex.3 on sheet 1might be useful

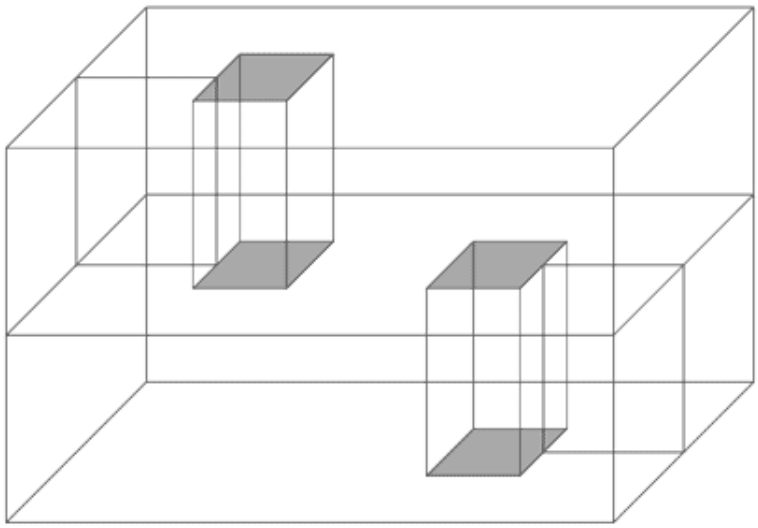
Exercise 6.2: Contraction vs collapsing (4 Punkte)

Which 1-dimensional complexes can be

- contracted into a point?
- collapsed into a point?

Exercise 6.3: Bonus: House with two rooms (4 Punkte)

An example for a contractible, but not collapsible 2-dimensional complex is given below by the "House with two rooms". Why is it not collapsible? Can you describe a deformation retraction to a point?



Hint: It might be easier to imagine the retraction the other way around.