Chiral extensions of regular toroids

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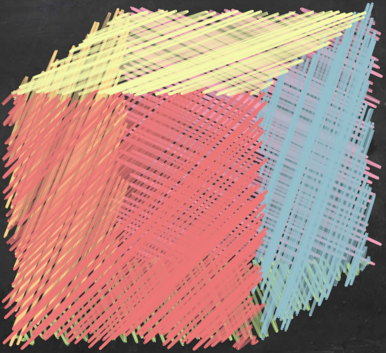
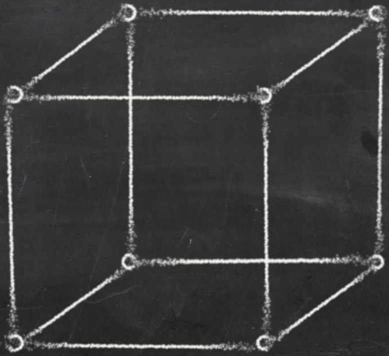
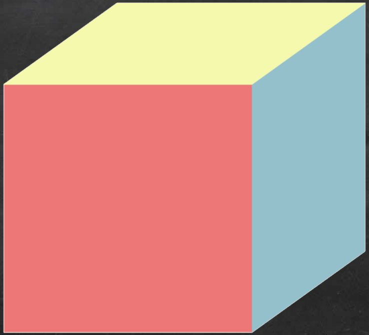
joint work with Daniel Pellicer and Micael Toledo

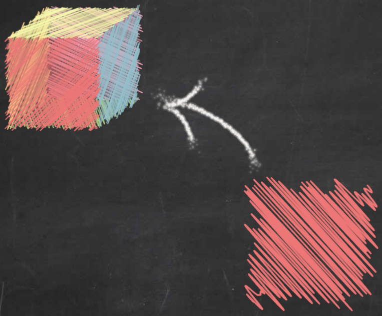
Centro de Ciencias Matemáticas - UNAM

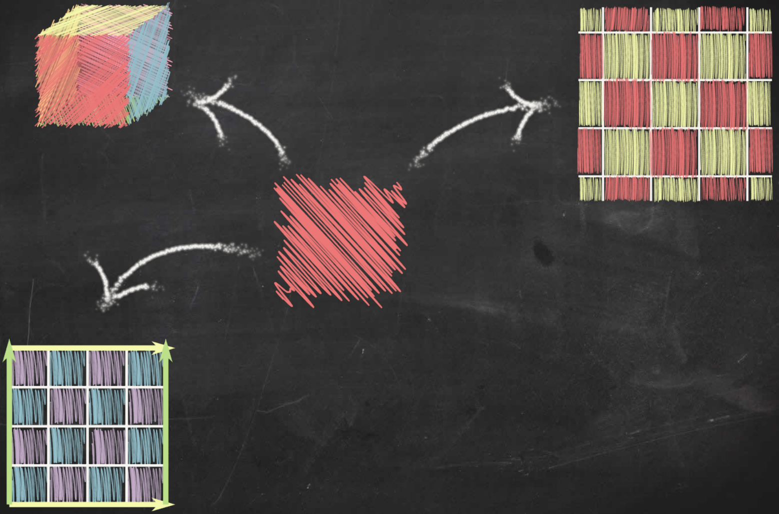
SIGMAP 2018
Morelia, Mexico. June 2018

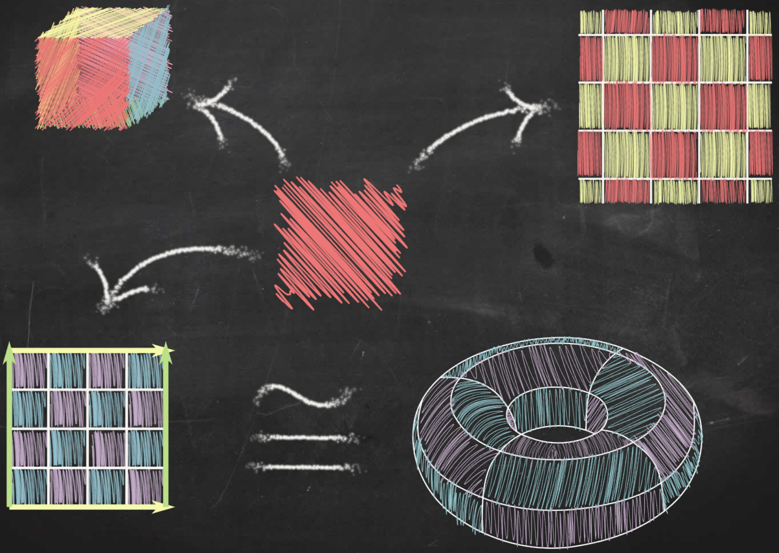


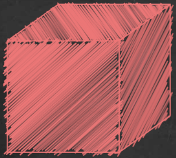


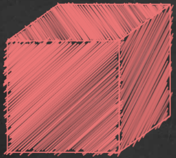


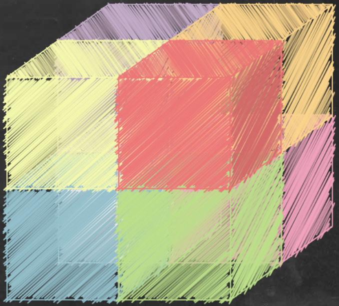












Recursive Construction

Recursive Construction

Strong Connectivity Conditions

Recursive Construction

Strong Connectivity Conditions

Abstract Polytopes

Given an abstract
n-polytope $\mathcal{K}$

Given an abstract
n-polytope K

does there
exist an abstract
(n+1)-polytope* P
with all its facets
isomorphic to K?

Given an abstract n-polytope K

does there exist an abstract $(n+1)$-polytope* P with all its facets isomorphic to K?

*: with given symmetry properties

Given an abstract n-polytope K

symmetry conditions

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$\mathcal{P}$

regular

$\mathcal{P}$ $\Longrightarrow$ $\mathcal{K}$

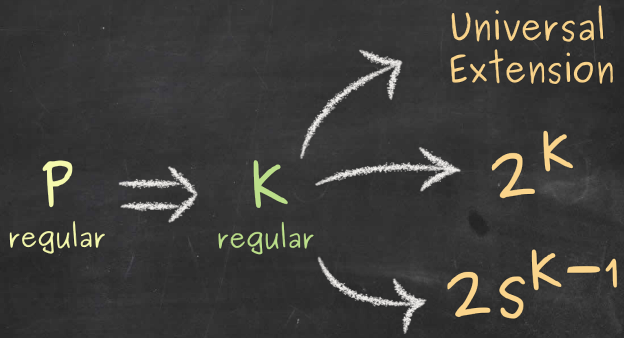
regular regular

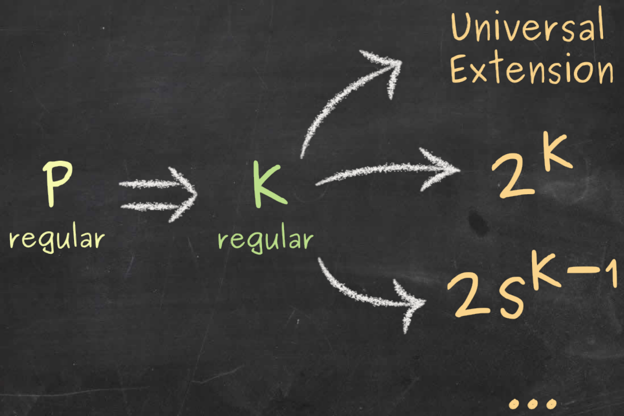
Universal Extension

P $\Longrightarrow$ K

regular regular


P
regular
K
regular
Universal
Extension
2^K


P
regular
K
regular
Universal Extension
2^k
$2s^{k-1}$


$\mathcal{P}$
regular
$\mathcal{K}$
regular
Universal Extension
$2^{\mathcal{K}}$
$2s^{\mathcal{K}-1}$
...

Chiral polytopes

Chiral polytopes

Determined by its group:

Chiral polytopes

Determined by its group:

- Generators and relations

Chiral polytopes

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- Intersection property

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Regular o chiral facets, regular subfacets

$\mathcal{P}$

chiral

K

chiral
w/reg facets

P

chiral

P

chiral

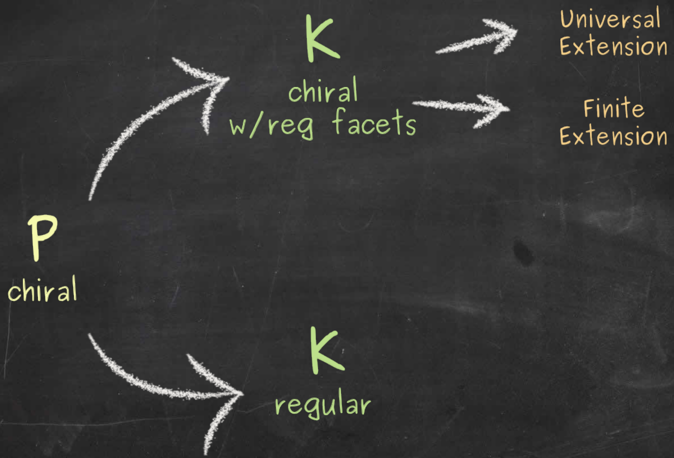
K

chiral

w/reg facets

Universal Extension


P
chiral
K
chiral
w/reg facets
Universal
Extension
Finite
Extension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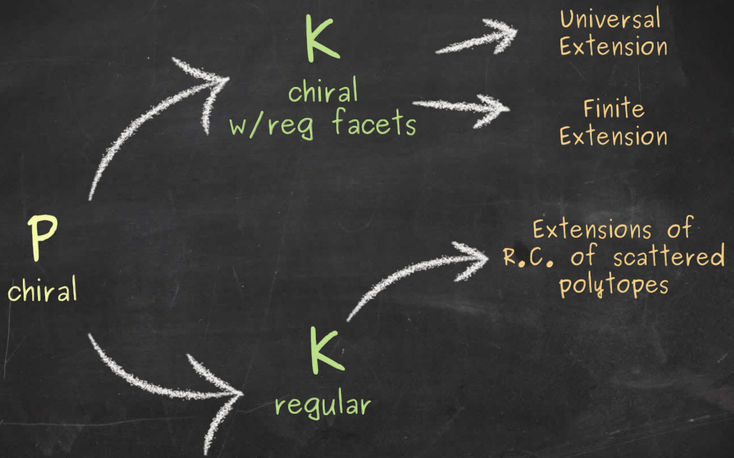
K
chiral
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Universal
Extension
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P
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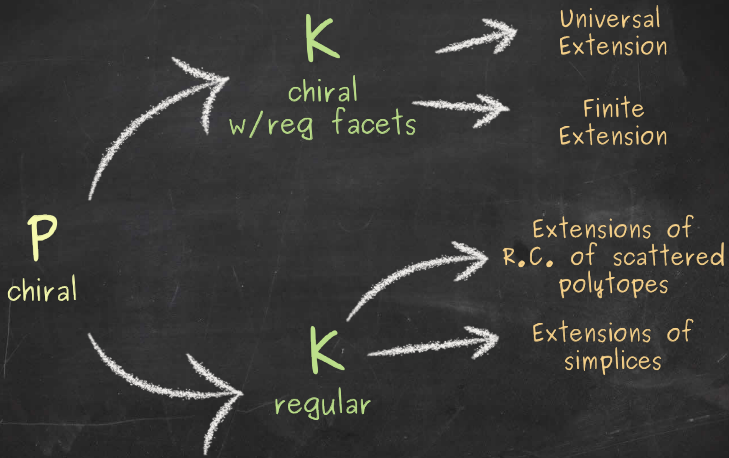
Extensions of
R.C. of scattered
polytopes
K
regular


K
chiral
w/reg facets
Universal
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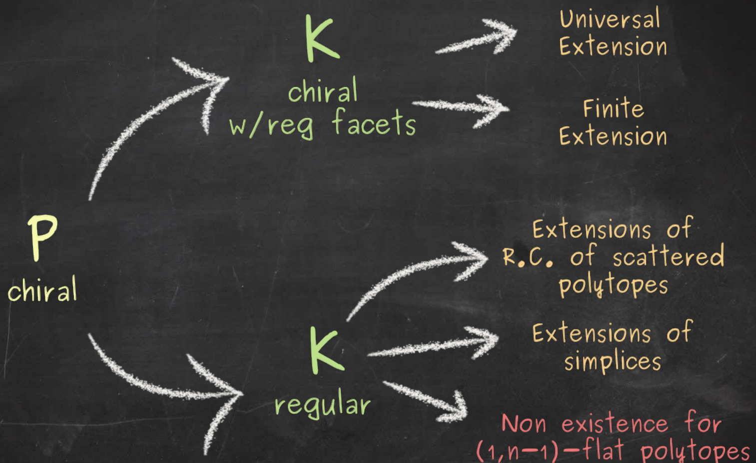
Extensions of
R.C. of scattered
polytopes
K
regular
Extensions of
simplices


P
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Universal
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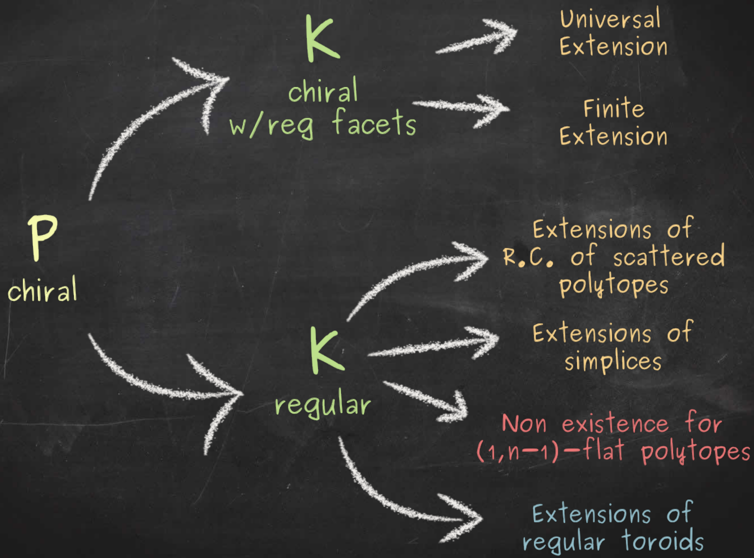
K
regular
Extensions of
R.C. of scattered
polytopes
Extensions of
simplices
Non existence for
(1,n−1)−flat polytopes


P
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Non existence for
(1,n−1)−flat polytopes
Extensions of
regular toroids

Theorem (Pellicer, Potocnik, Toledo, 2018)

For every $n \geqslant 3$ and every $I \subsetneq \{0, \ldots, n-1\}$ there exists an n-maniplex of type 2_I.

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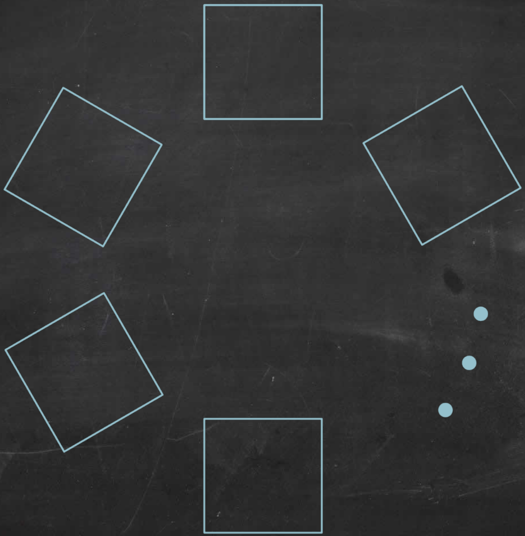
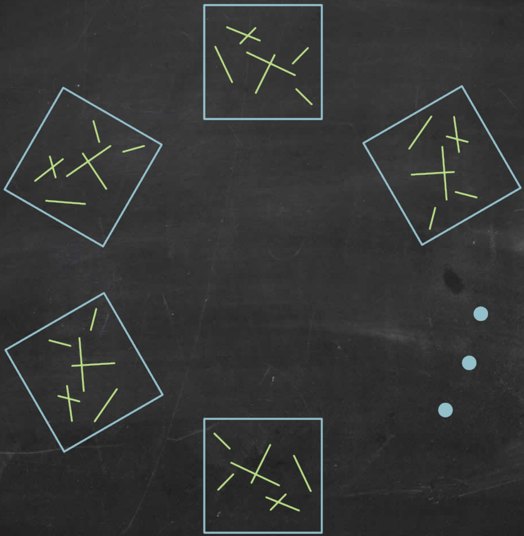
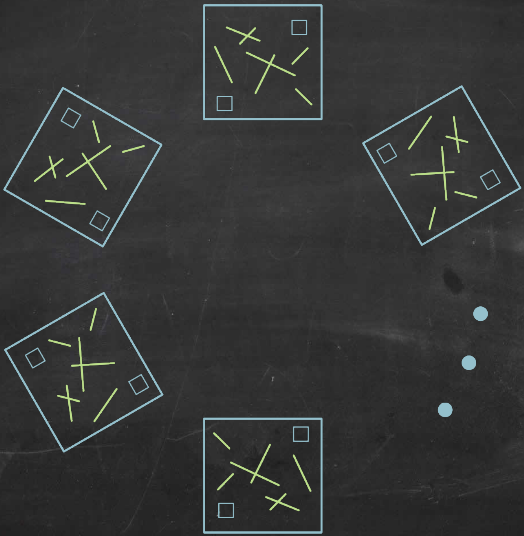
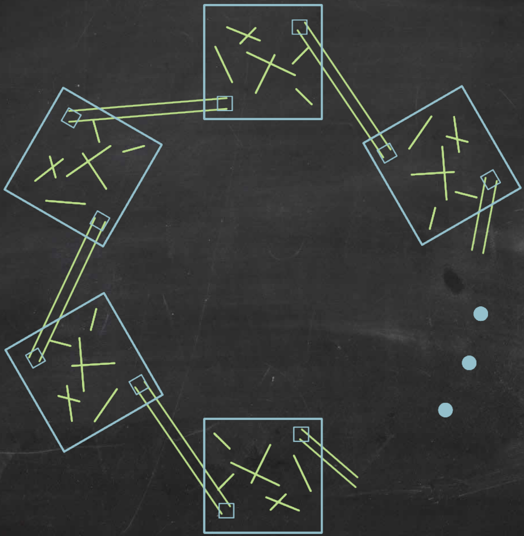
For every $n \geqslant 3$ and every $I \subsetneq \{0, \ldots, n-1\}$ there exists an n-maniplex of type 2_I.

Theorem (M., Pellicer, Toledo)
For every $n \geqslant 3$ and every $a \geqslant 2n+1$ there exists a chiral extension of the regular toroid $\{4, 3, \ldots, 3, 4\}_{(a,0,\ldots,0)}$









Thank you!