

Macaulay2, version 1.24.11-1695-gf35df1017f (vanilla)

with packages: ConwayPolynomials, Elimination, IntegralClosure, InverseSystems, Isomorphism, LLBases, MinimalPrimes, OnlineLookup, PackageCit

i1 : load "hhl (4).m2"

i2 : M = matrix {{1, 0, -1, 1, 0}, {1, 0, -1, 0, 0}, {1, 0, 0, 0, -1}, {1, -1, 0, 0, 0}, {1, 0, 0, -1, 0}, {1, 0, 0, 1, 0}, {1, 1, 1, -3, 1}}

$$\underline{o2} = \begin{pmatrix} 1 & 0 & -1 & 1 & 0 \\ 1 & 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & 0 & -1 \\ 1 & -1 & 0 & 0 & 0 \\ 1 & 0 & 0 & -1 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & -3 & 1 \end{pmatrix}$$

o2 : Matrix $Z^7 \leftarrow Z^5$

i3 : MNew = submatrix(M, , {1,2,3,4})

$$\underline{o3} = \begin{pmatrix} 0 & -1 & 1 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & -1 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & -3 & 1 \end{pmatrix}$$

o3 : Matrix $Z^7 \leftarrow Z^4$

i4 : A = -1*MNew

$$\underline{o4} = \begin{pmatrix} 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & -1 & 0 \\ -1 & -1 & 3 & -1 \end{pmatrix}$$

o4 : Matrix $Z^7 \leftarrow Z^4$

i5 : v = M_0

$$\underline{o5} = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}$$

o5 : Z^7

i6 : needsPackage "NormalToricVarieties"

o6 = NormalToricVarieties

o6 : Package

i7 : P = polyhedronFromHData(A, matrix v)

o7 = P

o7 : Polyhedron

i8 : X = normalToricVariety(P)

o8 = X

o8 : NormalToricVariety

i9 : X

o9 = X

o9 : NormalToricVariety

i10 : dim Xo10 = 4i11 : isWellDefined Xo11 = truei12 : isSmooth Xo12 = truei13 : isFano Xo13 = truei14 : classGroup(X)o14 = \mathbb{Z}^3 o14 : \mathbb{Z} -module, freei15 : rays Xo15 = {{-1, 0, 0, 0}, {0, -1, 0, 0}, {0, 0, -1, 0}, {0, 0, 1, 0}, {0, -1, 1, 0}, {0, 0, 0, -1}, {1, 1, -3, 1}}o15 : Listi16 : max Xo16 = {{0, 1, 2, 5}, {0, 1, 2, 6}, {0, 1, 4, 5}, {0, 1, 4, 6}, {0, 2, 5, 6}, {0, 3, 4, 5}, {0, 3, 4, 6}, {0, 3, 5, 6}, {1, 2, 5, 6}, {1, 4, 5, 6}, {3, 4, 5, 6}}o16 : Listi17 : fromWDivToCl(X)o17 = $\begin{pmatrix} 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & -3 & 0 & 0 & 1 & 1 \end{pmatrix}$ o17 : Matrix $\mathbb{Z}^3 \leftarrow \mathbb{Z}^7$ i18 : Y = X**Xo18 = Yo18 : NormalToricVarietyi19 : phi = diagonalToricMap(X)

o19 = ToricMap $\left\{ \begin{array}{l} \text{cache} \Rightarrow (\text{CacheTable}\{\}), \text{matrix} \Rightarrow \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \text{source} \Rightarrow X, \text{target} \Rightarrow Y \end{array} \right\}$

o19 : ToricMapi20 : makeHHLResolution(Y, matrix phi)

$\left(\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 \end{pmatrix}, (0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 1 \ 1) \right)$

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Labels Complete

o20 = $(\mathbb{Q}[x_0 \dots x_{13}])^4 \xleftarrow{\begin{pmatrix} 0 & \dots & 0 \\ 0 & \dots & -x_{13} \\ x_1 & \dots & 0 \\ -x_3 x_8 x_9 x_{11} & \dots & x_1 x_2 x_6 x_{10} \end{pmatrix}} (\mathbb{Q}[x_0 \dots x_{13}])^{25} \xleftarrow{\begin{pmatrix} 0 & \dots & -x_7 \\ \vdots & \ddots & \vdots \\ 0 & \dots & 0 \end{pmatrix}} (\mathbb{Q}[x_0 \dots x_{13}])^{47} \xleftarrow{\begin{pmatrix} 0 & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & 0 \end{pmatrix}} (\mathbb{Q}[x_0 \dots x_{13}])^{36} \xleftarrow{\begin{pmatrix} 0 & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & 0 \end{pmatrix}} (\mathbb{C}$

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o27 : List