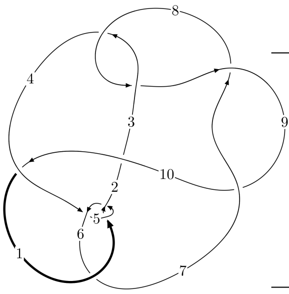
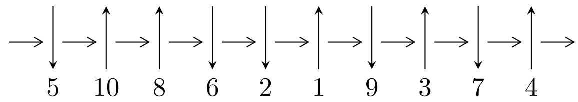
# $10_{42}$ $(K10a_{31})$




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

$$1,5 \underset{c_1}{\longrightarrow} 2 \underset{c_5}{\longrightarrow} 6 \underset{c_6}{\longrightarrow} 7 \underset{c_4}{\longrightarrow} 4 \underset{c_{10}}{\longrightarrow} 10 \underset{c_2}{\longrightarrow} 3 \underset{c_9}{\longrightarrow} 9 \underset{c_8}{\longrightarrow} 8 \twoheadrightarrow c_3, c_7$$

**Ideals for irreducible components[2] of $X_{\mathbf{par}}$**

$$I_1^u = \langle u^{40} + u^{39} + \cdots + 2u + 1 \rangle$$

* 1 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 40 representations.

[1]The image of knot diagram is generated by the software "**Draw programme**" developed by Andrew Bartholomew(`http://www.layer8.co.uk/maths/draw/index.htm#Running-draw`), where we modified some parts for our purpose(`https://github.com/CATsTAILs/LinksPainter`).

[2]All coefficients of polynomials are rational numbers. But the coefficients are sometimes approximated in decimal forms when there is not enough margin.

## I. $I_1^u = \langle u^{40} + u^{39} + \cdots + 2u + 1 \rangle$

**(i) Arc colorings**

$$a_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} -u \\ -u^3 + u \end{pmatrix}$$
$$a_7 = \begin{pmatrix} -u^3 \\ -u^3 + u \end{pmatrix}$$
$$a_4 = \begin{pmatrix} u^3 \\ u^5 - u^3 + u \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} u^8 - u^6 + u^4 + 1 \\ u^{10} - 2u^8 + 3u^6 - 2u^4 + u^2 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} u^{16} - 3u^{14} + 5u^{12} - 4u^{10} + 3u^8 - 2u^6 + 2u^4 + 1 \\ u^{18} - 4u^{16} + 9u^{14} - 12u^{12} + 11u^{10} - 6u^8 + 2u^6 + u^2 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} u^{16} - 3u^{14} + 5u^{12} - 4u^{10} + 3u^8 - 2u^6 + 2u^4 + 1 \\ u^{16} - 4u^{14} + 8u^{12} - 8u^{10} + 4u^8 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^{29} + 6u^{27} + \cdots - 4u^5 - u \\ -u^{29} + 7u^{27} + \cdots - u^3 + u \end{pmatrix}$$

**(ii) Obstruction class** $= -1$

**(iii) Cusp Shapes**
$= -4u^{39} + 40u^{37} + 4u^{36} - 200u^{35} - 36u^{34} + 644u^{33} + 164u^{32} - 1472u^{31} - 484u^{30} + 2500u^{29} + 1020u^{28} - 3236u^{27} - 1616u^{26} + 3252u^{25} + 2004u^{24} - 2608u^{23} - 2040u^{22} + 1752u^{21} + 1812u^{20} - 1036u^{19} - 1468u^{18} + 512u^{17} + 1064u^{16} - 160u^{15} - 652u^{14} - 16u^{13} + 340u^{12} + 72u^{11} - 168u^{10} - 96u^9 + 68u^8 + 76u^7 - 8u^6 - 24u^5 - 4u^4 - 4u^3 - 4u^2 - 8u - 6$

**(iv) u-Polynomials at the component**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $u^{40} + u^{39} + \cdots + 2u + 1$ |
| $c_2$ | $u^{40} + 5u^{39} + \cdots + 12u + 1$ |
| $c_3, c_8$ | $u^{40} - u^{39} + \cdots - 2u^3 + 1$ |
| $c_4$ | $u^{40} + 19u^{39} + \cdots + 2u^2 + 1$ |
| $c_6$ | $u^{40} + 3u^{39} + \cdots + 61u + 16$ |
| $c_7, c_9$ | $u^{40} + 13u^{39} + \cdots - 2u^2 + 1$ |
| $c_{10}$ | $u^{40} - u^{39} + \cdots + 70u + 25$ |

**(v) Riley Polynomials at the component**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $y^{40} - 19y^{39} + \cdots + 2y^2 + 1$ |
| $c_2$ | $y^{40} + y^{39} + \cdots + 12y + 1$ |
| $c_3, c_8$ | $y^{40} + 13y^{39} + \cdots - 2y^2 + 1$ |
| $c_4$ | $y^{40} + 5y^{39} + \cdots + 4y + 1$ |
| $c_6$ | $y^{40} + 9y^{39} + \cdots + 4695y + 256$ |
| $c_7, c_9$ | $y^{40} + 29y^{39} + \cdots - 4y + 1$ |
| $c_{10}$ | $y^{40} - 11y^{39} + \cdots - 11300y + 625$ |

**(vi) Complex Volumes and Cusp Shapes**

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.028980 + 0.356861I$ | $-1.87833 + 1.42866I$ | $-1.75477 - 0.64534I$ |
| $u = -1.028980 - 0.356861I$ | $-1.87833 - 1.42866I$ | $-1.75477 + 0.64534I$ |
| $u = -0.605776 + 0.668794I$ | $4.58827 + 5.88166I$ | $4.65065 - 6.09482I$ |
| $u = -0.605776 - 0.668794I$ | $4.58827 - 5.88166I$ | $4.65065 + 6.09482I$ |
| $u = -1.085730 + 0.202553I$ | $-0.384043 - 0.065531I$ | $-1.65195 - 0.65182I$ |
| $u = -1.085730 - 0.202553I$ | $-0.384043 + 0.065531I$ | $-1.65195 + 0.65182I$ |
| $u = 0.571687 + 0.673264I$ | $5.18330 - 0.15085I$ | $6.02823 + 0.49618I$ |
| $u = 0.571687 - 0.673264I$ | $5.18330 + 0.15085I$ | $6.02823 - 0.49618I$ |
| $u = -0.964797 + 0.581212I$ | $3.52924 - 1.02826I$ | $3.02738 + 0.15735I$ |
| $u = -0.964797 - 0.581212I$ | $3.52924 + 1.02826I$ | $3.02738 - 0.15735I$ |
| $u = 1.120660 + 0.212549I$ | $-1.32786 + 5.57768I$ | $-3.43862 - 4.39035I$ |
| $u = 1.120660 - 0.212549I$ | $-1.32786 - 5.57768I$ | $-3.43862 + 4.39035I$ |
| $u = 1.110950 + 0.292389I$ | $-6.07985 - 0.03674I$ | $-9.04849 - 0.16943I$ |
| $u = 1.110950 - 0.292389I$ | $-6.07985 + 0.03674I$ | $-9.04849 + 0.16943I$ |
| $u = 0.991959 + 0.580881I$ | $3.94345 - 4.71182I$ | $3.76114 + 5.41408I$ |
| $u = 0.991959 - 0.580881I$ | $3.94345 + 4.71182I$ | $3.76114 - 5.41408I$ |
| $u = -0.355458 + 0.766083I$ | $3.32299 - 8.17729I$ | $3.05192 + 5.82128I$ |
| $u = -0.355458 - 0.766083I$ | $3.32299 + 8.17729I$ | $3.05192 - 5.82128I$ |
| $u = 0.374958 + 0.750172I$ | $4.20581 + 2.43691I$ | $4.87403 - 0.79132I$ |
| $u = 0.374958 - 0.750172I$ | $4.20581 - 2.43691I$ | $4.87403 + 0.79132I$ |
| $u = 1.112780 + 0.379878I$ | $-3.07700 - 5.78108I$ | $-4.88901 + 6.61715I$ |
| $u = 1.112780 - 0.379878I$ | $-3.07700 + 5.78108I$ | $-4.88901 - 6.61715I$ |
| $u = -1.093860 + 0.474186I$ | $-2.46460 + 1.67611I$ | $-4.01967 - 0.72581I$ |
| $u = -1.093860 - 0.474186I$ | $-2.46460 - 1.67611I$ | $-4.01967 + 0.72581I$ |
| $u = 1.075660 + 0.536322I$ | $-0.51656 - 5.28641I$ | $1.70674 + 5.92677I$ |
| $u = 1.075660 - 0.536322I$ | $-0.51656 + 5.28641I$ | $1.70674 - 5.92677I$ |
| $u = -0.626259 + 0.461310I$ | $-0.75320 + 1.72242I$ | $-1.30257 - 5.15094I$ |
| $u = -0.626259 - 0.461310I$ | $-0.75320 - 1.72242I$ | $-1.30257 + 5.15094I$ |
| $u = -1.116800 + 0.540554I$ | $-4.40573 + 7.54884I$ | $-5.84455 - 7.16323I$ |
| $u = -1.116800 - 0.540554I$ | $-4.40573 - 7.54884I$ | $-5.84455 + 7.16323I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.294391+0.695895I$ | $-2.04511-2.81020I$ | $-2.71121+3.60415I$ |
| $u=-0.294391-0.695895I$ | $-2.04511+2.81020I$ | $-2.71121-3.60415I$ |
| $u=\phantom{-}1.109470+0.575876I$ | $2.04477-7.46361I$ | $1.61835+4.86663I$ |
| $u=\phantom{-}1.109470-0.575876I$ | $2.04477+7.46361I$ | $1.61835-4.86663I$ |
| $u=-1.120570+0.575970I$ | $1.06923+13.23980I$ | $0.-9.63322I$ |
| $u=-1.120570-0.575970I$ | $1.06923-13.23980I$ | $0.+9.63322I$ |
| $u=\phantom{-}0.404022+0.614715I$ | $1.43625+0.71721I$ | $6.03452-1.24829I$ |
| $u=\phantom{-}0.404022-0.614715I$ | $1.43625-0.71721I$ | $6.03452+1.24829I$ |
| $u=-0.079510+0.604610I$ | $0.18870+2.31784I$ | $0.10490-3.06865I$ |
| $u=-0.079510-0.604610I$ | $0.18870-2.31784I$ | $0.10490+3.06865I$ |

**II. u-Polynomials**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $u^{40} + u^{39} + \cdots + 2u + 1$ |
| $c_2$ | $u^{40} + 5u^{39} + \cdots + 12u + 1$ |
| $c_3, c_8$ | $u^{40} - u^{39} + \cdots - 2u^3 + 1$ |
| $c_4$ | $u^{40} + 19u^{39} + \cdots + 2u^2 + 1$ |
| $c_6$ | $u^{40} + 3u^{39} + \cdots + 61u + 16$ |
| $c_7, c_9$ | $u^{40} + 13u^{39} + \cdots - 2u^2 + 1$ |
| $c_{10}$ | $u^{40} - u^{39} + \cdots + 70u + 25$ |

## III. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $y^{40} - 19y^{39} + \cdots + 2y^2 + 1$ |
| $c_2$ | $y^{40} + y^{39} + \cdots + 12y + 1$ |
| $c_3, c_8$ | $y^{40} + 13y^{39} + \cdots - 2y^2 + 1$ |
| $c_4$ | $y^{40} + 5y^{39} + \cdots + 4y + 1$ |
| $c_6$ | $y^{40} + 9y^{39} + \cdots + 4695y + 256$ |
| $c_7, c_9$ | $y^{40} + 29y^{39} + \cdots - 4y + 1$ |
| $c_{10}$ | $y^{40} - 11y^{39} + \cdots - 11300y + 625$ |