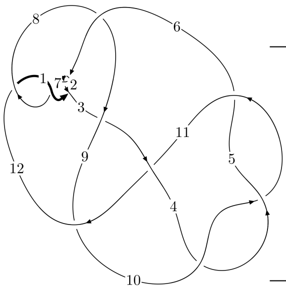
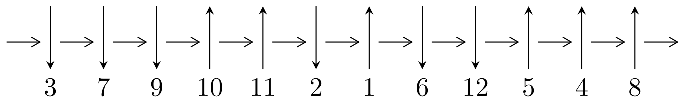
## $12a_{0579}$ ($K12a_{0579}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

$$3,7 \underset{c_2}{\rightarrow} 2 \underset{c_1}{\rightarrow} 1 \underset{c_7}{\rightarrow} 8 \underset{c_6}{\rightarrow} 6 \underset{c_8}{\rightarrow} 9 \underset{c_3}{\rightarrow} 4 \underset{c_{12}}{\rightarrow} 12 \underset{c_9}{\rightarrow} 10 \underset{c_{11}}{\rightarrow} 11 \underset{c_5}{\rightarrow} 5 \gg c_4, c_{10}$$

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

$$I_1^u = \langle u^{87} + 2u^{86} + \cdots - 3u - 1\rangle$$
$$I_2^u = \langle u - 1\rangle$$

* 2 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 88 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. $I_1^u = \langle u^{87} + 2u^{86} + \cdots - 3u - 1 \rangle$

**(i) Arc colorings**

$$a_3 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 1 \\ -u^2 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} -u^2 + 1 \\ -u^2 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} u^5 - 2u^3 + u \\ u^5 - u^3 + u \end{pmatrix}$$

$$a_6 = \begin{pmatrix} u \\ -u^3 + u \end{pmatrix}$$

$$a_9 = \begin{pmatrix} -u^9 + 2u^7 - u^5 - 2u^3 + u \\ u^{11} - 3u^9 + 4u^7 - u^5 - u^3 + u \end{pmatrix}$$

$$a_4 = \begin{pmatrix} -u^{20} + 5u^{18} - 11u^{16} + 10u^{14} + 2u^{12} - 13u^{10} + 9u^8 - 3u^4 + u^2 + 1 \\ u^{22} - 6u^{20} + 17u^{18} - 26u^{16} + 20u^{14} - 13u^{10} + 10u^8 - u^6 - 2u^4 + u^2 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} -u^8 + 3u^6 - 3u^4 + 1 \\ -u^8 + 2u^6 - 2u^4 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} -u^{27} + 8u^{25} + \cdots + 4u^5 - u^3 \\ -u^{27} + 7u^{25} + \cdots - u^3 + u \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} u^{50} - 13u^{48} + \cdots + u^2 + 1 \\ -u^{52} + 14u^{50} + \cdots - 6u^8 - u^4 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} u^{76} - 21u^{74} + \cdots + u^2 + 1 \\ u^{76} - 20u^{74} + \cdots + 10u^8 - u^4 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 4u^{86} - 92u^{84} + \cdots - 4u^2 + 6$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{87}+46u^{86}+\cdots-u+1$ |
| $c_2, c_6$ | $u^{87}-2u^{86}+\cdots-3u+1$ |
| $c_3$ | $u^{87}-2u^{86}+\cdots-15553u+1789$ |
| $c_4, c_5, c_{10}$ | $u^{87}-39u^{85}+\cdots-u+1$ |
| $c_7, c_{12}$ | $u^{87}-3u^{86}+\cdots+59u+11$ |
| $c_8$ | $u^{87}-12u^{86}+\cdots+3u+1$ |
| $c_9$ | $u^{87}-18u^{86}+\cdots+65191u-4073$ |
| $c_{11}$ | $u^{87}-3u^{86}+\cdots-3u+11$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{87} - 10y^{86} + \cdots + 3y - 1$ |
| $c_2, c_6$ | $y^{87} - 46y^{86} + \cdots - y - 1$ |
| $c_3$ | $y^{87} - 22y^{86} + \cdots + 148162943y - 3200521$ |
| $c_4, c_5, c_{10}$ | $y^{87} - 78y^{86} + \cdots - y - 1$ |
| $c_7, c_{12}$ | $y^{87} + 69y^{86} + \cdots - 1579y - 121$ |
| $c_8$ | $y^{87} + 2y^{86} + \cdots + 187y - 1$ |
| $c_9$ | $y^{87} + 26y^{86} + \cdots - 406378973y - 16589329$ |
| $c_{11}$ | $y^{87} - 3y^{86} + \cdots + 581y - 121$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.966141 + 0.257989I$ | $3.05247 - 1.13677I$ | $0$ |
| $u = -0.966141 - 0.257989I$ | $3.05247 + 1.13677I$ | $0$ |
| $u = -0.884260 + 0.473666I$ | $1.43118 + 4.23576I$ | $0$ |
| $u = -0.884260 - 0.473666I$ | $1.43118 - 4.23576I$ | $0$ |
| $u = -0.840538 + 0.517807I$ | $1.69738 + 3.45223I$ | $0$ |
| $u = -0.840538 - 0.517807I$ | $1.69738 - 3.45223I$ | $0$ |
| $u = 0.862004 + 0.537117I$ | $0.53831 - 7.10255I$ | $0$ |
| $u = 0.862004 - 0.537117I$ | $0.53831 + 7.10255I$ | $0$ |
| $u = 0.818200 + 0.544961I$ | $7.81764 - 1.63453I$ | $7.64996 + 3.75286I$ |
| $u = 0.818200 - 0.544961I$ | $7.81764 + 1.63453I$ | $7.64996 - 3.75286I$ |
| $u = -1.014630 + 0.076379I$ | $-3.56476 + 3.14041I$ | $0$ |
| $u = -1.014630 - 0.076379I$ | $-3.56476 - 3.14041I$ | $0$ |
| $u = -0.862976 + 0.550546I$ | $6.01709 + 10.55840I$ | $0$ |
| $u = -0.862976 - 0.550546I$ | $6.01709 - 10.55840I$ | $0$ |
| $u = 1.034630 + 0.100691I$ | $1.61270 - 6.52842I$ | $0$ |
| $u = 1.034630 - 0.100691I$ | $1.61270 + 6.52842I$ | $0$ |
| $u = 0.877745 + 0.381441I$ | $-1.57258 - 1.45395I$ | $-5.27659 + 2.81251I$ |
| $u = 0.877745 - 0.381441I$ | $-1.57258 + 1.45395I$ | $-5.27659 - 2.81251I$ |
| $u = 0.949322$ | $-1.75071$ | $-4.59820$ |
| $u = 0.707240 + 0.548889I$ | $8.13382 - 2.76721I$ | $8.70750 + 3.54192I$ |
| $u = 0.707240 - 0.548889I$ | $8.13382 + 2.76721I$ | $8.70750 - 3.54192I$ |
| $u = -0.644779 + 0.563536I$ | $6.63286 - 6.10066I$ | $6.67875 + 3.11647I$ |
| $u = -0.644779 - 0.563536I$ | $6.63286 + 6.10066I$ | $6.67875 - 3.11647I$ |
| $u = -0.682539 + 0.509279I$ | $2.15178 + 0.76326I$ | $5.46969 - 3.60542I$ |
| $u = -0.682539 - 0.509279I$ | $2.15178 - 0.76326I$ | $5.46969 + 3.60542I$ |
| $u = 0.641757 + 0.540416I$ | $1.15794 + 2.74428I$ | $2.34838 - 3.28740I$ |
| $u = 0.641757 - 0.540416I$ | $1.15794 - 2.74428I$ | $2.34838 + 3.28740I$ |
| $u = -0.147114 + 0.807933I$ | $2.59735 - 11.10170I$ | $2.85354 + 7.04638I$ |
| $u = -0.147114 - 0.807933I$ | $2.59735 + 11.10170I$ | $2.85354 - 7.04638I$ |
| $u = 0.139710 + 0.803211I$ | $-2.82602 + 7.50372I$ | $-1.71194 - 6.83043I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = \phantom{-}0.139710 - 0.803211I$ | $-2.82602 - 7.50372I$ | $-1.71194 + 6.83043I$ |
| $u = -1.093090 + 0.461867I$ | $3.40048 - 0.74196I$ | $0$ |
| $u = -1.093090 - 0.461867I$ | $3.40048 + 0.74196I$ | $0$ |
| $u = -0.104841 + 0.792610I$ | $-1.84325 - 3.95466I$ | $-0.78666 + 4.04344I$ |
| $u = -0.104841 - 0.792610I$ | $-1.84325 + 3.95466I$ | $-0.78666 - 4.04344I$ |
| $u = -0.131118 + 0.787561I$ | $-1.39783 - 3.69601I$ | $1.00853 + 1.78136I$ |
| $u = -0.131118 - 0.787561I$ | $-1.39783 + 3.69601I$ | $1.00853 - 1.78136I$ |
| $u = \phantom{-}1.121560 + 0.452590I$ | $-2.20477 - 2.15024I$ | $0$ |
| $u = \phantom{-}1.121560 - 0.452590I$ | $-2.20477 + 2.15024I$ | $0$ |
| $u = -0.055872 + 0.787918I$ | $0.12538 + 2.84570I$ | $0.09778 - 2.42036I$ |
| $u = -0.055872 - 0.787918I$ | $0.12538 - 2.84570I$ | $0.09778 + 2.42036I$ |
| $u = \phantom{-}0.078455 + 0.785741I$ | $-4.55325 + 0.55742I$ | $-5.08529 + 0.67714I$ |
| $u = \phantom{-}0.078455 - 0.785741I$ | $-4.55325 - 0.55742I$ | $-5.08529 - 0.67714I$ |
| $u = \phantom{-}0.157374 + 0.772504I$ | $4.93345 + 2.24336I$ | $5.56036 - 2.08431I$ |
| $u = \phantom{-}0.157374 - 0.772504I$ | $4.93345 - 2.24336I$ | $5.56036 + 2.08431I$ |
| $u = -1.138470 + 0.476384I$ | $-1.96887 + 5.60074I$ | $0$ |
| $u = -1.138470 - 0.476384I$ | $-1.96887 - 5.60074I$ | $0$ |
| $u = \phantom{-}1.131420 + 0.493450I$ | $3.87168 - 8.16081I$ | $0$ |
| $u = \phantom{-}1.131420 - 0.493450I$ | $3.87168 + 8.16081I$ | $0$ |
| $u = -1.184400 + 0.373392I$ | $0.98186 + 1.54403I$ | $0$ |
| $u = -1.184400 - 0.373392I$ | $0.98186 - 1.54403I$ | $0$ |
| $u = \phantom{-}1.202200 + 0.386893I$ | $-5.34474 - 0.27499I$ | $0$ |
| $u = \phantom{-}1.202200 - 0.386893I$ | $-5.34474 + 0.27499I$ | $0$ |
| $u = -1.210270 + 0.378326I$ | $-6.87411 - 3.52324I$ | $0$ |
| $u = -1.210270 - 0.378326I$ | $-6.87411 + 3.52324I$ | $0$ |
| $u = \phantom{-}1.212320 + 0.372596I$ | $-1.49892 + 7.13914I$ | $0$ |
| $u = \phantom{-}1.212320 - 0.372596I$ | $-1.49892 - 7.13914I$ | $0$ |
| $u = \phantom{-}1.207670 + 0.400251I$ | $-5.72997 - 0.13864I$ | $0$ |
| $u = \phantom{-}1.207670 - 0.400251I$ | $-5.72997 + 0.13864I$ | $0$ |
| $u = -1.206850 + 0.414420I$ | $-8.33467 + 3.61849I$ | $0$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.206850 - 0.414420I$ | $-8.33467 - 3.61849I$ | 0 |
| $u = \phantom{-}1.208380 + 0.424632I$ | $-3.59584 - 7.10442I$ | 0 |
| $u = \phantom{-}1.208380 - 0.424632I$ | $-3.59584 + 7.10442I$ | 0 |
| $u = \phantom{-}1.179390 + 0.510697I$ | $1.94326 - 7.00326I$ | 0 |
| $u = \phantom{-}1.179390 - 0.510697I$ | $1.94326 + 7.00326I$ | 0 |
| $u = -1.199560 + 0.477330I$ | $-3.22033 + 1.74513I$ | 0 |
| $u = -1.199560 - 0.477330I$ | $-3.22033 - 1.74513I$ | 0 |
| $u = \phantom{-}1.196800 + 0.486367I$ | $-7.82292 - 5.20062I$ | 0 |
| $u = \phantom{-}1.196800 - 0.486367I$ | $-7.82292 + 5.20062I$ | 0 |
| $u = -1.189780 + 0.506005I$ | $-4.50194 + 8.46175I$ | 0 |
| $u = -1.189780 - 0.506005I$ | $-4.50194 - 8.46175I$ | 0 |
| $u = -1.195880 + 0.496933I$ | $-5.04500 + 8.67949I$ | 0 |
| $u = -1.195880 - 0.496933I$ | $-5.04500 - 8.67949I$ | 0 |
| $u = \phantom{-}1.193320 + 0.511980I$ | $-5.93104 - 12.33810I$ | 0 |
| $u = \phantom{-}1.193320 - 0.511980I$ | $-5.93104 + 12.33810I$ | 0 |
| $u = -1.193390 + 0.515647I$ | $-0.4909 + 15.9669I$ | 0 |
| $u = -1.193390 - 0.515647I$ | $-0.4909 - 15.9669I$ | 0 |
| $u = \phantom{-}0.232114 + 0.655329I$ | $6.46120 + 3.72588I$ | $7.39278 - 3.37040I$ |
| $u = \phantom{-}0.232114 - 0.655329I$ | $6.46120 - 3.72588I$ | $7.39278 + 3.37040I$ |
| $u = -0.527497 + 0.441971I$ | $2.35577 - 0.33907I$ | $3.68741 + 0.05432I$ |
| $u = -0.527497 - 0.441971I$ | $2.35577 + 0.33907I$ | $3.68741 - 0.05432I$ |
| $u = -0.329405 + 0.589621I$ | $5.58601 + 4.90010I$ | $6.38719 - 3.76074I$ |
| $u = -0.329405 - 0.589621I$ | $5.58601 - 4.90010I$ | $6.38719 + 3.76074I$ |
| $u = -0.181861 + 0.602722I$ | $0.74652 - 1.35095I$ | $3.80548 + 4.35021I$ |
| $u = -0.181861 - 0.602722I$ | $0.74652 + 1.35095I$ | $3.80548 - 4.35021I$ |
| $u = \phantom{-}0.308308 + 0.533007I$ | $0.19366 - 1.78298I$ | $1.92568 + 4.24061I$ |
| $u = \phantom{-}0.308308 - 0.533007I$ | $0.19366 + 1.78298I$ | $1.92568 - 4.24061I$ |

## II. $I_2^u = \langle u - 1 \rangle$

**(i) Arc colorings**

$$a_3 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -6$

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

| Crossings | u-Polynomials at each crossing |
| --- | --- |
| $c_1, c_2, c_3$<br>$c_4, c_5, c_6$<br>$c_8, c_{10}$ | $u+1$ |
| $c_7, c_{11}, c_{12}$ | $u$ |
| $c_9$ | $u-1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_2, c_3$<br>$c_4, c_5, c_6$<br>$c_8, c_9, c_{10}$ | $y - 1$ |
| $c_7, c_{11}, c_{12}$ | $y$ |

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

| | Solutions to $I_2^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|---|
| $u =$ | 1.00000 | −1.64493 | −6.00000 |

## III. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $(u+1)(u^{87}+46u^{86}+\cdots-u+1)$ |
| $c_2, c_6$ | $(u+1)(u^{87}-2u^{86}+\cdots-3u+1)$ |
| $c_3$ | $(u+1)(u^{87}-2u^{86}+\cdots-15553u+1789)$ |
| $c_4, c_5, c_{10}$ | $(u+1)(u^{87}-39u^{85}+\cdots-u+1)$ |
| $c_7, c_{12}$ | $u(u^{87}-3u^{86}+\cdots+59u+11)$ |
| $c_8$ | $(u+1)(u^{87}-12u^{86}+\cdots+3u+1)$ |
| $c_9$ | $(u-1)(u^{87}-18u^{86}+\cdots+65191u-4073)$ |
| $c_{11}$ | $u(u^{87}-3u^{86}+\cdots-3u+11)$ |

## IV. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $(y-1)(y^{87}-10y^{86}+\cdots+3y-1)$ |
| $c_2, c_6$ | $(y-1)(y^{87}-46y^{86}+\cdots-y-1)$ |
| $c_3$ | $(y-1)(y^{87}-22y^{86}+\cdots+1.48163\times 10^8 y-3200521)$ |
| $c_4, c_5, c_{10}$ | $(y-1)(y^{87}-78y^{86}+\cdots-y-1)$ |
| $c_7, c_{12}$ | $y(y^{87}+69y^{86}+\cdots-1579y-121)$ |
| $c_8$ | $(y-1)(y^{87}+2y^{86}+\cdots+187y-1)$ |
| $c_9$ | $(y-1)(y^{87}+26y^{86}+\cdots-4.06379\times 10^8 y-1.65893\times 10^7)$ |
| $c_{11}$ | $y(y^{87}-3y^{86}+\cdots+581y-121)$ |