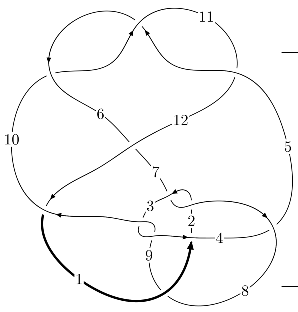
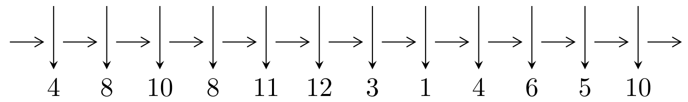
# $12n_{0851}$ ($K12n_{0851}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

$$6,10 \xrightarrow[c_{10}]{} 11 \xrightarrow[c_5]{} 5 \xrightarrow[c_{11}]{} 12 \xrightarrow[c_{12}]{} 1,8 \xrightarrow[c_4]{} 4 \xrightarrow[c_1]{} 2 \xrightarrow[c_3]{} 3 \xrightarrow[c_7]{} 7 \xrightarrow[c_9]{} 9 \twoheadrightarrow c_2, c_6, c_8$$

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

$$\begin{aligned}
I_1^u = \langle & u^{13} - 4u^{12} + 14u^{11} - 32u^{10} + 61u^9 - 92u^8 + 114u^7 - 113u^6 + 90u^5 - 49u^4 + 18u^3 + 2u^2 + 2b - 5u, \\
& -u^{13} + 5u^{12} + \cdots + 2a - 5,\ u^{14} - 6u^{13} + \cdots + 10u - 4 \rangle \\
I_2^u = \langle & u^{11} + 5u^9 + 9u^7 + 5u^5 + u^4 - 2u^3 + 2u^2 + b - 2u, \\
& -u^{11} + u^{10} - 5u^9 + 5u^8 - 9u^7 + 9u^6 - 5u^5 + 4u^4 + 3u^3 - 4u^2 + a + 4u - 2, \\
& u^{12} + 6u^{10} + 13u^8 + 10u^6 + u^5 - 2u^4 + 3u^3 - 4u^2 + 2u + 1 \rangle
\end{aligned}$$

* 2 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 26 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. $I_1^u = \langle u^{13}-4u^{12}+\cdots+2b-5u,\ -u^{13}+5u^{12}+\cdots+2a-5,\ u^{14}-6u^{13}+\cdots+10u-4\rangle$

**(i) Arc colorings**

$$a_6 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} u \\ u^3+u \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} u^2+1 \\ u^4+2u^2 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} -u^4-u^2+1 \\ u^4+2u^2 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} \frac{1}{2}u^{13}-\frac{5}{2}u^{12}+\cdots-\frac{7}{2}u+\frac{5}{2} \\ -\frac{1}{2}u^{13}+2u^{12}+\cdots-u^2+\frac{5}{2}u \end{pmatrix}$$
$$a_4 = \begin{pmatrix} \frac{1}{4}u^{13}-u^{12}+\cdots+\frac{3}{4}u-1 \\ \frac{1}{2}u^{13}-3u^{12}+\cdots-\frac{9}{2}u+3 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} -u^{13}+\frac{11}{2}u^{12}+\cdots+6u-\frac{5}{2} \\ -\frac{1}{2}u^{13}+3u^{12}+\cdots+\frac{11}{2}u-4 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} \frac{3}{4}u^{13}-4u^{12}+\cdots-\frac{15}{4}u+2 \\ \frac{1}{2}u^{13}-3u^{12}+\cdots-\frac{9}{2}u+3 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} -u^5-2u^3-u \\ -u^7-3u^5-2u^3+u \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -u^{13}+\frac{9}{2}u^{12}+\cdots+4u-\frac{3}{2} \\ \frac{1}{2}u^{13}-2u^{12}+\cdots+u^2-\frac{3}{2}u \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -u^{13}+6u^{12}-24u^{11}+68u^{10}-151u^9+270u^8-394u^7+469u^6-448u^5+327u^4-164u^3+34u^2+24u-26$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{14} - 5u^{13} + \cdots - 2u + 1$ |
| $c_2, c_3, c_7$ $c_9$ | $u^{14} - u^{13} + \cdots - 2u - 1$ |
| $c_4, c_8$ | $u^{14} + 2u^{13} + \cdots - 3u - 1$ |
| $c_5, c_{10}, c_{11}$ | $u^{14} - 6u^{13} + \cdots + 10u - 4$ |
| $c_6$ | $u^{14} + 6u^{13} + \cdots - 462u - 180$ |
| $c_{12}$ | $u^{14} - 4u^{13} + \cdots + 1960u + 1216$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{14} - 29y^{13} + \cdots - 38y + 1$ |
| $c_2, c_3, c_7$ $c_9$ | $y^{14} + 39y^{13} + \cdots + 14y + 1$ |
| $c_4, c_8$ | $y^{14} + 30y^{13} + \cdots - 33y + 1$ |
| $c_5, c_{10}, c_{11}$ | $y^{14} + 12y^{13} + \cdots - 156y + 16$ |
| $c_6$ | $y^{14} - 4y^{13} + \cdots - 178524y + 32400$ |
| $c_{12}$ | $y^{14} + 76y^{13} + \cdots - 36622528y + 1478656$ |

### (vi) Complex Volumes and Cusp Shapes

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.858928$<br>$a = -0.109294$<br>$b = -0.665442$ | $-6.60134$ | $-10.5000$ |
| $u = -0.057867 + 1.252230I$<br>$a = 0.540753 - 0.387507I$<br>$b = -0.147291 + 0.486948I$ | $3.16264 + 1.26178I$ | $-8.12371 - 5.07005I$ |
| $u = -0.057867 - 1.252230I$<br>$a = 0.540753 + 0.387507I$<br>$b = -0.147291 - 0.486948I$ | $3.16264 - 1.26178I$ | $-8.12371 + 5.07005I$ |
| $u = 0.606137 + 0.416811I$<br>$a = -0.101897 - 1.053150I$<br>$b = 1.314670 - 0.337317I$ | $2.36646 - 1.94252I$ | $-10.80294 + 5.02822I$ |
| $u = 0.606137 - 0.416811I$<br>$a = -0.101897 + 1.053150I$<br>$b = 1.314670 + 0.337317I$ | $2.36646 + 1.94252I$ | $-10.80294 - 5.02822I$ |
| $u = 1.116120 + 0.614225I$<br>$a = 0.611664 + 0.699390I$<br>$b = -1.89280 + 0.05423I$ | $14.8430 - 3.5814I$ | $-10.19251 + 1.82347I$ |
| $u = 1.116120 - 0.614225I$<br>$a = 0.611664 - 0.699390I$<br>$b = -1.89280 - 0.05423I$ | $14.8430 + 3.5814I$ | $-10.19251 - 1.82347I$ |
| $u = 0.396990 + 1.275890I$<br>$a = 0.477782 + 0.520657I$<br>$b = -0.666680 - 0.056910I$ | $-2.63737 - 4.50416I$ | $-7.28522 + 5.75195I$ |
| $u = 0.396990 - 1.275890I$<br>$a = 0.477782 - 0.520657I$<br>$b = -0.666680 + 0.056910I$ | $-2.63737 + 4.50416I$ | $-7.28522 - 5.75195I$ |
| $u = 0.22659 + 1.45890I$<br>$a = -2.00625 - 0.57060I$<br>$b = 1.74247 - 0.66474I$ | $8.40238 - 5.00923I$ | $-8.98141 + 6.39703I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
| --- | --- | --- |
| $u = 0.22659 - 1.45890I$<br>$a = -2.00625 + 0.57060I$<br>$b = 1.74247 + 0.66474I$ | $8.40238 + 5.00923I$ | $-8.98141 - 6.39703I$ |
| $u = 0.43989 + 1.60061I$<br>$a = 1.72225 + 0.99994I$<br>$b = -1.94337 + 0.15344I$ | $-17.6523 - 9.3227I$ | $-8.42289 + 3.11986I$ |
| $u = 0.43989 - 1.60061I$<br>$a = 1.72225 - 0.99994I$<br>$b = -1.94337 - 0.15344I$ | $-17.6523 + 9.3227I$ | $-8.42289 - 3.11986I$ |
| $u = -0.314654$<br>$a = 0.620672$<br>$b = -0.148554$ | $-0.498688$ | $-19.8820$ |

**II.**

$$\boldsymbol{I_2^u = \langle u^{11}+5u^9+\cdots+b-2u,\ -u^{11}+u^{10}+\cdots+a-2,\ u^{12}+6u^{10}+\cdots+2u+1\rangle}$$

**(i) Arc colorings**

$$a_6 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} u \\ u^3+u \end{pmatrix}$$

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

$$a_1 = \begin{pmatrix} -u^4-u^2+1 \\ u^4+2u^2 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} u^{11}-u^{10}+5u^9-5u^8+9u^7-9u^6+5u^5-4u^4-3u^3+4u^2-4u+2 \\ -u^{11}-5u^9-9u^7-5u^5-u^4+2u^3-2u^2+2u \end{pmatrix}$$

$$a_4 = \begin{pmatrix} u^{10}-u^9+5u^8-5u^7+8u^6-8u^5+3u^4-u^3-4u^2+6u-3 \\ -u^{10}-5u^8-8u^6-3u^4-u^3+2u^2-2u \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -u^{11}-u^{10}-7u^9-4u^8-17u^7-4u^6-15u^5+u^4+u^3-2u^2+6u-5 \\ u^9+4u^7+5u^5+u^3+u^2-u+1 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} -u^9-5u^7-8u^5-2u^3-2u^2+4u-3 \\ -u^{10}-5u^8-8u^6-3u^4-u^3+2u^2-2u \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -u^5-2u^3-u \\ -u^7-3u^5-2u^3+u \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 2u^{11}-u^{10}+\cdots-4u+3 \\ -u^{11}-5u^9-8u^7-2u^5-u^4+4u^3-2u^2+u \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 2u^{10}+8u^8+2u^7+8u^6+10u^5-4u^4+14u^3-6u^2+5u-6$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{12}-10u^{11}+\cdots-3u+1$ |
| $c_2,c_9$ | $u^{12}+u^{10}-u^9-3u^8-2u^6+2u^5+3u^4+u^3+u^2-u-1$ |
| $c_3,c_7$ | $u^{12}+u^{10}+u^9-3u^8-2u^6-2u^5+3u^4-u^3+u^2+u-1$ |
| $c_4,c_8$ | $u^{12}+u^{11}-u^{10}-u^9-3u^8-2u^7+2u^6+3u^4+u^3-u^2-1$ |
| $c_5$ | $u^{12}+6u^{10}+13u^8+10u^6-u^5-2u^4-3u^3-4u^2-2u+1$ |
| $c_6$ | $u^{12}-2u^{10}+2u^9+5u^8+u^7-8u^6-13u^5+2u^4+6u^3+u^2-4u+1$ |
| $c_{10},c_{11}$ | $u^{12}+6u^{10}+13u^8+10u^6+u^5-2u^4+3u^3-4u^2+2u+1$ |
| $c_{12}$ | $u^{12}-4u^{11}+\cdots+2u+1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{12} - 22y^{11} + \cdots + 13y + 1$ |
| $c_2, c_3, c_7$ $c_9$ | $y^{12} + 2y^{11} + \cdots - 3y + 1$ |
| $c_4, c_8$ | $y^{12} - 3y^{11} + \cdots + 2y + 1$ |
| $c_5, c_{10}, c_{11}$ | $y^{12} + 12y^{11} + \cdots - 12y + 1$ |
| $c_6$ | $y^{12} - 4y^{11} + \cdots - 14y + 1$ |
| $c_{12}$ | $y^{12} - 4y^{11} + \cdots - 32y + 1$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.166667+1.154930I$<br>$a = -1.18491-1.41896I$<br>$b = 1.50605+0.16129I$ | $5.94732-1.25425I$ | $-6.73308-0.07102I$ |
| $u = 0.166667-1.154930I$<br>$a = -1.18491+1.41896I$<br>$b = 1.50605-0.16129I$ | $5.94732+1.25425I$ | $-6.73308+0.07102I$ |
| $u = -0.810172$<br>$a = -0.514676$<br>$b = 0.230352$ | $-7.30066$ | $-23.1150$ |
| $u = 0.607258+0.278363I$<br>$a = 0.486854-1.232570I$<br>$b = 1.81887-0.27158I$ | $3.51234-1.43480I$ | $-5.19843+3.96866I$ |
| $u = 0.607258-0.278363I$<br>$a = 0.486854+1.232570I$<br>$b = 1.81887+0.27158I$ | $3.51234+1.43480I$ | $-5.19843-3.96866I$ |
| $u = -0.361738+1.288800I$<br>$a = -0.494619+0.090187I$<br>$b = 0.269953-0.236589I$ | $-3.28068+4.21532I$ | $-18.1322-1.6804I$ |
| $u = -0.361738-1.288800I$<br>$a = -0.494619-0.090187I$<br>$b = 0.269953+0.236589I$ | $-3.28068-4.21532I$ | $-18.1322+1.6804I$ |
| $u = -0.101870+1.358190I$<br>$a = 1.389980+0.057997I$<br>$b = -0.915023+0.580086I$ | $0.36145+1.41595I$ | $-9.15778-0.19766I$ |
| $u = -0.101870-1.358190I$<br>$a = 1.389980-0.057997I$<br>$b = -0.915023-0.580086I$ | $0.36145-1.41595I$ | $-9.15778+0.19766I$ |
| $u = 0.23985+1.43128I$<br>$a = -2.20239-0.98427I$<br>$b = 2.10135-0.50082I$ | $9.05494-4.57784I$ | $-0.04990+1.52761I$ |

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.23985 - 1.43128I$<br>$a = -2.20239 + 0.98427I$<br>$b = 2.10135 + 0.50082I$ | $9.05494 + 4.57784I$ | $-0.04990 - 1.52761I$ |
| $u = -0.290167$<br>$a = 3.52484$<br>$b = -0.792760$ | $-4.15087$ | $-8.34210$ |

**III. u-Polynomials**

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $(u^{12} - 10u^{11} + \cdots - 3u + 1)(u^{14} - 5u^{13} + \cdots - 2u + 1)$ |
| $c_2, c_9$ | $(u^{12} + u^{10} - u^9 - 3u^8 - 2u^6 + 2u^5 + 3u^4 + u^3 + u^2 - u - 1)$ $\cdot (u^{14} - u^{13} + \cdots - 2u - 1)$ |
| $c_3, c_7$ | $(u^{12} + u^{10} + u^9 - 3u^8 - 2u^6 - 2u^5 + 3u^4 - u^3 + u^2 + u - 1)$ $\cdot (u^{14} - u^{13} + \cdots - 2u - 1)$ |
| $c_4, c_8$ | $(u^{12} + u^{11} - u^{10} - u^9 - 3u^8 - 2u^7 + 2u^6 + 3u^4 + u^3 - u^2 - 1)$ $\cdot (u^{14} + 2u^{13} + \cdots - 3u - 1)$ |
| $c_5$ | $(u^{12} + 6u^{10} + 13u^8 + 10u^6 - u^5 - 2u^4 - 3u^3 - 4u^2 - 2u + 1)$ $\cdot (u^{14} - 6u^{13} + \cdots + 10u - 4)$ |
| $c_6$ | $(u^{12} - 2u^{10} + 2u^9 + 5u^8 + u^7 - 8u^6 - 13u^5 + 2u^4 + 6u^3 + u^2 - 4u + 1)$ $\cdot (u^{14} + 6u^{13} + \cdots - 462u - 180)$ |
| $c_{10}, c_{11}$ | $(u^{12} + 6u^{10} + 13u^8 + 10u^6 + u^5 - 2u^4 + 3u^3 - 4u^2 + 2u + 1)$ $\cdot (u^{14} - 6u^{13} + \cdots + 10u - 4)$ |
| $c_{12}$ | $(u^{12} - 4u^{11} + \cdots + 2u + 1)(u^{14} - 4u^{13} + \cdots + 1960u + 1216)$ |

## IV. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $(y^{12} - 22y^{11} + \cdots + 13y + 1)(y^{14} - 29y^{13} + \cdots - 38y + 1)$ |
| $c_2, c_3, c_7$ $c_9$ | $(y^{12} + 2y^{11} + \cdots - 3y + 1)(y^{14} + 39y^{13} + \cdots + 14y + 1)$ |
| $c_4, c_8$ | $(y^{12} - 3y^{11} + \cdots + 2y + 1)(y^{14} + 30y^{13} + \cdots - 33y + 1)$ |
| $c_5, c_{10}, c_{11}$ | $(y^{12} + 12y^{11} + \cdots - 12y + 1)(y^{14} + 12y^{13} + \cdots - 156y + 16)$ |
| $c_6$ | $(y^{12} - 4y^{11} + \cdots - 14y + 1)(y^{14} - 4y^{13} + \cdots - 178524y + 32400)$ |
| $c_{12}$ | $(y^{12} - 4y^{11} + \cdots - 32y + 1)$ $\cdot (y^{14} + 76y^{13} + \cdots - 36622528y + 1478656)$ |