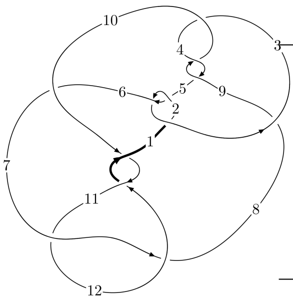
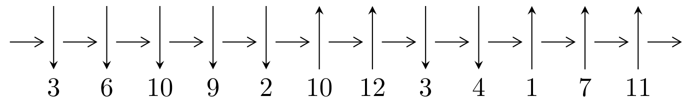
# $12n_{0342}$ ($K12n_{0342}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$I_1^u = \langle -2.22257 \times 10^{23} u^{34} + 1.20633 \times 10^{24} u^{33} + \cdots + 9.94460 \times 10^{24} b + 2.05358 \times 10^{25},$$
$$5.94554 \times 10^{24} u^{34} - 9.98345 \times 10^{24} u^{33} + \cdots + 3.97784 \times 10^{25} a - 1.87822 \times 10^{26},\ u^{35} - u^{34} + \cdots + 16u + 8$$
$$I_2^u = \langle b + 1,\ 4a^3 + 2a^2 u - 4a - u,\ u^2 + 2 \rangle$$

$$I_1^v = \langle a,\ b - 1,\ v^3 - v^2 + 2v - 1 \rangle$$

* 3 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 44 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.**

$\boldsymbol{I_1^u = \langle -2.22\times10^{23}u^{34}+1.21\times10^{24}u^{33}+\cdots+9.94\times10^{24}b+2.05\times10^{25},\ 5.95\times10^{24}u^{34}-9.98\times10^{24}u^{33}+\cdots+3.98\times10^{25}a-1.88\times10^{26},\ u^{35}-u^{34}+\cdots+16u+8\rangle}$

**(i) Arc colorings**

$$a_3 = \begin{pmatrix}1\\0\end{pmatrix}$$
$$a_{10} = \begin{pmatrix}0\\u\end{pmatrix}$$
$$a_4 = \begin{pmatrix}1\\u^2\end{pmatrix}$$
$$a_6 = \begin{pmatrix}-0.149467u^{34}+0.250977u^{33}+\cdots+0.744011u+4.72171\\0.0223495u^{34}-0.121305u^{33}+\cdots-3.13828u-2.06502\end{pmatrix}$$
$$a_7 = \begin{pmatrix}-0.149467u^{34}+0.250977u^{33}+\cdots+0.744011u+4.72171\\-0.0135884u^{34}-0.0414490u^{33}+\cdots-2.70986u-1.25294\end{pmatrix}$$
$$a_2 = \begin{pmatrix}-0.135878u^{34}+0.292426u^{33}+\cdots+3.45387u+5.97465\\0.0244551u^{34}-0.00480744u^{33}+\cdots+1.29212u+0.000559791\end{pmatrix}$$
$$a_1 = \begin{pmatrix}-0.111423u^{34}+0.287618u^{33}+\cdots+4.74599u+5.97521\\0.0244551u^{34}-0.00480744u^{33}+\cdots+1.29212u+0.000559791\end{pmatrix}$$
$$a_{11} = \begin{pmatrix}0.182308u^{34}-0.0553187u^{33}+\cdots+19.9927u+4.90487\\-0.169723u^{34}+0.180211u^{33}+\cdots-4.99372u-0.555765\end{pmatrix}$$
$$a_5 = \begin{pmatrix}u^2+1\\u^4+2u^2\end{pmatrix}$$
$$a_9 = \begin{pmatrix}u\\u^3+u\end{pmatrix}$$
$$a_{12} = \begin{pmatrix}0.146821u^{34}-0.205755u^{33}+\cdots+3.25395u-3.12378\\-0.115099u^{34}+0.0771834u^{33}+\cdots-4.79628u-1.53754\end{pmatrix}$$
$$a_8 = \begin{pmatrix}-u^3-2u\\-u^3-u\end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -\frac{1474460357408080056497195 9}{1988920933697617777668262 0}u^{34}+\frac{1914037674182455656702351 1}{1988920933697617777668262 0}u^{33}+\cdots-\frac{1314354795937529029017253 0}{994460466848808888834131}u+\frac{1519825404502265762057644}{4972302334244044444170655}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $u^{35} + 8u^{34} + \cdots - 52u + 1$ |
| $c_2, c_5$ | $u^{35} + 4u^{34} + \cdots - 4u + 1$ |
| $c_3, c_4, c_9$ | $u^{35} - u^{34} + \cdots + 16u + 8$ |
| $c_6$ | $u^{35} - 2u^{34} + \cdots + 21u + 3$ |
| $c_7, c_{11}$ | $u^{35} + 2u^{34} + \cdots + 9u + 3$ |
| $c_8$ | $u^{35} + u^{34} + \cdots + 480u + 200$ |
| $c_{10}, c_{12}$ | $u^{35} - 14u^{34} + \cdots + 129u - 9$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $y^{35} + 48y^{34} + \cdots + 1020y - 1$ |
| $c_2, c_5$ | $y^{35} - 8y^{34} + \cdots - 52y - 1$ |
| $c_3, c_4, c_9$ | $y^{35} + 49y^{34} + \cdots - 768y - 64$ |
| $c_6$ | $y^{35} - 54y^{34} + \cdots - 15y - 9$ |
| $c_7, c_{11}$ | $y^{35} - 14y^{34} + \cdots + 129y - 9$ |
| $c_8$ | $y^{35} + 133y^{34} + \cdots - 12598400y - 40000$ |
| $c_{10}, c_{12}$ | $y^{35} + 18y^{34} + \cdots + 2313y - 81$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.001709 + 0.955912I$<br>$a = 0.185156 - 0.791460I$<br>$b = -0.661252 + 0.559258I$ | $1.60959 + 1.37990I$ | $-0.61653 - 3.70044I$ |
| $u = 0.001709 - 0.955912I$<br>$a = 0.185156 + 0.791460I$<br>$b = -0.661252 - 0.559258I$ | $1.60959 - 1.37990I$ | $-0.61653 + 3.70044I$ |
| $u = -0.457643 + 0.944024I$<br>$a = -0.498093 - 1.222730I$<br>$b = -0.873919 + 0.740811I$ | $1.28798 + 3.57056I$ | $-1.83989 - 3.72840I$ |
| $u = -0.457643 - 0.944024I$<br>$a = -0.498093 + 1.222730I$<br>$b = -0.873919 - 0.740811I$ | $1.28798 - 3.57056I$ | $-1.83989 + 3.72840I$ |
| $u = 0.578123 + 1.001790I$<br>$a = -0.641074 + 1.123880I$<br>$b = -0.937353 - 0.867983I$ | $2.89503 - 8.89111I$ | $0.41854 + 7.86310I$ |
| $u = 0.578123 - 1.001790I$<br>$a = -0.641074 - 1.123880I$<br>$b = -0.937353 + 0.867983I$ | $2.89503 + 8.89111I$ | $0.41854 - 7.86310I$ |
| $u = -0.280567 + 1.198240I$<br>$a = 0.212983 + 0.307706I$<br>$b = -0.848880 - 0.653452I$ | $2.89532 + 2.93605I$ | $1.67114 - 3.26620I$ |
| $u = -0.280567 - 1.198240I$<br>$a = 0.212983 - 0.307706I$<br>$b = -0.848880 + 0.653452I$ | $2.89532 - 2.93605I$ | $1.67114 + 3.26620I$ |
| $u = 0.746902 + 0.064874I$<br>$a = 0.763197 + 0.046917I$<br>$b = 0.618050 + 0.742602I$ | $-0.31975 - 4.37952I$ | $-1.83091 + 6.07452I$ |
| $u = 0.746902 - 0.064874I$<br>$a = 0.763197 - 0.046917I$<br>$b = 0.618050 - 0.742602I$ | $-0.31975 + 4.37952I$ | $-1.83091 - 6.07452I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.353706 + 1.218390I$<br>$a = -0.474249 + 0.899612I$<br>$b = -0.572481 - 0.845888I$ | $6.57185 - 2.11496I$ | $5.70868 + 2.44246I$ |
| $u = 0.353706 - 1.218390I$<br>$a = -0.474249 - 0.899612I$<br>$b = -0.572481 + 0.845888I$ | $6.57185 + 2.11496I$ | $5.70868 - 2.44246I$ |
| $u = 0.398585 + 0.473638I$<br>$a = 0.800117 - 0.238876I$<br>$b = -0.139739 + 0.561536I$ | $1.46027 + 0.77126I$ | $3.61366 - 0.98435I$ |
| $u = 0.398585 - 0.473638I$<br>$a = 0.800117 + 0.238876I$<br>$b = -0.139739 - 0.561536I$ | $1.46027 - 0.77126I$ | $3.61366 + 0.98435I$ |
| $u = -0.090108 + 0.598555I$<br>$a = 1.184960 + 0.064358I$<br>$b = 1.219850 + 0.040491I$ | $-3.56638 - 2.55876I$ | $-1.13575 + 2.02591I$ |
| $u = -0.090108 - 0.598555I$<br>$a = 1.184960 - 0.064358I$<br>$b = 1.219850 - 0.040491I$ | $-3.56638 + 2.55876I$ | $-1.13575 - 2.02591I$ |
| $u = 0.031695 + 1.407050I$<br>$a = -0.911900 + 0.239123I$<br>$b = -0.046000 - 0.170713I$ | $1.93564 + 2.80926I$ | $0$ |
| $u = 0.031695 - 1.407050I$<br>$a = -0.911900 - 0.239123I$<br>$b = -0.046000 + 0.170713I$ | $1.93564 - 2.80926I$ | $0$ |
| $u = -0.576386 + 0.100273I$<br>$a = 0.859064 + 0.075571I$<br>$b = 0.794836 + 0.430575I$ | $-1.361170 + 0.009026I$ | $-6.02384 - 1.12650I$ |
| $u = -0.576386 - 0.100273I$<br>$a = 0.859064 - 0.075571I$<br>$b = 0.794836 - 0.430575I$ | $-1.361170 - 0.009026I$ | $-6.02384 + 1.12650I$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.07940 + 1.54042I$<br>$a = \ 0.1203980 + 0.0430251I$<br>$b = -1.303940 - 0.164109I$ | $3.74701 - 1.80891I$ | $0$ |
| $u = -0.07940 - 1.54042I$<br>$a = \ 0.1203980 - 0.0430251I$<br>$b = -1.303940 + 0.164109I$ | $3.74701 + 1.80891I$ | $0$ |
| $u = -0.020066 + 0.420369I$<br>$a = \ 3.70274 - 0.63177I$<br>$b = -0.763223 + 0.037247I$ | $-4.12675 + 2.92147I$ | $3.70844 - 4.07635I$ |
| $u = -0.020066 - 0.420369I$<br>$a = \ 3.70274 + 0.63177I$<br>$b = -0.763223 - 0.037247I$ | $-4.12675 - 2.92147I$ | $3.70844 + 4.07635I$ |
| $u = -0.361397$<br>$a = \ 0.932708$<br>$b = \ 0.810295$ | $-1.03588$ | $-12.2760$ |
| $u = -0.14043 + 1.72815I$<br>$a = -0.16477 + 1.41522I$<br>$b = \ 1.14266 - 0.93268I$ | $10.72680 + 6.05251I$ | $0$ |
| $u = -0.14043 - 1.72815I$<br>$a = -0.16477 - 1.41522I$<br>$b = \ 1.14266 + 0.93268I$ | $10.72680 - 6.05251I$ | $0$ |
| $u = \ 0.18174 + 1.73920I$<br>$a = -0.077993 - 1.391040I$<br>$b = \ 1.23438 + 0.93163I$ | $12.4359 - 12.0719I$ | $0$ |
| $u = \ 0.18174 - 1.73920I$<br>$a = -0.077993 + 1.391040I$<br>$b = \ 1.23438 - 0.93163I$ | $12.4359 + 12.0719I$ | $0$ |
| $u = -0.00142 + 1.75473I$<br>$a = -0.393349 + 1.254280I$<br>$b = \ 0.860192 - 1.095830I$ | $11.66250 + 1.36680I$ | $0$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.00142 - 1.75473I$<br>$a = -0.393349 - 1.254280I$<br>$b = 0.860192 + 1.095830I$ | $11.66250 - 1.36680I$ | 0 |
| $u = -0.05090 + 1.79450I$<br>$a = -0.401616 - 1.156030I$<br>$b = 0.78741 + 1.23198I$ | $13.9358 + 4.2732I$ | 0 |
| $u = -0.05090 - 1.79450I$<br>$a = -0.401616 + 1.156030I$<br>$b = 0.78741 - 1.23198I$ | $13.9358 - 4.2732I$ | 0 |
| $u = 0.08516 + 1.80955I$<br>$a = -0.231921 - 1.248780I$<br>$b = 1.08426 + 1.14113I$ | $17.6851 - 4.1242I$ | 0 |
| $u = 0.08516 - 1.80955I$<br>$a = -0.231921 + 1.248780I$<br>$b = 1.08426 - 1.14113I$ | $17.6851 + 4.1242I$ | 0 |

**II.** $\boldsymbol{I_2^u = \langle b+1,\ 4a^3+2a^2u-4a-u,\ u^2+2\rangle}$

**(i) Arc colorings**

$$a_3 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_4 = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} a \\ -1 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} a \\ 2a-1 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} a+1 \\ -1 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} a \\ -1 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} a^2u \\ -au+u \end{pmatrix}$$
$$a_5 = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} u \\ -u \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} a^2u-a-\frac{1}{2}u \\ 2a^2-2a-1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} 0 \\ -u \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= -8a^2-4au+4$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_5$ | $(u-1)^6$ |
| $c_2$ | $(u+1)^6$ |
| $c_3, c_4, c_8$<br>$c_9$ | $(u^2+2)^3$ |
| $c_6, c_{12}$ | $(u^3-u^2+2u-1)^2$ |
| $c_7$ | $(u^3+u^2-1)^2$ |
| $c_{10}$ | $(u^3+u^2+2u+1)^2$ |
| $c_{11}$ | $(u^3-u^2+1)^2$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_2, c_5$ | $(y-1)^6$ |
| $c_3, c_4, c_8$ $c_9$ | $(y+2)^6$ |
| $c_6, c_{10}, c_{12}$ | $(y^3+3y^2+2y-1)^2$ |
| $c_7, c_{11}$ | $(y^3-y^2+2y-1)^2$ |

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 1.414210I$<br>$a = 0.924288 - 0.152084I$<br>$b = -1.00000$ | $0.26574 + 2.82812I$ | $-3.50976 - 2.97945I$ |
| $u = 1.414210I$<br>$a = -0.924288 - 0.152084I$<br>$b = -1.00000$ | $0.26574 - 2.82812I$ | $-3.50976 + 2.97945I$ |
| $u = 1.414210I$<br>$a = -0.402938I$<br>$b = -1.00000$ | $4.40332$ | $3.01950$ |
| $u = -1.414210I$<br>$a = 0.924288 + 0.152084I$<br>$b = -1.00000$ | $0.26574 - 2.82812I$ | $-3.50976 + 2.97945I$ |
| $u = -1.414210I$<br>$a = -0.924288 + 0.152084I$<br>$b = -1.00000$ | $0.26574 + 2.82812I$ | $-3.50976 - 2.97945I$ |
| $u = -1.414210I$<br>$a = 0.402938I$<br>$b = -1.00000$ | $4.40332$ | $3.01950$ |

**III. $I_1^v = \langle a,\ b-1,\ v^3 - v^2 + 2v - 1\rangle$**

**(i) Arc colorings**

$$a_3 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} v \\ 0 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} v^2 \\ 1 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} v \\ -v \end{pmatrix}$$
$$a_5 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} v \\ 0 \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} v^2 \\ -v^2 - 1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} v \\ 0 \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= 10v^2 - 6v + 6$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_2$ | $(u-1)^3$ |
| $c_3, c_4, c_8$<br>$c_9$ | $u^3$ |
| $c_5$ | $(u+1)^3$ |
| $c_6, c_{10}$ | $u^3+u^2+2u+1$ |
| $c_7$ | $u^3-u^2+1$ |
| $c_{11}$ | $u^3+u^2-1$ |
| $c_{12}$ | $u^3-u^2+2u-1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_2, c_5$ | $(y-1)^3$ |
| $c_3, c_4, c_8$<br>$c_9$ | $y^3$ |
| $c_6, c_{10}, c_{12}$ | $y^3 + 3y^2 + 2y - 1$ |
| $c_7, c_{11}$ | $y^3 - y^2 + 2y - 1$ |

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

| Solutions to $I_1^v$ | | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|---|
| $v=$ | $0.215080+1.307140I$ | | |
| $a=$ | $0$ | $-4.66906+2.82812I$ | $-11.91407-2.22005I$ |
| $b=$ | $1.00000$ | | |
| $v=$ | $0.215080-1.307140I$ | | |
| $a=$ | $0$ | $-4.66906-2.82812I$ | $-11.91407+2.22005I$ |
| $b=$ | $1.00000$ | | |
| $v=$ | $0.569840$ | | |
| $a=$ | $0$ | $-0.531480$ | $5.82810$ |
| $b=$ | $1.00000$ | | |

## IV. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1$ | $((u-1)^9)(u^{35}+8u^{34}+\cdots-52u+1)$ |
| $c_2$ | $((u-1)^3)(u+1)^6(u^{35}+4u^{34}+\cdots-4u+1)$ |
| $c_3, c_4, c_9$ | $u^3(u^2+2)^3(u^{35}-u^{34}+\cdots+16u+8)$ |
| $c_5$ | $((u-1)^6)(u+1)^3(u^{35}+4u^{34}+\cdots-4u+1)$ |
| $c_6$ | $((u^3-u^2+2u-1)^2)(u^3+u^2+2u+1)(u^{35}-2u^{34}+\cdots+21u+3)$ |
| $c_7$ | $(u^3-u^2+1)(u^3+u^2-1)^2(u^{35}+2u^{34}+\cdots+9u+3)$ |
| $c_8$ | $u^3(u^2+2)^3(u^{35}+u^{34}+\cdots+480u+200)$ |
| $c_{10}$ | $((u^3+u^2+2u+1)^3)(u^{35}-14u^{34}+\cdots+129u-9)$ |
| $c_{11}$ | $((u^3-u^2+1)^2)(u^3+u^2-1)(u^{35}+2u^{34}+\cdots+9u+3)$ |
| $c_{12}$ | $((u^3-u^2+2u-1)^3)(u^{35}-14u^{34}+\cdots+129u-9)$ |

## V. Riley Polynomials

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1$ | $((y-1)^9)(y^{35}+48y^{34}+\cdots+1020y-1)$ |
| $c_2, c_5$ | $((y-1)^9)(y^{35}-8y^{34}+\cdots-52y-1)$ |
| $c_3, c_4, c_9$ | $y^3(y+2)^6(y^{35}+49y^{34}+\cdots-768y-64)$ |
| $c_6$ | $((y^3+3y^2+2y-1)^3)(y^{35}-54y^{34}+\cdots-15y-9)$ |
| $c_7, c_{11}$ | $((y^3-y^2+2y-1)^3)(y^{35}-14y^{34}+\cdots+129y-9)$ |
| $c_8$ | $y^3(y+2)^6(y^{35}+133y^{34}+\cdots-1.25984\times 10^7 y-40000)$ |
| $c_{10}, c_{12}$ | $((y^3+3y^2+2y-1)^3)(y^{35}+18y^{34}+\cdots+2313y-81)$ |