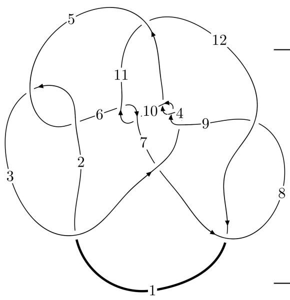
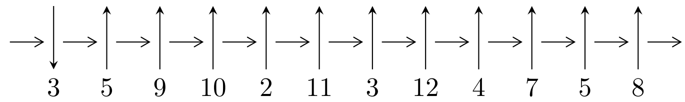
$12n_{0402}$ ($K12n_{0402}$)



A knot diagram[1]

Linearized knot diagam



Solving Sequence

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

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

$$\begin{aligned}
I_1^u = \langle & -u^9 + 2u^8 + 3u^7 - 4u^6 - 6u^5 - 2u^4 + 9u^3 + 4u^2 + b - 1, \\
& u^9 - u^8 - 3u^7 - u^6 + 5u^5 + 9u^4 - 4u^3 - 6u^2 + 2a - 5u + 1, \\
& u^{10} - 3u^9 - u^8 + 7u^7 + 3u^6 - 5u^5 - 14u^4 + 6u^3 + 7u^2 + 3u - 2\rangle \\
I_2^u = \langle & -u^5 + 3u^3 + b - u + 1,\ u^6 - 4u^4 + 4u^2 + a,\ u^8 - 5u^6 + 7u^4 - 2u^2 + 1\rangle \\
I_3^u = \langle & b + 1,\ a^2 + a + 2,\ u + 1\rangle
\end{aligned}$$

* 3 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 20 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.

$$\boldsymbol{I_1^u = \langle -u^9 + 2u^8 + \cdots + b - 1,\ u^9 - u^8 + \cdots + 2a + 1,\ u^{10} - 3u^9 + \cdots + 3u - 2\rangle}$$

(i) Arc colorings

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

$$a_9 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 1 \\ -u^2 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} u \\ -u^3 + u \end{pmatrix}$$

$$a_5 = \begin{pmatrix} -u^2 + 1 \\ u^4 - 2u^2 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} -u^6 + 3u^4 - 2u^2 + 1 \\ u^8 - 4u^6 + 4u^4 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} u^8 - 5u^6 + 7u^4 - 2u^2 + 1 \\ u^8 - 4u^6 + 4u^4 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} -\frac{1}{2}u^9 + \frac{1}{2}u^8 + \cdots + \frac{5}{2}u - \frac{1}{2} \\ u^9 - 2u^8 - 3u^7 + 4u^6 + 6u^5 + 2u^4 - 9u^3 - 4u^2 + 1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} \frac{1}{2}u^9 - \frac{1}{2}u^8 + \cdots - \frac{1}{2}u + \frac{1}{2} \\ u^9 - u^8 - 4u^7 + u^6 + 7u^5 + 4u^4 - 6u^3 - 4u^2 + 1 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -\frac{1}{2}u^9 + \frac{1}{2}u^8 + \cdots - \frac{1}{2}u - \frac{1}{2} \\ u^9 - u^8 - 4u^7 + u^6 + 7u^5 + 4u^4 - 6u^3 - 4u^2 + 1 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} \frac{3}{2}u^9 - \frac{5}{2}u^8 + \cdots - \frac{3}{2}u + \frac{5}{2} \\ -u^9 + 3u^8 + 3u^7 - 8u^6 - 6u^5 + 2u^4 + 8u^3 + 4u^2 + u - 1 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 3u^9 - 4u^8 - 7u^7 + 5u^6 + 5u^5 + 9u^4 - 6u^3 - 4u^2 - 3u + 1 \\ -8u^9 + 8u^8 + 32u^7 - 9u^6 - 56u^5 - 32u^4 + 48u^3 + 37u^2 + 6u - 8 \end{pmatrix}$$

(ii) Obstruction class $= -1$

(iii) Cusp Shapes $= -4u^9 + 6u^8 + 12u^7 - 6u^6 - 22u^5 - 22u^4 + 22u^3 + 20u^2 + 18u + 10$

(iv) u-Polynomials at the component

Crossings	u-Polynomials at each crossing
c_1	$u^{10}+49u^9+\cdots-2401u+64$
c_2, c_5	$u^{10}+u^9+\cdots-9u-8$
c_3, c_4, c_9	$u^{10}-3u^9-u^8+7u^7+3u^6-5u^5-14u^4+6u^3+7u^2+3u-2$
c_6, c_8, c_{10} c_{12}	$u^{10}+13u^8+2u^7+48u^6+30u^5+20u^4+14u^3-u^2+2u-1$
c_7, c_{11}	$u^{10}-2u^9+\cdots-54u-29$

(v) Riley Polynomials at the component

Crossings	Riley Polynomials at each crossing
c_1	$y^{10} - 535y^9 + \cdots - 3422273y + 4096$
c_2, c_5	$y^{10} + 49y^9 + \cdots - 2401y + 64$
c_3, c_4, c_9	$y^{10} - 11y^9 + \cdots - 37y + 4$
c_6, c_8, c_{10} c_{12}	$y^{10} + 26y^9 + \cdots - 2y + 1$
c_7, c_{11}	$y^{10} + 110y^9 + \cdots - 23448y + 841$

(vi) Complex Volumes and Cusp Shapes

Solutions to I_1^u	$\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$	Cusp shape
$u = -0.632414 + 0.947419I$ $a = 2.18175 - 1.13028I$ $b = 2.28217 - 0.07300I$	$15.8724 - 3.1297I$	$7.30319 + 2.05885I$
$u = -0.632414 - 0.947419I$ $a = 2.18175 + 1.13028I$ $b = 2.28217 + 0.07300I$	$15.8724 + 3.1297I$	$7.30319 - 2.05885I$
$u = -0.481550 + 0.474579I$ $a = -0.609360 + 0.497018I$ $b = -0.743164 - 0.230554I$	$-1.67643 - 1.67312I$	$8.34167 + 5.35276I$
$u = -0.481550 - 0.474579I$ $a = -0.609360 - 0.497018I$ $b = -0.743164 + 0.230554I$	$-1.67643 + 1.67312I$	$8.34167 - 5.35276I$
$u = -1.44882$ $a = 0.519822$ $b = 0.723841$	6.49727	15.2060
$u = 1.53180 + 0.11762I$ $a = -0.119445 - 0.373636I$ $b = -0.797864 + 0.675313I$	$5.05958 + 3.70571I$	$13.2497 - 5.2095I$
$u = 1.53180 - 0.11762I$ $a = -0.119445 + 0.373636I$ $b = -0.797864 - 0.675313I$	$5.05958 - 3.70571I$	$13.2497 + 5.2095I$
$u = 0.358246$ $a = 0.785999$ $b = 0.146927$	0.511729	19.5320
$u = 1.62745 + 0.32233I$ $a = 0.64414 + 1.30973I$ $b = 2.32347 + 0.23227I$	$-16.1803 + 7.8809I$	$9.73645 - 2.75764I$
$u = 1.62745 - 0.32233I$ $a = 0.64414 - 1.30973I$ $b = 2.32347 - 0.23227I$	$-16.1803 - 7.8809I$	$9.73645 + 2.75764I$

II. $\boldsymbol{I_2^u = \langle -u^5+3u^3+b-u+1,\ u^6-4u^4+4u^2+a,\ u^8-5u^6+7u^4-2u^2+1\rangle}$

(i) Arc colorings

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

(ii) Obstruction class $= 1$

(iii) Cusp Shapes $= -4u^6+16u^4-16u^2+8$

(iv) u-Polynomials at the component

Crossings	u-Polynomials at each crossing
c_1	$(u^4 - u^3 + 3u^2 - 2u + 1)^2$
c_2	$(u^4 - u^3 + u^2 + 1)^2$
c_3, c_4, c_9	$u^8 - 5u^6 + 7u^4 - 2u^2 + 1$
c_5	$(u^4 + u^3 + u^2 + 1)^2$
c_6, c_8, c_{10} c_{12}	$(u^2 + 1)^4$
c_7	$u^8 - 2u^7 - 10u^5 + 5u^4 + 14u^3 + 19u^2 + 48u + 29$
c_{11}	$u^8 + 2u^7 + 10u^5 + 5u^4 - 14u^3 + 19u^2 - 48u + 29$

(v) Riley Polynomials at the component

Crossings	Riley Polynomials at each crossing
c_1	$(y^4 + 5y^3 + 7y^2 + 2y + 1)^2$
c_2, c_5	$(y^4 + y^3 + 3y^2 + 2y + 1)^2$
c_3, c_4, c_9	$(y^4 - 5y^3 + 7y^2 - 2y + 1)^2$
c_6, c_8, c_{10} c_{12}	$(y + 1)^8$
c_7, c_{11}	$y^8 - 4y^7 - 30y^6 - 6y^5 + 555y^4 + 954y^3 - 693y^2 - 1202y + 841$

(vi) Complex Volumes and Cusp Shapes

Solutions to I_2^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = 0.506844 + 0.395123I$ $a = -0.95668 - 1.22719I$ $b = -0.279658 - 0.351808I$	$-3.50087 + 1.41510I$	$4.17326 - 4.90874I$
$u = 0.506844 - 0.395123I$ $a = -0.95668 + 1.22719I$ $b = -0.279658 + 0.351808I$	$-3.50087 - 1.41510I$	$4.17326 + 4.90874I$
$u = -0.506844 + 0.395123I$ $a = -0.95668 + 1.22719I$ $b = -1.72034 - 0.35181I$	$-3.50087 - 1.41510I$	$4.17326 + 4.90874I$
$u = -0.506844 - 0.395123I$ $a = -0.95668 - 1.22719I$ $b = -1.72034 + 0.35181I$	$-3.50087 + 1.41510I$	$4.17326 - 4.90874I$
$u = 1.55249 + 0.10488I$ $a = -0.043315 - 0.641200I$ $b = -1.91129 + 0.85181I$	$3.50087 + 3.16396I$	$7.82674 - 2.56480I$
$u = 1.55249 - 0.10488I$ $a = -0.043315 + 0.641200I$ $b = -1.91129 - 0.85181I$	$3.50087 - 3.16396I$	$7.82674 + 2.56480I$
$u = -1.55249 + 0.10488I$ $a = -0.043315 + 0.641200I$ $b = -0.088708 + 0.851808I$	$3.50087 - 3.16396I$	$7.82674 + 2.56480I$
$u = -1.55249 - 0.10488I$ $a = -0.043315 - 0.641200I$ $b = -0.088708 - 0.851808I$	$3.50087 + 3.16396I$	$7.82674 - 2.56480I$

III. $I_3^u = \langle b+1,\ a^2+a+2,\ u+1 \rangle$

(i) Arc colorings

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

$$a_9 = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

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

$$a_5 = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} a \\ -1 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -a-2 \\ -a-1 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -1 \\ -a-1 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} a \\ a-1 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

(ii) Obstruction class $= -1$

(iii) Cusp Shapes $= 10$

(iv) u-Polynomials at the component

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

(v) Riley Polynomials at the component

Crossings	Riley Polynomials at each crossing
c_1, c_2, c_3 c_4, c_5, c_9	$(y-1)^2$
c_6, c_7, c_8 c_{10}, c_{11}, c_{12}	y^2+3y+4

(vi) Complex Volumes and Cusp Shapes

Solutions to I_3^u	$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.00000$ $a = -0.50000 + 1.32288I$ $b = -1.00000$	-1.64493	10.0000
$u = -1.00000$ $a = -0.50000 - 1.32288I$ $b = -1.00000$	-1.64493	10.0000

IV. u-Polynomials

Crossings	u-Polynomials at each crossing
c_1	$((u-1)^2)(u^4-u^3+3u^2-2u+1)^2(u^{10}+49u^9+\cdots-2401u+64)$
c_2	$((u-1)^2)(u^4-u^3+u^2+1)^2(u^{10}+u^9+\cdots-9u-8)$
c_3, c_4, c_9	$(u+1)^2(u^8-5u^6+7u^4-2u^2+1)$ $\cdot(u^{10}-3u^9-u^8+7u^7+3u^6-5u^5-14u^4+6u^3+7u^2+3u-2)$
c_5	$((u-1)^2)(u^4+u^3+u^2+1)^2(u^{10}+u^9+\cdots-9u-8)$
c_6, c_8, c_{10} c_{12}	$(u^2+1)^4(u^2-u+2)$ $\cdot(u^{10}+13u^8+2u^7+48u^6+30u^5+20u^4+14u^3-u^2+2u-1)$
c_7	$(u^2+u+2)(u^8-2u^7-10u^5+5u^4+14u^3+19u^2+48u+29)$ $\cdot(u^{10}-2u^9+\cdots-54u-29)$
c_{11}	$(u^2+u+2)(u^8+2u^7+10u^5+5u^4-14u^3+19u^2-48u+29)$ $\cdot(u^{10}-2u^9+\cdots-54u-29)$

V. Riley Polynomials

Crossings	Riley Polynomials at each crossing
c_1	$(y-1)^2(y^4+5y^3+7y^2+2y+1)^2$ $\cdot(y^{10}-535y^9+\cdots-3422273y+4096)$
c_2, c_5	$((y-1)^2)(y^4+y^3+3y^2+2y+1)^2(y^{10}+49y^9+\cdots-2401y+64)$
c_3, c_4, c_9	$((y-1)^2)(y^4-5y^3+\cdots-2y+1)^2(y^{10}-11y^9+\cdots-37y+4)$
c_6, c_8, c_{10} c_{12}	$((y+1)^8)(y^2+3y+4)(y^{10}+26y^9+\cdots-2y+1)$
c_7, c_{11}	(y^2+3y+4) $\cdot(y^8-4y^7-30y^6-6y^5+555y^4+954y^3-693y^2-1202y+841)$ $\cdot(y^{10}+110y^9+\cdots-23448y+841)$