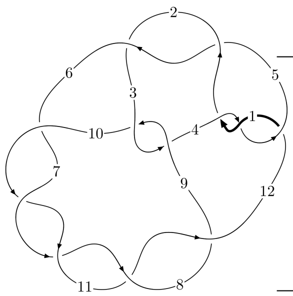
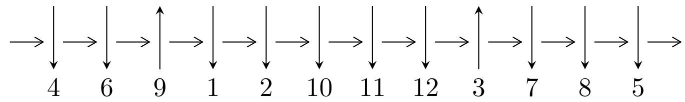
# $12a_{0937}$ ($K12a_{0937}$)




A knot diagram[1]

**Linearized knot diagam**




**Solving Sequence**

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

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

$$I_1^u = \langle u^{44} + 4u^{43} + \cdots + 2b + 1,\ -4u^{44} - 14u^{43} + \cdots + 2a + 11,\ u^{45} + 3u^{44} + \cdots - 4u - 1\rangle$$
$$I_2^u = \langle -u^2a + b - a,\ -u^2a + a^2 + au - a - u,\ u^3 - u^2 + 2u - 1\rangle$$

* 2 irreducible components of $\dim_{\mathbb{C}} = 0$, with total 51 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. $I^u_1 =$
## $\langle u^{44}+4u^{43}+\cdots+2b+1,\ -4u^{44}-14u^{43}+\cdots+2a+11,\ u^{45}+3u^{44}+\cdots-4u-1\rangle$

**(i) Arc colorings**

$$a_5 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_{12} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} u \\ u^3 + u \end{pmatrix}$$
$$a_2 = \begin{pmatrix} u^2 + 1 \\ u^4 + 2u^2 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} -u^5 - 2u^3 - u \\ -u^7 - 3u^5 - 2u^3 + u \end{pmatrix}$$
$$a_9 = \begin{pmatrix} 2u^{44} + 7u^{43} + \cdots - 2u - \frac{11}{2} \\ -\frac{1}{2}u^{44} - 2u^{43} + \cdots + 3u - \frac{1}{2} \end{pmatrix}$$
$$a_3 = \begin{pmatrix} -u^8 - 3u^6 - 3u^4 + 1 \\ -u^{10} - 4u^8 - 5u^6 + 3u^2 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} \frac{3}{2}u^{44} + 5u^{43} + \cdots + u - 6 \\ -\frac{1}{2}u^{44} - 2u^{43} + \cdots + 3u - \frac{1}{2} \end{pmatrix}$$
$$a_{11} = \begin{pmatrix} -\frac{1}{2}u^{44} - u^{43} + \cdots + 7u + 1 \\ -\frac{1}{2}u^{44} - u^{43} + \cdots + 2u + \frac{1}{2} \end{pmatrix}$$
$$a_7 = \begin{pmatrix} -\frac{1}{2}u^{42} - u^{41} + \cdots + 7u - \frac{1}{2} \\ -\frac{1}{2}u^{44} - u^{43} + \cdots + u + \frac{1}{2} \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} -u^{44} - u^{43} + \cdots + 7u - \frac{7}{2} \\ -\frac{3}{2}u^{44} - 5u^{43} + \cdots + 7u + \frac{1}{2} \end{pmatrix}$$

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

**(iii) Cusp Shapes** $= u^{44} + \frac{5}{2}u^{43} + \cdots - \frac{15}{2}u - \frac{21}{2}$

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

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{12}$ | $u^{45} - 3u^{44} + \cdots - 4u + 1$ |
| $c_2, c_5$ | $u^{45} + 3u^{44} + \cdots - 2u + 41$ |
| $c_3, c_9$ | $u^{45} - u^{44} + \cdots - 32u + 64$ |
| $c_6, c_7, c_8$<br>$c_{10}, c_{11}$ | $u^{45} + 4u^{44} + \cdots + u - 1$ |

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

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{12}$ | $y^{45} + 37y^{44} + \cdots + 40y - 1$ |
| $c_2, c_5$ | $y^{45} - 39y^{44} + \cdots + 54616y - 1681$ |
| $c_3, c_9$ | $y^{45} + 35y^{44} + \cdots + 29696y - 4096$ |
| $c_6, c_7, c_8$<br>$c_{10}, c_{11}$ | $y^{45} - 62y^{44} + \cdots + 33y - 1$ |

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

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.890413 + 0.122697I$<br>$a = -1.10889 - 1.11126I$<br>$b = -1.76542 + 0.09202I$ | $18.6493 + 7.3520I$ | $-17.3944 - 3.6030I$ |
| $u = -0.890413 - 0.122697I$<br>$a = -1.10889 + 1.11126I$<br>$b = -1.76542 - 0.09202I$ | $18.6493 - 7.3520I$ | $-17.3944 + 3.6030I$ |
| $u = -0.857781 + 0.085739I$<br>$a = 0.773971 + 0.850892I$<br>$b = 1.146650 - 0.350828I$ | $-10.38620 + 5.44992I$ | $-17.1451 - 4.4258I$ |
| $u = -0.857781 - 0.085739I$<br>$a = 0.773971 - 0.850892I$<br>$b = 1.146650 + 0.350828I$ | $-10.38620 - 5.44992I$ | $-17.1451 + 4.4258I$ |
| $u = 0.851384$<br>$a = 1.98833$<br>$b = 1.74823$ | $-15.7842$ | $-16.5970$ |
| $u = -0.826935 + 0.030025I$<br>$a = -0.276934 - 0.575320I$<br>$b = -0.381901 + 0.636194I$ | $-5.58348 + 2.07140I$ | $-14.3541 - 3.3642I$ |
| $u = -0.826935 - 0.030025I$<br>$a = -0.276934 + 0.575320I$<br>$b = -0.381901 - 0.636194I$ | $-5.58348 - 2.07140I$ | $-14.3541 + 3.3642I$ |
| $u = 0.606365 + 0.531100I$<br>$a = 0.104984 + 1.236330I$<br>$b = -1.74792 - 0.01574I$ | $-14.7030 - 2.1539I$ | $-15.6545 + 3.1266I$ |
| $u = 0.606365 - 0.531100I$<br>$a = 0.104984 - 1.236330I$<br>$b = -1.74792 + 0.01574I$ | $-14.7030 + 2.1539I$ | $-15.6545 - 3.1266I$ |
| $u = 0.778750$<br>$a = -1.54037$<br>$b = -1.06860$ | $-5.57462$ | $-16.4290$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -0.110795 + 1.218650I$<br>$a = -1.31939 + 1.71047I$<br>$b = \ \ 1.61924 - 0.05616I$ | $-5.93702 + 1.70967I$ | $-11.27232 + 1.90310I$ |
| $u = -0.110795 - 1.218650I$<br>$a = -1.31939 - 1.71047I$<br>$b = \ \ 1.61924 + 0.05616I$ | $-5.93702 - 1.70967I$ | $-11.27232 - 1.90310I$ |
| $u = -0.002801 + 1.227720I$<br>$a = \ \ 0.43866 - 1.57194I$<br>$b = -0.738328 + 0.291820I$ | $2.19010 + 0.49707I$ | $-9.03459 - 1.32514I$ |
| $u = -0.002801 - 1.227720I$<br>$a = \ \ 0.43866 + 1.57194I$<br>$b = -0.738328 - 0.291820I$ | $2.19010 - 0.49707I$ | $-9.03459 + 1.32514I$ |
| $u = -0.463428 + 1.150540I$<br>$a = \ \ 0.206323 - 0.367607I$<br>$b = -1.77236 - 0.07475I$ | $-17.6778 - 2.5277I$ | $-14.7181 + 0.I$ |
| $u = -0.463428 - 1.150540I$<br>$a = \ \ 0.206323 + 0.367607I$<br>$b = -1.77236 + 0.07475I$ | $-17.6778 + 2.5277I$ | $-14.7181 + 0.I$ |
| $u = -0.407555 + 1.183180I$<br>$a = -0.449308 - 0.082403I$<br>$b = \ \ 1.184170 + 0.302548I$ | $-7.01503 - 0.90790I$ | $-14.2280 + 0.I$ |
| $u = -0.407555 - 1.183180I$<br>$a = -0.449308 + 0.082403I$<br>$b = \ \ 1.184170 - 0.302548I$ | $-7.01503 + 0.90790I$ | $-14.2280 + 0.I$ |
| $u = -0.370756 + 1.245550I$<br>$a = \ \ 0.615468 + 0.827180I$<br>$b = -0.445891 - 0.613389I$ | $-1.82707 + 2.23489I$ | 0 |
| $u = -0.370756 - 1.245550I$<br>$a = \ \ 0.615468 - 0.827180I$<br>$b = -0.445891 + 0.613389I$ | $-1.82707 - 2.23489I$ | 0 |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.085876 + 1.300140I$<br>$a = 0.31567 + 1.38001I$<br>$b = -0.051237 - 0.435616I$ | $4.23150 - 2.03860I$ | $0$ |
| $u = 0.085876 - 1.300140I$<br>$a = 0.31567 - 1.38001I$<br>$b = -0.051237 + 0.435616I$ | $4.23150 + 2.03860I$ | $0$ |
| $u = 0.334888 + 1.264580I$<br>$a = -0.392426 + 1.134500I$<br>$b = -1.068570 - 0.086970I$ | $-1.65436 - 4.01424I$ | $0$ |
| $u = 0.334888 - 1.264580I$<br>$a = -0.392426 - 1.134500I$<br>$b = -1.068570 + 0.086970I$ | $-1.65436 + 4.01424I$ | $0$ |
| $u = 0.242153 + 1.287270I$<br>$a = 0.318641 - 0.571138I$<br>$b = 0.280859 + 0.154657I$ | $2.59980 - 3.13937I$ | $0$ |
| $u = 0.242153 - 1.287270I$<br>$a = 0.318641 + 0.571138I$<br>$b = 0.280859 - 0.154657I$ | $2.59980 + 3.13937I$ | $0$ |
| $u = 0.503331 + 0.451082I$<br>$a = -0.360474 - 1.020470I$<br>$b = 1.066120 + 0.076462I$ | $-4.50790 - 1.79515I$ | $-15.5943 + 4.2867I$ |
| $u = 0.503331 - 0.451082I$<br>$a = -0.360474 + 1.020470I$<br>$b = 1.066120 - 0.076462I$ | $-4.50790 + 1.79515I$ | $-15.5943 - 4.2867I$ |
| $u = 0.391513 + 1.271870I$<br>$a = 0.32209 - 1.48073I$<br>$b = 1.74641 + 0.02116I$ | $-11.83510 - 4.45927I$ | $0$ |
| $u = 0.391513 - 1.271870I$<br>$a = 0.32209 + 1.48073I$<br>$b = 1.74641 - 0.02116I$ | $-11.83510 + 4.45927I$ | $0$ |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u=-0.371472+1.293170I$<br>$a=-0.36103-1.45695I$<br>$b=-0.326465+0.656457I$ | $-1.45817+6.38100I$ | 0 |
| $u=-0.371472-1.293170I$<br>$a=-0.36103+1.45695I$<br>$b=-0.326465-0.656457I$ | $-1.45817-6.38100I$ | 0 |
| $u=\ \ 0.627430$<br>$a=\ \ 0.675315$<br>$b=\ \ 0.234560$ | $-1.43225$ | $-5.16570$ |
| $u=-0.385838+1.331430I$<br>$a=-0.13299+1.85543I$<br>$b=\ \ 1.112000-0.380680I$ | $-5.94556+9.91745I$ | 0 |
| $u=-0.385838-1.331430I$<br>$a=-0.13299-1.85543I$<br>$b=\ \ 1.112000+0.380680I$ | $-5.94556-9.91745I$ | 0 |
| $u=\ \ 0.145397+1.390720I$<br>$a=-1.28933-1.01084I$<br>$b=\ \ 0.939446+0.150253I$ | $1.30405-3.95914I$ | 0 |
| $u=\ \ 0.145397-1.390720I$<br>$a=-1.28933+1.01084I$<br>$b=\ \ 0.939446-0.150253I$ | $1.30405+3.95914I$ | 0 |
| $u=-0.39751+1.35949I$<br>$a=\ \ 0.53384-2.10202I$<br>$b=-1.75547+0.10280I$ | $-16.1695+11.9726I$ | 0 |
| $u=-0.39751-1.35949I$<br>$a=\ \ 0.53384+2.10202I$<br>$b=-1.75547-0.10280I$ | $-16.1695-11.9726I$ | 0 |
| $u=\ \ 0.15162+1.44483I$<br>$a=\ \ 1.95312+1.07952I$<br>$b=-1.72058-0.03402I$ | $-8.28166-4.65852I$ | 0 |

| Solutions to $I_1^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.15162 - 1.44483I$<br>$a = 1.95312 - 1.07952I$<br>$b = -1.72058 + 0.03402I$ | $-8.28166 + 4.65852I$ | 0 |
| $u = -0.369157$<br>$a = 2.62661$<br>$b = 1.63816$ | $-9.52192$ | $-4.22190$ |
| $u = 0.271798 + 0.224791I$<br>$a = 0.661349 + 1.168710I$<br>$b = -0.244731 - 0.245078I$ | $-0.383394 - 0.784998I$ | $-9.02382 + 8.78053I$ |
| $u = 0.271798 - 0.224791I$<br>$a = 0.661349 - 1.168710I$<br>$b = -0.244731 + 0.245078I$ | $-0.383394 + 0.784998I$ | $-9.02382 - 8.78053I$ |
| $u = -0.183739$<br>$a = -2.85656$<br>$b = -0.704396$ | $-1.23322$ | $-6.78810$ |

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

**(i) Arc colorings**

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

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

**(iii) Cusp Shapes** $= -au - 5u^2 - a + 3u - 20$

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

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

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

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

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

| Solutions to $I_2^u$ | $\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = 0.215080+1.307140I$<br>$a = 0.542287+0.460350I$<br>$b = -0.618034$ | $2.03717-2.82812I$ | $-11.10015-0.15818I$ |
| $u = 0.215080+1.307140I$<br>$a = -1.41973-1.20521I$<br>$b = 1.61803$ | $-5.85852-2.82812I$ | $-10.89327+4.43024I$ |
| $u = 0.215080-1.307140I$<br>$a = 0.542287-0.460350I$<br>$b = -0.618034$ | $2.03717+2.82812I$ | $-11.10015+0.15818I$ |
| $u = 0.215080-1.307140I$<br>$a = -1.41973+1.20521I$<br>$b = 1.61803$ | $-5.85852+2.82812I$ | $-10.89327-4.43024I$ |
| $u = 0.569840$<br>$a = 1.22142$<br>$b = 1.61803$ | $-9.99610$ | $-21.8310$ |
| $u = 0.569840$<br>$a = -0.466540$<br>$b = -0.618034$ | $-2.10041$ | $-19.1820$ |

## III. u-Polynomials

| Crossings | u-Polynomials at each crossing |
|---|---|
| $c_1, c_{12}$ | $((u^3 - u^2 + 2u - 1)^2)(u^{45} - 3u^{44} + \cdots - 4u + 1)$ |
| $c_2$ | $((u^3 + u^2 - 1)^2)(u^{45} + 3u^{44} + \cdots - 2u + 41)$ |
| $c_3, c_9$ | $u^6(u^{45} - u^{44} + \cdots - 32u + 64)$ |
| $c_4$ | $((u^3 + u^2 + 2u + 1)^2)(u^{45} - 3u^{44} + \cdots - 4u + 1)$ |
| $c_5$ | $((u^3 - u^2 + 1)^2)(u^{45} + 3u^{44} + \cdots - 2u + 41)$ |
| $c_6, c_7, c_8$ | $((u^2 + u - 1)^3)(u^{45} + 4u^{44} + \cdots + u - 1)$ |
| $c_{10}, c_{11}$ | $((u^2 - u - 1)^3)(u^{45} + 4u^{44} + \cdots + u - 1)$ |

**IV. Riley Polynomials**

| Crossings | Riley Polynomials at each crossing |
|---|---|
| $c_1, c_4, c_{12}$ | $((y^3+3y^2+2y-1)^2)(y^{45}+37y^{44}+\cdots+40y-1)$ |
| $c_2, c_5$ | $((y^3-y^2+2y-1)^2)(y^{45}-39y^{44}+\cdots+54616y-1681)$ |
| $c_3, c_9$ | $y^6(y^{45}+35y^{44}+\cdots+29696y-4096)$ |
| $c_6, c_7, c_8$<br>$c_{10}, c_{11}$ | $((y^2-3y+1)^3)(y^{45}-62y^{44}+\cdots+33y-1)$ |