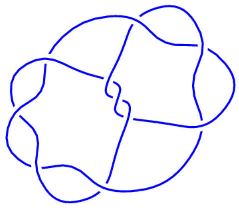
10_{61} $(K10a_{123})$



1

Arc Sequences

$$\rightarrow \downarrow \rightarrow \uparrow \rightarrow \uparrow \rightarrow \downarrow \rightarrow \downarrow \rightarrow \downarrow \rightarrow \uparrow \rightarrow \uparrow \rightarrow \downarrow \rightarrow \downarrow \rightarrow$$

5 9 8 1 2 10 4 3 6 7

Solving Sequence

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

Representation Ideals

$$I = \bigcap_{i=1}^{4} I_i^u$$

$I_1^u = \langle u-1,\ b,\ a+1\rangle$

$I_2^u = \langle b^2+2,\ a+1,\ u+1\rangle$

$I_3^u = \langle u^{10} - u^9 - 4u^8 + 2u^7 + 6u^6 + 2u^5 - 7u^4 - 3u^3 + 8u^2 - 2u - 3,$
$\quad u^9 - 8u^8 + u^7 + 12u^6 + 7u^5 + 4u^4 - 18u^3 + 4u^2 + 17b - 3u + 2,$
$\quad -7u^9 + 22u^8 + 10u^7 - 50u^6 - 15u^5 + 40u^4 + 58u^3 - 96u^2 + 51a - 47u + 122\rangle$

$I_4^u = \langle u^9 - u^8 - 6u^7 + 5u^6 + 12u^5 - 6u^4 - 8u^3 - u^2 + u - 1,\ a-1,\ -u^7 + u^6 + 5u^5 - 4u^4 - 7u^3 + 4u^2 + 2b + u$

There are 4 irreducible components with 22 representations.

[1]The knot diagram image is adapter from "C. Livingston and A. H. Moore, KnotInfo: Table of Knot Invariants, http://www.indiana.edu/ knotinfo"

I. $I_1^u = \langle u - 1,\ b,\ a + 1 \rangle$

(i) Arc colorings

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

(ii) Obstruction class $= 1$

(iii) Cusp Shapes $= -12$

(iv) Complex Volumes and Cusp Shapes

Solution to I_1^u	$\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$	Cusp shape
$u = 1.00000$ $a = -1.00000$ $b = 0$	-3.28987	-12.0000

II. $I_2^u = \langle b^2 + 2,\ a + 1,\ u + 1 \rangle$

(i) Arc colorings

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

(ii) Obstruction class $= 1$

(iii) Cusp Shapes $= -12$

(iv) Complex Volumes and Cusp Shapes

Solution to I_2^u	$\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.00000$ $a = -1.00000$ $b = \quad - 1.41421I$	-8.22467	-12.0000
$u = -1.00000$ $a = -1.00000$ $b = \quad 1.41421I$	-8.22467	-12.0000

III.
$$\boldsymbol{I^u_3 = \langle u^{10}-u^9+\cdots-2u-3,\ u^9-8u^8+\cdots+17b+2,\ -7u^9+22u^8+\cdots+51a+122\rangle}$$

(i) Arc colorings

$$a_2 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} 0.137255u^9 - 0.431373u^8 + \cdots + 0.921569u - 2.39216 \\ -0.0588235u^9 + 0.470588u^8 + \cdots + 0.176471u - 0.117647 \end{pmatrix}$$
$$a_3 = \begin{pmatrix} 0.0784314u^9 + 0.0392157u^8 + \cdots + 1.09804u + 0.490196 \\ -0.235294u^9 - 0.117647u^8 + \cdots - 0.294118u - 0.470588 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} 0.137255u^9 - 0.431373u^8 + \cdots + 0.921569u - 2.39216 \\ -1 \end{pmatrix}$$
$$a_7 = \begin{pmatrix} -0.627451u^9 + 0.686275u^8 + \cdots - 3.78431u + 1.07843 \\ -0.294118u^9 + 0.352941u^8 + \cdots - 1.11765u + 0.411765 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} u \\ u \end{pmatrix}$$
$$a_1 = \begin{pmatrix} -u^2 + 1 \\ -u^2 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} -u^3 + 2u \\ -u^3 + u \end{pmatrix}$$
$$a_8 = \begin{pmatrix} 0.274510u^9 - 0.862745u^8 + \cdots + 1.84314u - 1.78431 \\ -0.470588u^9 - 0.235294u^8 + \cdots - 0.588235u - 0.941176 \end{pmatrix}$$

(ii) Obstruction class $= -1$

(iii) Cusp Shapes
$$= -\frac{8}{17}u^9 + \frac{64}{17}u^8 - \frac{8}{17}u^7 - \frac{164}{17}u^6 - \frac{56}{17}u^5 + \frac{104}{17}u^4 + \frac{212}{17}u^3 - \frac{100}{17}u^2 - \frac{44}{17}u + \frac{18}{17}$$

(iv) Complex Volumes and Cusp Shapes

Solution to I_3^u	$\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.349550 - 0.050168I$ $a = -0.455069 - 0.453019I$ $b = -0.233677 + 0.885557I$	$-5.10967 - 2.21397I$	$-8.88568 + 4.22289I$
$u = -1.349550 + 0.050168I$ $a = -0.455069 + 0.453019I$ $b = -0.233677 - 0.885557I$	$-5.10967 + 2.21397I$	$-8.88568 - 4.22289I$
$u = -0.660273 - 1.014194I$ $a = -0.795823 + 1.055371I$ $b = -0.05818 + 1.69128I$	$-14.2482 - 3.3317I$	$-9.91874 + 2.36228I$
$u = -0.660273 + 1.014194I$ $a = -0.795823 - 1.055371I$ $b = -0.05818 - 1.69128I$	$-14.2482 + 3.3317I$	$-9.91874 - 2.36228I$
$u = -0.506729$ $a = -2.27326$ $b = -0.416284$	-2.40769	-0.391165
$u = 0.591412 - 0.634202I$ $a = -1.10369 - 1.09872I$ $b = -0.233677 - 0.885557I$	$-5.10967 + 2.21397I$	$-8.88568 - 4.22289I$
$u = 0.591412 + 0.634202I$ $a = -1.10369 + 1.09872I$ $b = -0.233677 + 0.885557I$	$-5.10967 - 2.21397I$	$-8.88568 + 4.22289I$
$u = 1.15193$ $a = -0.439896$ $b = -0.416284$	-2.40769	-0.391165
$u = 1.59581 - 0.11029I$ $a = -0.455500 + 0.604056I$ $b = -0.05818 - 1.69128I$	$-14.2482 + 3.3317I$	$-9.91874 - 2.36228I$
$u = 1.59581 + 0.11029I$ $a = -0.455500 - 0.604056I$ $b = -0.05818 + 1.69128I$	$-14.2482 - 3.3317I$	$-9.91874 + 2.36228I$

IV. $\boldsymbol{I^u_4 = \langle u^9 - u^8 + \cdots + u - 1,\ a - 1,\ -u^7 + u^6 + \cdots + 2b - 1\rangle}$

(i) Arc colorings

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

(ii) Obstruction class $= -1$

(iii) Cusp Shapes $= -u^8 - u^7 + 9u^6 + 6u^5 - 25u^4 - 14u^3 + 21u^2 + 13u - 6$

(iv) Complex Volumes and Cusp Shapes

Solution to I_4^u	$\sqrt{-1}(\mathrm{vol}+\sqrt{-1}CS)$	Cusp shape
$u = -1.59750 - 0.17287I$ $a = 1.00000$ $b = 0.638951 - 0.973621I$	$-12.55800 - 5.12744I$	$-10.43762 + 3.71423I$
$u = -1.59750 + 0.17287I$ $a = 1.00000$ $b = 0.638951 + 0.973621I$	$-12.55800 + 5.12744I$	$-10.43762 - 3.71423I$
$u = -0.581336 - 0.407332I$ $a = 1.00000$ $b = 0.00790 - 1.51466I$	$-6.71646 - 1.46233I$	$-6.34609 + 4.72292I$
$u = -0.581336 + 0.407332I$ $a = 1.00000$ $b = 0.00790 + 1.51466I$	$-6.71646 + 1.46233I$	$-6.34609 - 4.72292I$
$u = 0.234603 - 0.339731I$ $a = 1.00000$ $b = 0.215940 + 0.436674I$	$-0.116751 + 0.880893I$	$-2.67139 - 7.91481I$
$u = 0.234603 + 0.339731I$ $a = 1.00000$ $b = 0.215940 - 0.436674I$	$-0.116751 - 0.880893I$	$-2.67139 + 7.91481I$
$u = 1.56954$ $a = 1.00000$ $b = 0.903187$	-9.61991	-8.30451
$u = 1.65947 - 0.34544I$ $a = 1.00000$ $b = 0.18562 + 1.72176I$	$17.6214 + 8.4586I$	$-11.39264 - 3.44703I$
$u = 1.65947 + 0.34544I$ $a = 1.00000$ $b = 0.18562 - 1.72176I$	$17.6214 - 8.4586I$	$-11.39264 + 3.44703I$

V. u-Polynomials

Crossings	u-Polynomials at each crossings
c_1, c_6	$(u-1)(u+1)^2(u^9+u^8+\cdots+u+1)$ $(u^{10}+u^9-4u^8-2u^7+6u^6-2u^5-7u^4+3u^3+8u^2+2u-3)$
c_2, c_3, c_7 c_8	$u(u^2+2)(u^5-u^4+4u^3-3u^2+3u-1)^2$ $(u^9+3u^8+10u^7+19u^6+31u^5+37u^4+34u^3+22u^2+8u+2)$
c_4, c_5, c_9 c_{10}	$(u-1)^2(u+1)(u^9+u^8+\cdots+u+1)$ $(u^{10}+u^9-4u^8-2u^7+6u^6-2u^5-7u^4+3u^3+8u^2+2u-3)$

VI. Riley Polynomials

Crossings	Riley Polynomials at each crossings
c_1, c_4, c_5 c_6, c_9, c_{10}	$(y-1)^3$ $(y^9 - 13y^8 + 70y^7 - 197y^6 + 300y^5 - 232y^4 + 86y^3 - 29y^2 - y - 1)$ $(y^{10} - 9y^9 + \cdots - 52y + 9)$
c_2, c_3, c_7 c_8	$y(y+2)^2(y^5 + 7y^4 + 16y^3 + 13y^2 + 3y - 1)^2$ $(y^9 + 11y^8 + 48y^7 + 105y^6 + 119y^5 + 51y^4 - 52y^3 - 88y^2 - 24y - 4)$