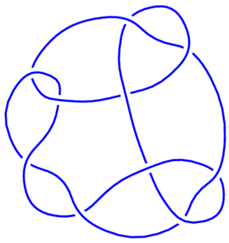
10_{78} ($K10a_{17}$)



[1]

Arc Sequences

$$\rightarrow \underset{4}{\downarrow} \rightarrow \underset{9}{\downarrow} \rightarrow \underset{5}{\downarrow} \rightarrow \underset{2}{\downarrow} \rightarrow \underset{7}{\downarrow} \rightarrow \underset{1}{\downarrow} \rightarrow \underset{10}{\uparrow} \rightarrow \underset{3}{\downarrow} \rightarrow \underset{8}{\uparrow} \rightarrow \underset{6}{\downarrow} \rightarrow$$

Solving Sequence

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

Representation Ideals

$$I = \bigcap_{i=1}^{3} I_i^u$$

$$\begin{aligned}
I_1^u &= \langle u-1,\ a+2,\ b+1\rangle \\
I_2^u &= \langle u^{13}+u^{12}-3u^{11}-4u^{10}+4u^9+7u^8-5u^6-3u^5+3u^3+2u^2-1,\ b-u, \\
&\quad u^{11}+u^{10}-2u^9-3u^8+2u^7+4u^6+2u^5-u^4-u^3-u^2+a+u+1\rangle \\
I_3^u &= \langle u^{22}+u^{21}+\cdots-4u^2+1,\ -u^{21}+6u^{19}+\cdots+b-1,\ -2u^{21}-u^{20}+\cdots+a-1\rangle
\end{aligned}$$

There are 3 irreducible components with 36 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. $I_1^u = \langle u - 1,\ a + 2,\ b + 1 \rangle$

(i) Arc colorings

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

(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
$u = 1.00000$ $a = -2.00000$ $b = -1.00000$	-3.28987	-12.0000

II. $I_2^u = \langle u^{13} + u^{12} + \cdots + 2u^2 - 1,\ b - u,\ u^{11} + u^{10} + \cdots + a + 1 \rangle$

(i) Arc colorings

$$a_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$

$$a_2 = \begin{pmatrix} 1 \\ u^2 \end{pmatrix}$$

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

$$a_6 = \begin{pmatrix} -u^{11} - u^{10} + 2u^9 + 3u^8 - 2u^7 - 4u^6 - 2u^5 + u^4 + u^3 + u^2 - u - 1 \\ u \end{pmatrix}$$

$$a_7 = \begin{pmatrix} -u^{11} - u^{10} + 2u^9 + 3u^8 - 2u^7 - 4u^6 - 2u^5 + u^4 + u^3 + u^2 - 2u - 1 \\ u \end{pmatrix}$$

$$a_3 = \begin{pmatrix} u^3 \\ u^5 - u^3 + u \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} u^{12} + u^{11} - 2u^{10} - 3u^9 + 2u^8 + 4u^7 + 2u^6 - u^5 - u^4 - u^3 + u^2 + u + 1 \\ -u^2 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} -u^{11} - u^{10} + 2u^9 + 3u^8 - 2u^7 - 4u^6 - u^5 + u^4 + u^3 + u^2 - u - 1 \\ u^5 - u^3 + u \end{pmatrix}$$

$$a_9 = \begin{pmatrix} u^{12} + u^{11} - 2u^{10} - 3u^9 + u^8 + 4u^7 + 3u^6 - u^5 - 2u^4 - u^3 + u + 1 \\ -u^8 + 2u^6 - 2u^4 \end{pmatrix}$$

(ii) Obstruction class $= -1$

(iii) Cusp Shapes
$= -2u^{11} + 2u^{10} + 8u^9 - 2u^8 - 16u^7 + 12u^5 + 10u^4 - 2u^3 - 2u^2 - 8u - 4$

(iv) Complex Volumes and Cusp Shapes

Solution to I_2^u	$\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.231339 - 0.513532I$ $a = -2.38620 + 1.20321I$ $b = -1.231339 - 0.513532I$	$-8.1203 - 12.5021I$	$-10.75701 + 8.36275I$
$u = -1.231339 + 0.513532I$ $a = -2.38620 - 1.20321I$ $b = -1.231339 + 0.513532I$	$-8.1203 + 12.5021I$	$-10.75701 - 8.36275I$
$u = -0.992158 - 0.546170I$ $a = -1.43275 + 1.41238I$ $b = -0.992158 - 0.546170I$	$0.33005 - 7.56007I$	$-5.81453 + 9.02411I$
$u = -0.992158 + 0.546170I$ $a = -1.43275 - 1.41238I$ $b = -0.992158 + 0.546170I$	$0.33005 + 7.56007I$	$-5.81453 - 9.02411I$
$u = -0.613960 - 0.561299I$ $a = -0.334868 + 0.840411I$ $b = -0.613960 - 0.561299I$	$2.63797 - 1.38269I$	$-0.35464 + 3.62793I$
$u = -0.613960 + 0.561299I$ $a = -0.334868 - 0.840411I$ $b = -0.613960 + 0.561299I$	$2.63797 + 1.38269I$	$-0.35464 - 3.62793I$
$u = -0.089121 - 0.795435I$ $a = -0.065042 + 0.185799I$ $b = -0.089121 - 0.795435I$	$-1.44691 + 2.76421I$	$-4.50885 - 2.57748I$
$u = -0.089121 + 0.795435I$ $a = -0.065042 - 0.185799I$ $b = -0.089121 + 0.795435I$	$-1.44691 - 2.76421I$	$-4.50885 + 2.57748I$
$u = 0.590758$ $a = -1.22415$ $b = 0.590758$	-1.09585	-8.11209
$u = 0.915058 - 0.384331I$ $a = 0.86874 + 2.19716I$ $b = 0.915058 - 0.384331I$	$-2.16179 + 3.07776I$	$-9.60750 - 5.91774I$

Solution to I_2^u		$\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$	Cusp shape
$u =$	$0.915058 + 0.384331I$		
$a =$	$0.86874 - 2.19716I$	$-2.16179 - 3.07776I$	$-9.60750 + 5.91774I$
$b =$	$0.915058 + 0.384331I$		
$u =$	$1.216142 - 0.467752I$		
$a =$	$2.46220 + 1.38514I$	$-8.78542 + 6.00980I$	$-11.90142 - 4.07839I$
$b =$	$1.216142 - 0.467752I$		
$u =$	$1.216142 + 0.467752I$		
$a =$	$2.46220 - 1.38514I$	$-8.78542 - 6.00980I$	$-11.90142 + 4.07839I$
$b =$	$1.216142 + 0.467752I$		

III.

$\boldsymbol{I_3^u = \langle u^{22}+u^{21}+\cdots-4u^2+1,\ -u^{21}+6u^{19}+\cdots+b-1,\ -2u^{21}-u^{20}+\cdots+a-1\rangle}$

(i) Arc colorings

$$a_1 = \begin{pmatrix}1\\0\end{pmatrix}$$
$$a_4 = \begin{pmatrix}0\\u\end{pmatrix}$$
$$a_2 = \begin{pmatrix}1\\u^2\end{pmatrix}$$
$$a_5 = \begin{pmatrix}-u\\-u^3+u\end{pmatrix}$$
$$a_6 = \begin{pmatrix}2u^{21}+u^{20}+\cdots-4u+1\\u^{21}-6u^{19}+\cdots-u^2+1\end{pmatrix}$$
$$a_7 = \begin{pmatrix}u^{21}+u^{20}+\cdots-6u^2-4u\\u^{21}-6u^{19}+\cdots-u^2+1\end{pmatrix}$$
$$a_3 = \begin{pmatrix}u^3\\u^5-u^3+u\end{pmatrix}$$
$$a_{10} = \begin{pmatrix}-2u^{21}+13u^{19}+\cdots+4u-1\\-u^{21}+7u^{19}+\cdots+u-2\end{pmatrix}$$
$$a_8 = \begin{pmatrix}2u^{21}-12u^{19}+\cdots-3u+1\\2u^{21}-12u^{19}+\cdots-u+2\end{pmatrix}$$
$$a_9 = \begin{pmatrix}-2u^{21}+12u^{19}+\cdots+3u-1\\-2u^{21}+12u^{19}+\cdots+u-2\end{pmatrix}$$

(ii) Obstruction class $= -1$

(iii) Cusp Shapes $= -4u^{21}+24u^{19}+4u^{18}-64u^{17}-20u^{16}+80u^{15}+44u^{14}-20u^{13}-40u^{12}-72u^{11}-4u^{10}+76u^9+40u^8-8u^7-20u^6-28u^5-4u^4+8u^3+8u^2-10$

(iv) Complex Volumes and Cusp Shapes

Solution to I_3^u	$\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$	Cusp shape
$u = -1.218832 - 0.447288I$ $a = 1.98611 - 0.66727I$ $b = 1.263031 - 0.401917I$	$-8.93247 - 3.04152I$	$-12.06121 + 2.82242I$
$u = -1.218832 + 0.447288I$ $a = 1.98611 + 0.66727I$ $b = 1.263031 + 0.401917I$	$-8.93247 + 3.04152I$	$-12.06121 - 2.82242I$
$u = -1.203206 - 0.491862I$ $a = 0.610676 + 0.586169I$ $b = -0.101435 + 0.877274I$	$-4.72165 - 7.47524I$	$-7.77092 + 5.55460I$
$u = -1.203206 + 0.491862I$ $a = 0.610676 - 0.586169I$ $b = -0.101435 - 0.877274I$	$-4.72165 + 7.47524I$	$-7.77092 - 5.55460I$
$u = -0.894378 - 0.268842I$ $a = 2.19177 - 0.42458I$ $b = 1.166325 - 0.116345I$	$-2.98514 - 1.13130I$	$-7.98780 + 6.05785I$
$u = -0.894378 + 0.268842I$ $a = 2.19177 + 0.42458I$ $b = 1.166325 + 0.116345I$	$-2.98514 + 1.13130I$	$-7.98780 - 6.05785I$
$u = -0.878994 - 0.515981I$ $a = 0.407883 + 0.148860I$ $b = -0.438226 + 0.645537I$	$1.89175 - 2.94672I$	$-2.20063 + 4.11787I$
$u = -0.878994 + 0.515981I$ $a = 0.407883 - 0.148860I$ $b = -0.438226 - 0.645537I$	$1.89175 + 2.94672I$	$-2.20063 - 4.11787I$
$u = -0.438226 - 0.645537I$ $a = -0.159128 - 0.544432I$ $b = -0.878994 + 0.515981I$	$1.89175 + 2.94672I$	$-2.20063 - 4.11787I$
$u = -0.438226 + 0.645537I$ $a = -0.159128 + 0.544432I$ $b = -0.878994 - 0.515981I$	$1.89175 - 2.94672I$	$-2.20063 + 4.11787I$

Solution to I_3^u	$\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$	Cusp shape
$u=-0.101435-0.877274I$ $a=-1.073145-0.632994I$ $b=-1.203206+0.491862I$	$-4.72165+7.47524I$	$-7.77092-5.55460I$
$u=-0.101435+0.877274I$ $a=-1.073145+0.632994I$ $b=-1.203206-0.491862I$	$-4.72165-7.47524I$	$-7.77092+5.55460I$
$u=0.022883-0.808487I$ $a=1.17422-0.82028I$ $b=1.209204+0.415611I$	$-5.26692-1.41699I$	$-8.79131+0.63373I$
$u=0.022883+0.808487I$ $a=1.17422+0.82028I$ $b=1.209204-0.415611I$	$-5.26692+1.41699I$	$-8.79131-0.63373I$
$u=0.460239$ $a=-1.48577$ $b=0.687015$	-1.09450	-8.37626
$u=0.687015$ $a=-0.995334$ $b=0.460239$	-1.09450	-8.37626
$u=1.166325-0.116345I$ $a=-1.74332-0.35353I$ $b=-0.894378-0.268842I$	$-2.98514-1.13130I$	$-7.98780+6.05785I$
$u=1.166325+0.116345I$ $a=-1.74332+0.35353I$ $b=-0.894378+0.268842I$	$-2.98514+1.13130I$	$-7.98780-6.05785I$
$u=1.209204-0.415611I$ $a=-0.716733+0.554276I$ $b=0.022883+0.808487I$	$-5.26692+1.41699I$	$-8.79131-0.63373I$
$u=1.209204+0.415611I$ $a=-0.716733-0.554276I$ $b=0.022883-0.808487I$	$-5.26692-1.41699I$	$-8.79131+0.63373I$

Solution to I_3^u	$\sqrt{-1}(\text{vol}+\sqrt{-1}CS)$	Cusp shape
$u=1.263031-0.401917I$ $a=-1.93778-0.67607I$ $b=-1.218832-0.447288I$	$-8.93247-3.04152I$	$-12.06121+2.82242I$
$u=1.263031+0.401917I$ $a=-1.93778+0.67607I$ $b=-1.218832+0.447288I$	$-8.93247+3.04152I$	$-12.06121-2.82242I$

IV. u-Polynomials

Crossings	u-Polynomials at each crossings
c_1, c_6	$(u-1)(u^{13}+u^{12}+\cdots+2u^2-1)$ $(u^{22}+u^{21}+\cdots-4u^2+1)$
c_2, c_8	$u(u^{11}-u^{10}+2u^9-u^8+4u^7-2u^6+4u^5-u^4+3u^3+u^2+1)^2$ $(u^{13}+3u^{12}+\cdots+4u+2)$
c_3, c_5	$(u-1)(u^{13}+7u^{12}+\cdots+4u+1)(u^{22}+13u^{21}+\cdots+8u+1)$
c_4, c_{10}	$(u+1)(u^{13}+u^{12}+\cdots+2u^2-1)$ $(u^{22}+u^{21}+\cdots-4u^2+1)$
c_7, c_9	u $(-1-2u+u^2+15u^3+29u^4+40u^5+40u^6+32u^7+19u^8+10u^9+3u^{10}+u^{11})^2$ $(u^{13}+3u^{12}+\cdots+4u-4)$

V. Riley Polynomials

Crossings	Riley Polynomials at each crossings
c_1, c_4, c_6 c_{10}	$(y-1)(y^{13}-7y^{12}+\cdots+4y-1)(y^{22}-13y^{21}+\cdots-8y+1)$
c_2, c_8	y $(-1-2y+y^2+15y^3+29y^4+40y^5+40y^6+32y^7+19y^8+10y^9+3y^{10}+y^{11})^2$ $(y^{13}+3y^{12}+\cdots+4y-4)$
c_3, c_5	$(y-1)(y^{13}+y^{12}+\cdots+8y-1)(y^{22}-9y^{21}+\cdots-32y+1)$
c_7, c_9	y $(-1+6y-3y^2+87y^3+189y^4+168y^5+148y^6+160y^7+119y^8+50y^9+11y^{10}+y^{11})^2$ $(y^{13}+11y^{12}+\cdots+104y-16)$