

```
SetDirectory["~/AcademicPensieve/Projects/HigherRank/DunfieldKnots"];
<< ../../KnotTheory/KnotTheory/init.m
<< ../Rot.m
```

Get: Cannot open KnotTheory`.
 Loading Rot.m from http://drorbn.net/AP/Projects/HigherRank to compute rotation numbers.

```
(Alt) In[ ]:=
CCF[ε_] := ExpandDenominator@ExpandNumerator@Together[ε];
CCF[ε_] := Factor[ε];
CF[ε_List] := CF/@ε;
CF[ε_] := Module[{vs = Cases[ε, (x | p | π | g) , ∞] | {x, p, ε}, ps, c},
```

Data

(from Talks/Beiiiig-2407/theta.nb)

```
(Alt) In[ ]:=
R1[1, i_, j_] = CF[
  1/2 - T3 g1ji g2ji - g3ii + g2jj g3ii + T1 (T3 - 1) g1ji g3ji +
  T2 (T3 - 1) g2ji g3ji - T2 g2ji g3jj + (g1jj g2ii + (T3 - 1) g1jj g2ji -
```

```
(Alt) In[ ]:=
R1[-1, i_, j_] = CF[
  -1/2 - T1^-1 g1ji g2ii - (1 - T1^-1 - T2^-1) g1ji g2ji - g1jj g2ji - g1ji g2jj + g3ii +
  T1^-1 g1ji g3ii - (1 - T2^-1) g2ji g3ii - g2jj g3ii + (1 - T3^-1) g1ji g3ji - (1 - T3^-1) g2ii g3ji +
  (2 - T2^-1) (1 - T2^-1) g2ii g3ii + (1 - T2^-1) g2ii g3ii + g1ii g3ii + g2ii g3ii + (T1 (1 - T2^-1) g1ii g3ii -
```

```
(Alt) In[ ]:=
θ[{1, i0_, j0_}, {1, i1_, j1_}] =
  -T1 (T3 - 1) g1,j1,i0 g2,i1,i0 g3,j0,i1 + (T3 - 1) g1,j1,j0 g2,i1,i0 g3,j0,i1 +
```

```
(Alt) In[ ]:=
θ[{1, i0_, j0_}, {-1, i1_, j1_}] =
  (T3 - 1) g1,j1,i0 g2,i1,i0 g3,j0,i1 - T1^-1 (T3 - 1) g1,j1,j0 g2,i1,i0 g3,j0,i1 -
```

```
(Alt) In[ ]:=
θ[{-1, i0_, j0_}, {1, i1_, j1_}] = CF[
  T1^-1 T2^-1 (T3 - 1) (g1,j1,i0 g2,i1,i0 g3,j0,i1 -
```

```
(Alt) In[ ]:=
θ[{-1, i0_, j0_}, {-1, i1_, j1_}] = CF[
  (1 - T3^-1) (-T1^-1 g1,j1,i0 g2,i1,i0 g3,j0,i1 +
```

```
(Alt) In[ ]:=
T1[φ, k] = -φ/2 + φ g3,k,k;
```

The Programs

```

 $\theta[K_] := Module[{\{Cs, \varphi, n, A, s, i, j, k, \Delta, G, v, \alpha, \beta, gEval, c, z\},$ 
  {Cs, \varphi} = Rot[K]; n = Length[Cs];
  A = IdentityMatrix[2 n + 1];
  Cases[Cs, {s_, i_, j_}  $\Rightarrow$  (A[[{i, j}, {i + 1, j + 1}]] += ( $\begin{pmatrix} -T^s & T^s - 1 \\ 0 & -1 \end{pmatrix}$ ))];
   $\Delta = T^{(-Total[\varphi] - Total[Cs[[All, 1]])/2} Det[A];$ 
  G = Inverse[A]; gEval[\mathcal{E}_] := Factor[\mathcal{E} /. g_{v, \alpha, \beta}  $\Rightarrow$  (G[[\alpha, \beta]] /. T  $\rightarrow$  T_v)];
  z = gEval[Sum[\theta[Cs[[k1]], Cs[[k2]]], {k1, n}, {k2, n}]];

```

(Alt) In[]:=

```

PolyPlot[0] = Graphics[{}];
PolyPlot[p_] := Module[{crs, m1, m2, maxc, minc, s, hex},
  crs = CoefficientRules[T1^{-m1=-Exponent[p, T1, Min]} T2^{-m2=-Exponent[p, T2, Min]} p, {T1, T2}];
  maxc = N@Log@Max@Abs[Last /@ crs];
  minc = N@Log@Min@Select[Abs[Last /@ crs], # > 0 &];
  If[minc == maxc, s[_] = 0, s[c_] := s[c] = (maxc - Log@c) / (maxc - minc)];
  hex = Table[{Cos[\alpha], Sin[\alpha]} / Cos[2 \pi / 12] / 2, {\alpha, 2 \pi / 12, 2 \pi, 2 \pi / 6}];
  Graphics[crs /. ({x1_, x2_}  $\rightarrow$  c_)  $\Rightarrow$  {
    T[c] = 0, White, Lighten[T[c], 0.8], Blue, 0.8, Abs@c]]];

```

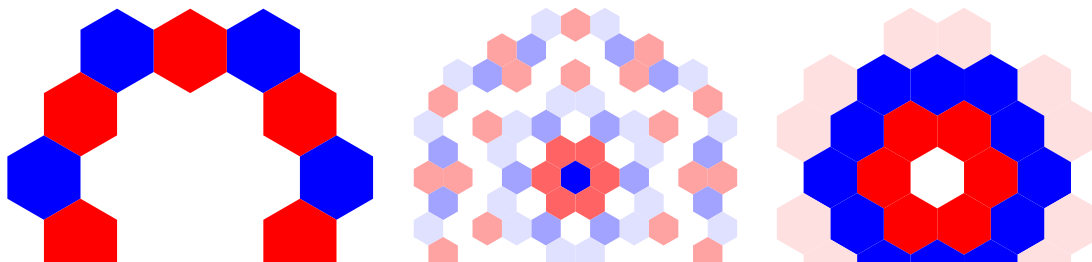
Testing

```
In[ ]:= GraphicsRow[PolyPlot[\theta[Knot[#]]][2]] &
```

```
{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99}
```

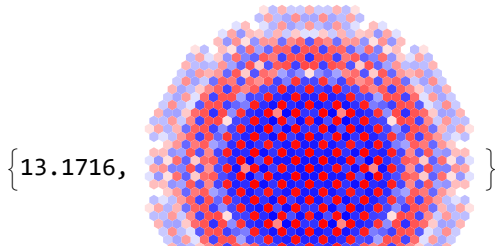
- ☞ KnotTheory: Loading precomputed data in PD4Knots`.
- ☞ KnotTheory: Loading precomputed data in DTCode4KnotsTo11`.
- ☞ KnotTheory: The GaussCode to PD conversion was written by Siddarth Sankaran at the University of Toronto in the summer of

Out[]:=



```
In[ ]:= AbsoluteTiming@
PolyPlot[ $\theta$ [EPD[X14,1, X̄2,29, X3,40, X43,4, X̄26,5, X6,95, X96,7, X13,8, X̄9,28, X10,41, X42,11, X̄27,12,
X30,15, X̄16,61, X̄17,72, X̄18,83, X19,34, X̄89,20, X̄21,92, X̄79,22, X̄68,23, X̄57,24, X̄25,56, X62,31,
X73,33, X84,32, X̄50,35, X̄26,81, X̄37,70, X̄38,50, X̄30,54, X44,55, X̄58,45, X̄60,46, X̄80,47, X̄48,81,
X̄59,48, X̄61,49, X̄62,50, X̄63,51, X̄64,52, X̄65,53, X̄66,54, X̄67,55, X̄68,56, X̄69,57, X̄70,58, X̄71,59, X̄72,60, X̄73,61, X̄74,62, X̄75,63, X̄76,64, X̄77,65, X̄78,66, X̄79,67, X̄80,68, X̄81,69, X̄82,70, X̄83,71, X̄84,72, X̄85,73, X̄86,74, X̄87,75, X̄88,76, X̄89,77, X̄90,78, X̄91,79, X̄92,80, X̄93,81, X̄94,82, X̄95,83, X̄96,84, X̄97,85, X̄98,86, X̄99,87, X̄100,88]]]
```

Out[]:=



Run

(Alt) In[]:=

```
DunfieldKnots =
ReadList["../../../../People/Dunfield/nmd_random_knots"] /. k_Integer -> k + 1;
```

(Alt) In[]:=

```
DKString[n_?IntegerQ] := StringDrop[ToString[1000 + n], 1]
```

```
In[ ]:= DKString[761]
```

Out[]:=

076

(Alt) In[]:=

```
Do[
If[FileExistsQ[from = "D" <> ToString[n] <> ".m"],
RenameFile[from, "D" <> DKString[n] <> ".m"]];
If[FileExistsQ[from = "PP" <> ToString[n] <> ".png"],
RenameFile[from, "PP" <> DKString[n] <> ".png"]];
```

```
Clear[at, pp];
Do[
If[(n = k) > 1000, Abort[]];
If[Not@FileExistsQ["D" <> DKString[n] <> ".m"],
Print["Working on ", n];
Put[
({at, th} = AbsoluteTiming[ $\theta$ [DK[n]]]) /. {T1 -> T1, T2 -> T2},
"D" <> DKString[n] <> ".m"];
Print@Export["PP" <> DKString[n] <> ".png", pp = PolyPlot[th[[2]]];
```

Join[mon, {n}]