Pensieve header: Making the "Knotted Candies" poster.

```
In[ ]:=  SetDirectory["C:\\drorbn\\AcademicPensieve\\2008-12"]
```

Out[ ]=

C:\drorbn\AcademicPensieve\2008-12

```
In[ ]:=  Switch[Online,
  Online, ideal = Import["http://katlas.org/w/images/d/d2/Ideal.txt.gz", "String"],
  Offline, ideal = Import["C:\\drorbn\\People\\Gilbert\\ideal.txt", "String"]
 ]
```

Out[ ]=

```
<DATA Title="Database of Ideal Knots 3-10 crossings" Author="Brian Gilbert" Date="6/11/2016 2:12:11 p.m.">

<AB Id="3:1:1" Conway="3" L="16.371637" D=" 1.000000">

  <Coeff I="  1" A=" 0.374139, 0.000000, 0.000000" B=" 0.000000, 0.373928, 0.000000" />

  <Coeff I="  2" A=" 0.824246, 0.750260, 0.000352" B=" 0.750450,-0.823952,-0.001991" />

  <Coeff I="  3" A=" 0.000257,-0.000932, 0.352397" B="-0.000770, 0.000726,-0.386764" />

  <Coeff I="  4" A=" 0.011652,- …

  <Coeff I="249" A="-0.000008, 0.000001, 0.000003" B=" 0.000015, 0.000001, 0.000008" />

  <Coeff I="251" A=" 0.000010,-0.000004, 0.000003" B=" 0.000005, 0.000003,-0.000000" />

  <Coeff I="253" A="-0.000010,-0.000011, 0.000002" B="-0.000005, 0.000004,-0.000005" />

  <Coeff I="255" A="-0.000001,-0.000006,-0.000004" B=" 0.000002, 0.000004, 0.000003" />

  <Coeff I="256" A=" 0.000004,-0.000002, 0.000003" B=" 0.000001,-0.000000, 0.000000" />

 </AB>

 </DATA>
```

Full expression not available (original memory size: 5.3 MB)   ⚙

```
(* ideal1=Import["C:\\drorbn\\People\\Gilbert\\ideal.txt", "String"]
   ideal="<data>"<>StringReplace[ideal1,
     "I="~~" "...~~ i:(DigitCharacter..) :> "I=\""<>i<>"\""]<>"</data>"; *)
```

```
In[ ]:=  data = Cases[ImportString[ideal, "XML"], XMLElement["AB", ab___] :> AB[ab], Infinity];
```

```
In[ ]:=  Length[data]
```

Out[ ]=

250

```
In[ ]:=  ProcessAB[ab_AB] := Module[
            {Id, CS, L, n, c, k, K, coeffs},
            {Id, CS, L} = {"Id", "Conway", "L"} /. ab〚1〛;
            {n, c, k} = ToExpression /@ StringSplit[Id, ":"];
            If[n == 10 && 161 < k ≤ 166, --k];
            K = Knot[n, k];
            coeffs = ab〚2〛 /. XMLElement["Coeff", l_List, {}] ⧴ {
                ToExpression["I" /. l],
                ToExpression["{" <> ("A" /. l) <> "}"],
                ToExpression["{" <> ("B" /. l) <> "}"]
              };
            If[c == 1,
             RopeLength[K] = ToExpression[L];
             ConwayString[K] = CS;
             IdealPresentationData[K] = coeffs;
             K,
             Print["Trouble in ", K]
            ]
           ];
        IdealPresentation[K_Knot][t_] := Plus @@ (IdealPresentationData[K] /.
           {i_, A_List, B_List} ⧴ A Cos[i t] + B Sin[i t]
          )
```

```
In[ ]:=  Ks = Union[ProcessAB /@ data];
```

```
In[ ]:=  Max[RopeLength /@ Ks]
```

```
Out[ ]=
        46.192
```

```
In[ ]:=  RopeLength[Knot[0, 1]] = N[Pi];
        IdealPresentationData[Knot[0, 1]] = {{1, {1, 0, 0}, {0, 1, 0}}};
```

```
(* ParametricPlot3D[IdealPresentation[Knot[3,1]][t], {t, 0, 2Pi}] *)
```

```
In[ ]:=  l = Length[Ks]
```

```
Out[ ]=
        249
```

```mathematica
In[ ]:=  Clear[DrawKnot];
         RandomUnitVector[] := (
            v = {1.15 * Random[], Random[], Random[]};
            v / Sqrt[v.v]
           );
         RandomColour[] := RGBColor @@ RandomUnitVector[];
         DrawKnot[K_Knot, opts___Rule] := DrawKnot[K, opts] = Module[
             {background = Background /. {opts} /. Background → Black},
             ImageCrop[Rasterize[Graphics3D[{
                 Specularity[Random[], 20 Random[]],
                 {X1, X2, X3} = Compile[{t}, #] & /@ IdealPresentation[K][t];
                 T = 8 RopeLength[K];
                 Tube[Table[
                    {X1[2 Pi k / T], X2[2 Pi k / T], X3[2 Pi k / T]}, {k, 0, T}], 0.1 + 0.4 Random[]]
                },
                Boxed → False, Background → background, ImagePadding → None,
                PlotRangePadding → 0,
                ViewPoint → 10 RandomUnitVector[],
                Lighting → {
                   {"Directional", RandomColour[], RandomUnitVector[]},
                   {"Point", RandomColour[], 2 RandomUnitVector[]}
                 }
              ]]]
           ];
```

```
In[ ]:=  SeedRandom[0];
         im = Rasterize[GraphicsGrid[
             Partition[
              Join[
               DrawKnot /@ {Knot[0, 1]},
               DrawKnot /@ Ks,
               {Graphics[{Yellow, Text[Style[
                    Column[{
                       "Knotted Candies by Dror Bar-Natan (2008)",
                       "based on data by Brian Gilbert",
                       "http://www.math.toronto.edu/~drorbn/Gallery/KnottedObjects/Candies/"
                      }, Center
                     ], 40
                   ]]}]},
               Table[SpanFromLeft, {5}]
              ], 16
             ],
             Background → Black, Spacings → 0
            ], ImageSize → 3200, RasterSize → 3200, Background → Black];
         Show[ImageResize[im, 400]]
```

Out[ ]=


```
         Export["C:/drorbn/AcademicPensieve/2008-12/KnottedCandies.png", im];
         Export[
           "C:/drorbn/AcademicPensieve/2008-12/KnottedCandies_720.png", ImageResize[im, 720]];
```

```
Export["C:/drorbn/AcademicPensieve/2008-12/KnottedCandies_120.png",
 ImageResize[ImageTake[im, -800, 800], 120]]
```

C:/drorbn/AcademicPensieve/2008-12/KnottedCandies_120.png

The white - background image wbim.

```
In[ ]:=  SeedRandom[0];
         wbim = Rasterize[GraphicsGrid[
             Partition[
               Join[
                 DrawKnot[#, Background → White] & /@ {Knot[0, 1]},
                 DrawKnot[#, Background → White] & /@ Ks,
                 {Graphics[{Red, Text[Style[
                       Column[{
                           "Knotted Candies by Dror Bar-Natan (2008)",
                           "based on data by Brian Gilbert",
                           "http://drorbn.net/ap/2008-12/"
                          }, Center
                        ], 40
                      ]]}]},
                 Table[SpanFromLeft, {5}]
                ], 16
               ],
             Background → White, Spacings → 0, Frame → None
            ], ImageSize → 3200, RasterSize → 3200, Background → Black];
         Show[ImageResize[wbim, 400]]
```

Out[ ]=


```
In[ ]:=  Export["C:/drorbn/AcademicPensieve/2008-12/KnottedCandies_WB_1600.png",
             ImageResize[wbim, 1600]];
```

The white - background up-to-8 image wbim8.

```
In[ ]:= SeedRandom[0];
       wbim8 = Rasterize[GraphicsGrid[
           Partition[
            Join[
             DrawKnot[#, Background → White] & /@ {Knot[0, 1]},
             DrawKnot[#, Background → White] & /@ Take[Ks, 35]
            ], 9
            ],
           Background → White, Spacings → 0, Frame → None
          ], ImageSize → 2400, RasterSize → 2400, Background → White];
       Show[ImageResize[wbim8, 400]]
```

Out[ ]=


```
In[ ]:= Export["C:/drorbn/AcademicPensieve/2008-12/KnottedCandiesTo8_WB_1600.png",
           ImageResize[wbim8, 1600]];
```

```
In[ ]:= SeedRandom[0];
       wbim8at5x7 = Rasterize[GraphicsGrid[
           Partition[DrawKnot[#, Background → White] & /@ Take[Ks, 35], 7],
           Background → White, Spacings → 0, Frame → None
          ], ImageSize → 2400, RasterSize → 2400, Background → White];
       Show[ImageResize[wbim8at5x7, 400]]
```

Out[ ]=

```
In[ ]:= Export["C:/drorbn/AcademicPensieve/2008-12/KnottedCandies@5x7_WB_800.png",
         ImageResize[wbim8at5x7, 800]];
```