

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"]
]
```

```
<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,-0.82395
... 03" 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>
```

```
Out[ ]:=
```

large output show less show more show all set size limit...

```
(* 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

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[wbm8, 1600]];
```

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

```
In[ ]:= SeedRandom[0];
wbm8 = 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[wbm8, 400]]
```

Out[]:=



```
In[ ]:= Export["C:/drorbn/AcademicPensieve/2008-12/KnottedCandiesTo8_WB_1600.png",
  ImageResize[wbm8, 1600]];
```