

Pensieve header: Knot Signatures as in KnotTheory`. Continues pensieve://Projects/KnotTheory/Testing/.

```
In[ ]:= SetDirectory["C:\\drorbn\\AcademicPensieve\\Projects\\Signatures"];
<< Common.m
```

Loading KnotTheory` version of February 2, 2020, 10:53:45.2097.
Read more at <http://katlas.org/wiki/KnotTheory>.

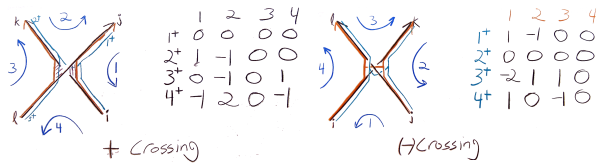
pdf

Knot Signatures as in KnotTheory`

tex

```
{\def\nbpdfText#1{\includegraphics[width=\linewidth]{#1}}
```

pdf



tex

```
}
```

```
In[ ]:= KS1[K_] := Module[{spd, x, a, s = 0, c, cs, A, is},
  spd = (Times @@ PD[K]) /. x_X => If[PositiveQ@x, Xp @@ x, Xm @@ x];
  cs = spd /. {
    Xp[i_, j_, k_, L_] => a[j, ++s, i] a[k, ++s, -j] a[-L, ++s, -k] a[-i, ++s, L],
    Xm[i_, j_, k_, L_] => a[-j, ++s, i] a[k, ++s, j] a[L, ++s, -k] a[-i, ++s, -L]
  } /. a[i_, x_, j_] a[j_, y_, k_] => a[i, x, y, k] /. a[i_, x_, j_] => a[x];
  A = Table[0, {Length[cs]}, {Length[cs]}];
  Do[is = Position[cs, #][[1, 1]] & /@ (4 i - {3, 2, 1, 0});
  A[[is, is]] += If[Head[spd[[i]]] === Xp,
     $\begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & -1 & 0 & 0 \\ 0 & -1 & 0 & 1 \\ -1 & 2 & 0 & -1 \end{pmatrix}$ ,
     $\begin{pmatrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ -2 & 1 & 1 & 0 \\ 1 & 0 & -1 & 0 \end{pmatrix}$ 
  ],
  {i, Length[spd]}];
  MatrixSignature[A + A^T];
```

```
In[ ]:= KS1[PD@Knot[3, 1]]
```

Out[]:=

2

```
In[ ]:= Total[(KS1[#] == -KnotSignature[#]) & /@ AllKnots[{3, 10}]]
```

Out[]:=

249 True

Tristram-Levine

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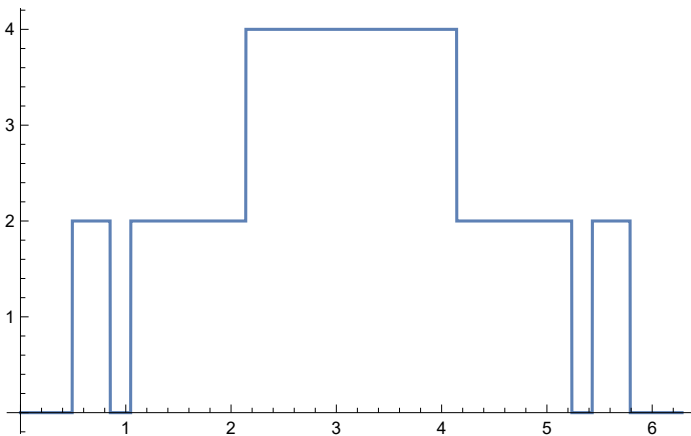
```
In[*]:= TLS1[K_, ω_] := Module[{spd, a, s = 0, c, cs, A, is},
  spd = Times @@ PD[K] /. x_X => If[PositiveQ@x, Xp, Xm] @@ x;
  cs = spd /. {
    Xp[i_, j_, k_, l_] => a[j, i][++s] a[k, -j][++s] a[-l, -k][++s] a[-i, l][++s],
    Xm[i_, j_, k_, l_] => a[-j, i][++s] a[k, j][++s] a[l, -k][++s] a[-i, -l][++s]
  } /. a_{i_, j_}[x_] a_{j_, k_}[y_] => a_{i, k}[x, y] /. a_{_}[x_] => a[x];
  A = Table[0, Length@cs, Length@cs];
  Do[is = Position[cs, 4 i - #][[1, 1]] & /@ {3, 2, 1, 0};

  A[[is, is]] += If[spd[[i, 0]] === Xp,
    
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & -1 & 0 & 0 \\ 0 & -1 & 0 & 1 \\ -1 & 2 & 0 & -1 \end{pmatrix}, \begin{pmatrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ -2 & 1 & 1 & 0 \\ 1 & 0 & -1 & 0 \end{pmatrix}],
    {i, Length[spd]}];
  Total[Sign[Select[
    Eigenvalues[(1 - ω) A + (1 - ω*) A^T], Abs[#] > 10^-6 &]]]]];$$

```

```
In[*]:= Plot[TLS1[Knot@"K12a422", e^i t], {t, 0, 2 π}]
```

Out[*]=



```
In[*]:= Total[(TLS1[#, -1] == -KnotSignature[#]) & /@ AllKnots[{3, 10}]]
```

Out[*]=

249 True

tex

{\red\bf To do.} Alexander in this language.

Done in {\tt AlexanderAsFxF.nb}.