

<< KnotTheory`

Loading KnotTheory` version of September 6, 2014, 13:37:37.2841.

Read more at <http://katlas.org/wiki/KnotTheory>.

The genus is $g = \frac{1}{2} (\text{Length}[L] - \text{cycles} + 2)$

SetAttributes[P, Orderless]

```
CG[K_PD] := Module[{k, kk, A, AA, B, BB, a, aa, b, bb, n = Length[K]},
  k = K /. X[i_, j_, k_, L_] => If[TrueQ[Mod[i, 2] == 0], X[i, j, k, L], X[L, i, j, k]];
  A = k //. X[i_, j_, k_, L_] => P[i, j] P[k, L];
  B = k //. X[i_, j_, k_, L_] => P[i, L] P[j, k];
  a = (Times @@ A) //. P[i_, j_] P[j_, k_] => P[i, k];
  b = (Times @@ B) //. P[i_, j_] P[j_, k_] => P[i, k];

  kk = K /. X[i_, j_, k_, L_] => If[TrueQ[Mod[i, 2] == 0], X[L, i, j, k], X[i, j, k, L]];
  AA = kk //. X[i_, j_, k_, L_] => P[i, j] P[k, L];
  BB = kk //. X[i_, j_, k_, L_] => P[i, L] P[j, k];
  aa = (Times @@ AA) //. P[i_, j_] P[j_, k_] => P[i, k];
  bb = (Times @@ BB) //. P[i_, j_] P[j_, k_] => P[i, k];

  Cases[{ $\frac{1}{2} (n - \text{Length@Variables}[a] - \text{Length@Variables}[b] + 2)$ ,
 $\frac{1}{2} (n - \text{Length@Variables}[aa] - \text{Length@Variables}[bb] + 2)$ }, _Integer][[1]]]
```

This only works for mod2 numberable knots, because those admit crossing changes that make them alternating. (This is a remark from Micah in an upcoming paper.)

```
k36 = PD[X[3, 6, 4, 1], X[1, 4, 2, 5], X[5, 2, 6, 3]];
CG[k36]
```

0

```
k487 = PD[X[3, 8, 4, 1], X[5, 1, 6, 2], X[6, 2, 7, 3], X[4, 7, 5, 8]];
CG[k487]
```

2

Turning a Gauss code into PD notation, because Green's table doesn't have it for knots with more than 4 crossings.

```
GCToPD[K_] := Module[{j, l = Length@Characters[K] / 3},
  i[j_] :=
  (StringPosition[K, StringReplace["On", "n" -> TextString[j]]][[1]][[1]] - 1) / 3 + 1;
  p[j_] := If[StringContainsQ[K, StringReplace["On+", "n" -> TextString[j]]],
  i[j], n[j] + 1];
  n[j_] := If[StringContainsQ[K, StringReplace["On-", "n" -> TextString[j]]],
  i[j], p[j] + 1];
  L = PD @@ Table[
  X[(t - 1) / 3 + 1, Mod[n[Characters[K][[t + 1]]], 1, 1], Mod[(t - 1) / 3 + 2, 1, 1],
  Mod[p[Characters[K][[t + 1]]], 1, 1], {t, Union@Flatten@StringPosition[K, "U"]}]
]
```

WW = **GctoPD**["01-02-U1-U3-U4-U2-04-03-"]

PD[X[3, 1, 4, 2], X[4, 8, 5, 1], X[5, 7, 6, 8], X[6, 2, 7, 3]]

QQ = **GctoPD**["01-02-U1-U3+04+03+U4+U2-"]

PD[X[3, 1, 4, 2], X[4, 7, 5, 6], X[7, 6, 8, 5], X[8, 2, 1, 3]]

CG[**WW**]

CG[**QQ**]

Part: Part 1 of {} does not exist.

{ } [[1]]

2

The program sometimes runs on knots it shouldn' t run on.