

Pensieve header: An attempt on a concise implementation of the FastKh algorithm.

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

EC[λ_List] := Module[{ρ, ec, p},
  ec = Fold[
    (ρ = First /@ Position[#1, #2];
     Append[Delete[#1, List /@ ρ], Union@@ (#1[[ρ]])]) &,
    λ, Union @@ λ
  ] // SortBy[#, First] &;
  p = Union@@Replace[ec, c_ -> ((# -> First[c]) & /@ c), {1}];
  {ec, First /@ ec, p}
];

dot /: dot[_]^k_ := 0;
EC[λ_S] := EC[Join@@List@@@ {λ}];
(σ_S)[i_] := Cases[σ, {i, j_} | {j_, i} -> j][[1]]

VCLaw[β_S, μ_S, τ_S] := Module[
  {$, comps, p, ins1, ins2, outs, χs, χ, h, law1 = {}, law2 = {}, dec},
  {$, comps, p} = EC[β, μ, τ];
  ins1 = EC[β, μ][[2]]; ins2 = EC[μ, τ][[2]]; outs = EC[β, τ][[2]];
  χs = 
$$\frac{\text{Times} @@ (\text{h} /@ \text{Join}[\text{ins1}, \text{ins2}, \text{outs}] /. \text{p})}{\text{PowerExpand}[(\text{Times} @@ (\text{h} /@ (\text{Last} /@ \text{p}))^{1/2}]}$$
;
  dec = χs /. h[i_]^{x_} -> (2 dot[i])^{(2-x)/2};
  dec *= Times @@ MapThread[If[#1 == #2, 1, dot[#1] + dot[#2]] &,
    {outs, outs /. p}];
  law1 = dot /@ ins1; law1 = Thread[law1 -> (law1 /. p)];
  law2 = dot /@ ins2; law2 = Thread[law2 -> (law2 /. p)];
  {law1, law2, Expand[dec]}
];

VC[Cob[β_S, μ_S, dots1_], Cob[μ_S, τ_S, dots2_]] := Module[
  {law1, law2, dec},
  {law1, law2, dec} = VCLaw[β, μ, τ];
  Cob[β, τ, Expand[dec * (dots1 /. law1) (dots2 /. law2)]]
];
```