

Pensieve header: Λ calculus as studied in Vietnam and on the way there.

bbCalculus.m is loaded only for comparisons.

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SetDirectory["C:\\drorbn\\AcademicPensieve\\2013-05"];
<< ../2012-05/bbCalculus.m;
bbSimplify = Factor;
tha[u_, x_][ $\beta_B$ ] := swaphth[u, x][ $\beta$ ];

f_ \ key_ := DeleteCases[f, key -> _];
f_ \ keys_List := Fold[#1 \ #2 &, f, keys];

Alternate[expr_] := Expand[expr /. (s_Ts | s_Hs) => Signature[s] Sort[s]];

te[u_] := L[Hs[] Ts[], {}];
he[x_] := L[Hs[] Ts[], {x -> 1}];
 $\rho^+$ [u_, x_] := L[Ts[] Hs[] + (t_u - 1) Ts[u] Hs[x], {x -> t_u}];
 $\rho^-$ [u_, x_] := L[Ts[] Hs[] + (t_u-1 - 1) Ts[u] Hs[x], {x -> t_u-1}];
R+[a_, b_] :=  $\rho^+$ [a, b] he[a] te[b];
R-[a_, b_] :=  $\rho^-$ [a, b] he[a] te[b];

L /: L[ $\lambda_1$ _,  $\sigma_1$ _] L[ $\lambda_2$ _,  $\sigma_2$ _] := Module[{Hs1, Ts1, Hs2, Ts2},
  L[
    Expand[( $\lambda_1$  /. {Ts -> Ts1, Hs -> Hs1}) * ( $\lambda_2$  /. {Ts -> Ts2, Hs -> Hs2})] /.
      Ts1[ts1___] * Ts2[ts2___] => Ts[ts1, ts2] /.
      Hs1[hs1___] * Hs2[hs2___] => Hs[hs1, hs2],
    Join[ $\sigma_1$ ,  $\sigma_2$ ] // Sort
  ] // Alternate
];

R-[1, 2]
L[Hs[] Ts[] - Hs[2] Ts[1] +  $\frac{Hs[2] Ts[1]}{t_1}$ , {1 -> 1, 2 ->  $\frac{1}{t_1}$ }]

tm[u_, v_, w_][L[ $\lambda$ _,  $\sigma$ _]] := L[ $\lambda$ ,  $\sigma$ ] /. {
  ts_Ts => (ts /. {u -> w, v -> w}),
  t_u -> t_w, t_v -> t_w
} // Alternate;

hm[x_, y_, z_][L[ $\lambda$ _,  $\sigma$ _]] := Module[
  { $\sigma_x = x$  /.  $\sigma$ ,  $\sigma_y = y$  /.  $\sigma$ },
  L[
    ( $\lambda$  /. hs_Hs /; MemberQ[hs, y] =>  $\sigma_x$  * hs) /. hs_Hs => (hs /. {x -> z, y -> z}),
    Union[ $\sigma$  \ {x, y}, {z ->  $\sigma_x$  *  $\sigma_y$ }]
  ] // Alternate
]

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tha[u_, x_][L[λ_, σ_]] := Module[
  {σx = x /. σ},
  L[Plus[
    λ /. ts_Ts /; MemberQ[ts, u] => σx * ts,
    Expand[λ /. {
      ts_Ts => If[FreeQ[ts, u], 0, (-1)Position[ts,u][[1,1]] * DeleteCases[ts, u],
      hs_Hs => If[FreeQ[hs, x], 0, (-1)Position[hs,x][[1,1]] * DeleteCases[hs, x]
    }]]
  ], σ] // Alternate
]

dm[a_, b_, c_][Λ_L] := Λ // tha[a, b] // tm[a, b, c] // hm[a, b, c];

B[L[λ_, σ_]] := bbCollect[B[
  Coefficient[λ, Hs[] Ts[]] /. t_u_ => T_u,
  Plus @@ (σ /. (x_ -> σx_) => h[x] (σx /. t_u_ => T_u)),
  λ /. {Ts[u_] => t[u], Hs[x_] => h[x]} /. {_Ts -> 0, _Hs -> 0} /. t_u_ => T_u
]];

```