INPUT: a genotype G_i partitioned into m segments $\{(g_1, g'_1), ..., (g_m, g'_m)\}$.

Let L and L' denote two lists of quadruplets as defined above.

Make a "root" quadruplet $q_R = \{h_R, \alpha_R, h'_R, \alpha'_R\}$ *:*

1. *Set* $h_R = g_1$. *Initialize* α_R *by expression (5) on the first marker of* g_1. *And compute* α_R *by recursive application of expression (6) on the other markers of* g_1.
2. *Set* $h'_R = g'_1$. *Initialize* α'_R *by expression (5) on the first marker of* g'_1. *And compute* α'_R *by recursive application of expression (6) on the other markers of* g'_1.

Put q_R *in L.*

For j from 2 to m

For each "parent" quadruplet $q_P = \{h_P, \alpha_P, h'_P, \alpha'_P\}$ *of L do*

Make two "children" quadruplets $q_{C1} = \{h_{C1}, \alpha_{C1}, h'_{C1}, \alpha'_{C1}\}$ *and* $q_{C2} = \{h_{C2}, \alpha_{C2}, h'_{C2}, \alpha'_{C2}\}$ *:*

1. *Set* $h_{C1} = h_P + g_j$. *Initialize* $\alpha_{C1} = \alpha_P$. *And compute* α_{C1} *by recursive application of expression (6) on markers of* g_j.
2. *Set* $h'_{C1} = h'_P + g'_j$. *Initialize* $\alpha'_{C1} = \alpha'_P$. *And compute* α'_{C1} *by recursive application of expression (6) on markers of* g'_j.
3. *Set* $h_{C2} = h_P + g'_j$. *Initialize* $\alpha_{C2} = \alpha_P$. *And compute* α_{C2} *by recursive application of expression (6) on markers of* g'_j.
4. *Set* $h'_{C2} = h'_P + g_j$. *Initialize* $\alpha'_{C2} = \alpha'_P$. *And compute* α'_{C2} *by recursive application of expression (6) on markers of* g_j.

Put q_{C1} *and* q_{C2} *in L'.*

Delete L.

L = L'.

OUTPUT:

For each "leaf" quadruplet $q_L = \{h_L, \alpha_L, h'_L, \alpha'_L\}$ *of L do*

Put (h_L, h'_L) *in* S_i.

Compute $\Pr(h_L, h'_L \mid H_{-i}^{(t)}, \rho)$ *from* α_L *and* α'_L *by expression (3) and (1).*