Algorithm 1 Pseudo-code for the new $O(zl^2)$ algorithm

Order base pairs in $A$ by their ending nucleotides; Order base pairs in $B$ by their ending nucleotides; Initialize the OPM list $\mathcal{O} \leftarrow \emptyset$;

for $i = 1$ to $|\mathcal{P}^A|$ do

$p^A \leftarrow$ $i$th base pair in $A$

for $j = 1$ to $|\mathcal{P}^B|$ do

$p^B \leftarrow$ $j$th base pair in $B$; Compute $M_l[p^A, p^B]$;

Estimate $\hat{M}_h[p^A, p^B]$ with Equation 10, $M_h[p^A, p^B] \leftarrow \hat{M}_h[p^A, p^B]$;

if $\hat{M}_h[p^A, p^B] \geq M_l[p^A, p^B]$ then

Compute $M_h[p^A, p^B]$;

end if

$M[p^A, p^B] \leftarrow \max(M_l[p^A, p^B], M_h[p^A, p^B])$; Compute $M[\bar{p}^A, \bar{p}^B]$;

if $M[p^A, p^B] \geq M[\bar{p}^A, \bar{p}^B]$ then

Identify the matching of $p^A$ and $p^B$ as an OPM $o^{A,B}$;

for each OPM $o_{k,k'}^{A,B} \in \mathcal{O}$ do

Estimate $\hat{U}_l[o_{k,k'}^{A,B}, o^{A,B}]$ and $\hat{U}_r[o_{k,k'}^{A,B}, o^{A,B}]$ with Equation 11;

if $M[p^A, p^B] \geq \hat{U}_l[o_{k,k'}^{A,B}, o^{A,B}] + \hat{U}_r[o_{k,k'}^{A,B}, o^{A,B}] + M[p_k^A, p_k^B]$ and There exists no base pair between $o_{k,k'}^{A,B}$ and $o^{A,B}$ then

Remove $o_{k,k'}^{A,B}$ from the OPM list $\mathcal{O}$;

end if

end for

Add $o^{A,B}$ to the OPM list $\mathcal{O}$;

end if

end for

end for