?
Positional Burrows–Wheeler Transform
trasformata di Burrows–Wheeler posizionale
aplotipo
??
?
genotipo
X
M
x_i
$i = 0, \ldots, M-1$
N
$k = 0, \ldots, N-1$
X
$\Sigma = \{0, 1\}$
$0 \prec 1$

(1) $$x_i[k] = \{0, 1\}$$

$x_i[k_1, k_2)$
x_i
k_1
$k_2 - 1$
$x_i \in X$
x_i
x_j
k_1
$k_2 - 1$

(2) $$x_i[k_1, k_2) = x_j[k_1, k_2)$$

x_i
x_j

(3) $$(k_1 = 0 \vee x_i[k_1-1] \neq x_j[k_1-1]) \wedge (k_2 = N \vee x_i[k_2] \neq x_j[k_2])$$

z
X
z
$x_i \in X$
k_1
$k_2 - 1$
z
x_j
$[k_1, k_2)$
z
k_1
$k_2 - 1$
X
k
$k - 1$
k
k
k
$k + 1$
X
k
prefix array
a_k
$\{0, \ldots, M-1\}$
$a_k[i] = j$
x_j
i
X
k
X

(4) $$y_i^k[j] = x_{a_k[i]}[j]$$

y_i^k
i
k
j
j
a_{k+1}

y_i^k
y_j^k
$i <$
j
$\max_{i<m\leq j} d_k[m]$

(7)

l_k
k
$l_k[i] = k - d_k[i]$

(8)

$X =$
$\{x_0, x_1, \ldots, x_{M-1}\}$
M
N
X
$N+$
1
(a_k, d_k)
$0 \leq$
$k \leq$
N
a_{k+1}
d_{k+1}
a_k
d_k
??
$\mathcal{O}(NM)$

(9)

α_k
a_k
$\alpha_k[i] = j \iff a_k[j] = i$

??
T a_k
T α_k
T d_k l_k
k
M
a_k
d_k
$u \leftarrow$
0
$v \leftarrow$
0
$p \leftarrow$
$k+$
1
$q \leftarrow$
$k+$
1
$a \leftarrow$
$[]$
$b \leftarrow$
$[]$
$d \leftarrow$
$[]$
$e \leftarrow$
$[]$
every
$i \in$
$[0, M-$
$1]$
$d_k[i] >$
p
$p \leftarrow$
$d_k[i]$
$d_k[i] >$
q
$q \leftarrow$
$d_k[i]$
$y_i^k[k] =$
0
$a[u] \leftarrow$
$a_k[i]$
$d[u] \leftarrow$
p
$u \leftarrow$
$u+$
1
$p \leftarrow$
0
$b[v] \leftarrow$
$a_k[i]$
$e[v] \leftarrow$
q
$v \leftarrow$
$v+$
1
$q \leftarrow$
0
$a_{k+1} \leftarrow$
$concatenate(a, b)$
$d_{k+1} \leftarrow$
$concatenate(d, e)$
a_{k+1}
d_{k+1}
a_k
d_k