
Algorithm 1 Computation of Trace Points from a given CIGAR-String

Input: $seq1, seq2, start_seq1, end_seq1, start_seq2, \Delta, cigar$ mit

$|seq1|, |seq2|, |cigar| > 0;$
 $start_seq1, start_seq2 \geq 0;$
 $start_seq1 < end_seq1$ und
 $\Delta > 0$

Output: Array TP of Trace Points

```
1: function encode( $seq1, seq2, start\_seq1, end\_seq1, start\_seq2, \Delta, cigar$ )
2:    $itv\_size \leftarrow MAX(1, \lceil start\_seq1 / \Delta \rceil)$ 
3:    $itv\_count \leftarrow MIN(\lceil |seq1| / \Delta \rceil, \lceil |seq2| / \Delta \rceil)$ 
4:   for  $i \leftarrow 0$  upto  $|itv\_count|$  do
5:      $itv[i] \leftarrow \begin{cases} start\_seq1, itv\_size \cdot \Delta - 1 & \text{if } i = 0 \\ (itv\_size + i - 1) \cdot \Delta, (itv\_size + i) \cdot \Delta - 1 & \text{if } 0 < i < |itv\_count| \\ (itv\_size + i - 1) \cdot \Delta, end\_seq1 - 1 & \text{else.} \end{cases}$ 
6:   end for
7:    $count1, count2, count3 \leftarrow 0$ 
8:    $TP \leftarrow$  Array for Trace Points
9:   for each ( $cig\_count, cig\_symbol$ ) in  $cigar$  do
10:    for  $i \leftarrow 0$  upto  $cig\_count$  do
11:      if  $cig\_symbol = 'I'$  then
12:        increment  $count1$ 
13:      else if  $cig\_symbol = 'D'$  then
14:        increment  $count2$ 
15:      else
16:        increment  $count1, count2$ 
17:      end if
18:      if  $count1 = intervals[count3][1] + 1$  and  $count1 \neq |seq1|$  then
19:        append ( $count2 - 1 + start\_seq2$ ) to  $TP$ 
20:      end if
21:      if  $count \neq |itv| - 1$  then
22:        increment  $count3$ 
23:      end if
24:    end for
25:  end for
26:  return  $TP$ 
27: end function
```

Algorithm 2 Computation of a CIGAR-String from a given Trace Point Array

Input: $seq1, seq2, \Delta, TP$ mit
 $|seq1|, |seq2|, \Delta, |TP| > 0$

Output: CIGAR-String

```
1: function decode(seq1, seq2,  $\Delta$ , TP)
2:   cig  $\leftarrow$  empty String
3:   for  $i \leftarrow 0$  upto  $|TP|$  do
4:     append to cig:
       
$$\begin{cases} \mathbf{cigar}(seq1[0... \Delta], seq2[0... TP[i] + 1]) & \text{if } i = 0 \\ \mathbf{cigar}(seq1[i \cdot \Delta... |seq1|], seq2[TP[i - 1] + 1... |seq2|]) & \text{if } i = |TP| - 1 \\ \mathbf{cigar}(seq1[i \cdot \Delta... (i + 1) \cdot \Delta], seq2[TP[i - 1] + 1... TP[i] + 1]) & \text{else.} \end{cases}$$

5:   end for
6:   cig  $\leftarrow$  combine(cig)
7:   return cig
8: end function
9:
10: function combine(cigar)
11:   cig  $\leftarrow$  empty String
12:   tmp  $\leftarrow 0$ 
13:   for each (cig_count, cig_symbol) in cigar do
14:     tmp  $\leftarrow$  tmp + previous_cig_count
15:     if cig_symbol = previous_cig_symbol then
16:       if not last element in cigar then
17:         tmp  $\leftarrow 0$ 
18:       end if
19:     end if
20:     if last element in cigar then
21:       append (tmp + cig_count, cig_symbol) to cig
22:     end if
23:   end for
24:   return cig
25: end function
```
