```
1                       algorithm Alignment
2                       input: phonetic strings $x$ and $y$
3                       output: alignment of $x$ and $y$
4                       define $S(i,j) = -\infty$ when $i < 0\, or\, j < 0$
5
6                       for $i := 0$ to $|x|$ do
7                           $S(i,0) := 0$
8                       for $j := 0$ to $|y|$ do
9                           $S(0,j) := 0$
10                      for $i := 1$ to $|x|$ do
11                          for $j := 1$ to $|y|$ do
12                              $S(i,j) := max($
13                                  $S(i-1,j) + \sigma_{skip}(x_i),$
14                                  $S(i,j-1) + \sigma_{skip}(y_j),$
15                                  $S(i-1,j-1) + \sigma_{sub}(x_i,y_j),$
16                                  $S(i-1,j-2) + \sigma_{exp}(x_i,y_{j-1}y_j),$
17                                  $S(i-2,j-1) + \sigma_{exp}(x_{i-1}x_i,y_j),$
18                                  $0)$
19
20                      $T := (1-\epsilon) \cdot \max_{i,j} S(i,j)$
21
23                      for $i \leftarrow 1$ to $|x|$ do
24                          for $j \leftarrow 1$ to $|y|$ do
25                              if $S(i,j) \geq T$ then
26                                  Retrieve$(i,j,0)$
```

Table 4.23: The algorithm for computing the alignment of two phonetic strings.

```
1            procedure Retrieve(i, j, s)
2
3            if S(i, j) = 0 then
4                    print(Out)
5                    print("alignment score is s")
6            else
7                    if S(i − 1, j − 1) + σ_sub(x_i, y_j) + s ≥ T then
8                            push(Out, "align x_i with y_j")
9                            Retrieve(i − 1, j − 1, s + σ_sub(x_i, y_j))
10                           pop(Out)
11                   if S(i, j − 1) + σ_skip(y_j) + s ≥ T then
12                           push(Out, "align null with y_j")
13                           Retrieve(i, j − 1, s + σ_skip(y_j))
14                           pop(Out)
15                   if S(i − 1, j − 2) + σ_exp(x_i, y_{j−1}y_j) + s ≥ T then
16                           push(Out, "align x_i with y_{j−1}y_j")
17                           Retrieve(i − 1, j − 2, s + σ_exp(x_i, y_{j−1}y_j))
18                           pop(Out)
19                   if S(i − 1, j) + σ_skip(x_i) + s ≥ T then
20                           push(Out, "align x_i with null")
21                           Retrieve(i − 1, j, s + σ_skip(x_i))
22                           pop(Out)
23                   if S(i − 2, j − 1) + σ_exp(y_j, x_{i−1}x_i) + s ≥ T then
24                           push(Out, "align x_i x_{i−1} with y_j")
25                           Retrieve(i − 2, j − 1, s + σ_exp(y_j, x_{i−1}x_i))
26                           pop(Out)
```

Table 4.25: The procedure for retrieving alignments from the similarity matrix.