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1  /*
2  * Shamim Bin Zahid
3  * Roll 43
4  * Lab 01
5  */
6  import java.util.Scanner;
7  public class Main {
8      private static String alignmentA, alignmentB;
9      private static int lenA, lenB;
10     private static int match, mismatch, gap;
11     private static int score=0;
12     private static int[][] scores= new int[100][100];
13
14     public static int SimilarityCheck(char a, char b){
15         if(a==b)
16             return match;
17         else if(a=='_' || b=='_')
18             return gap;
19         else
20             return mismatch;
21     }
22
23     public static void CalculateScores(String sequenceA, String sequenceB){
24         int align, delete, insert;
25         int lenA = sequenceA.length();
26         int lenB = sequenceB.length();
27         for (int i=0; i<=lenA; i++){
28             scores[i][0] = gap * i;
29         }
30         for(int j=0; j<=lenB; j++){
31             scores[0][j] = gap * j;
32         }
33         for(int i=1; i<=lenA; i++){
34             for (int j=1; j<=lenB; j++){
35                 align = scores[i-1][j-1] + SimilarityCheck(sequenceA.charAt(i-1), sequenceB.charAt(j-1));
36                 delete = scores[i-1][j] + gap;
37                 insert = scores[i][j-1] + gap;
38                 scores[i][j] = Math.max(align, Math.max(delete, insert));
39             }
40         }
41     }
42
43     public static void PrintScores(String sequenceA, String sequenceB){
44         int lenA = sequenceA.length();
45         int lenB = sequenceB.length();
46         System.out.print("\t"+"\t");
47         for(int j=0; j<lenB; j++){
48             System.out.print(sequenceB.charAt(j)+"\t");
49         }
50         System.out.println();
51         for(int i=0; i<=lenA; i++){
52             if(i==0) {
53                 System.out.print("\t");
54             }
55             if(i>0){
56                 System.out.print(sequenceA.charAt(i-1)+"\t");
57             }
58             for(int j=0; j<=lenB; j++){
59                 System.out.print(scores[i][j)+"\t");
60             }
61             System.out.println();
62         }
63     }
64
65     public static void GlobalAlignment(String sequenceA, String sequenceB){
66         String ansAlignA="";
67         String ansAlignB="";
68         int i = sequenceA.length();
69         int j = sequenceB.length();
70         while(i>0 || j>0){
71             if(i>0 && j>0 && scores[i][j]==scores[i-1][j-1]+SimilarityCheck(sequenceA.charAt(i-1), sequenceB.charAt(j-1))){
72                 ansAlignA += sequenceA.charAt(i-1);

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73         ansAlignB += sequenceB.charAt(j-1);
74         i--;
75         j--;
76     }
77     else if(i>0 && scores[i][j]==scores[i-1][j]+gap){
78         ansAlignA += sequenceA.charAt(i-1);
79         ansAlignB += "_";
80         i--;
81     }
82     else{
83         ansAlignA += "_";
84         ansAlignB += sequenceB.charAt(j-1);
85         j--;
86     }
87 }
88 int lenA = ansAlignA.length();
89 int lenB = ansAlignB.length();
90 System.out.print("Sequence A \t");
91 for(int k=lenA-1; k>=0; k--){
92     System.out.print(ansAlignA.charAt(k));
93 }
94 System.out.println();
95 System.out.print("Sequence B \t");
96 for(int k=lenB-1; k>=0; k--){
97     System.out.print(ansAlignB.charAt(k));
98 }
99 System.out.println();
100 for(int k=lenA-1; k>=0; k--){
101     score += SimilarityCheck(ansAlignA.charAt(k), ansAlignB.charAt(k));
102 }
103 System.out.println("Score value of the global alignment is: "+score);
104 }
105
106 public static void main(String[] args){
107     alignmentA = "CTCGCAGC";
108     alignmentB = "CATTGAG";
109     System.out.println("Sequence A: "+alignmentA);
110     System.out.println("\nSequence B: "+alignmentB);
111     lenA = alignmentA.length();
112     lenB = alignmentB.length();
113     match = +10;
114     mismatch = -2;
115     gap = -5;
116     System.out.println("\nMatch Point: "+match);
117     System.out.println("\nMismatch Penalty: "+mismatch);
118     System.out.println("\nGap Penalty: "+gap);
119
120     CalculateScores(alignmentA, alignmentB);
121
122     System.out.println("\n\nGlobal Alignment Table");
123     PrintScores(alignmentA, alignmentB);
124
125     System.out.println("\n\n");
126     GlobalAlignment(alignmentA, alignmentB);
127 }
128 }

```