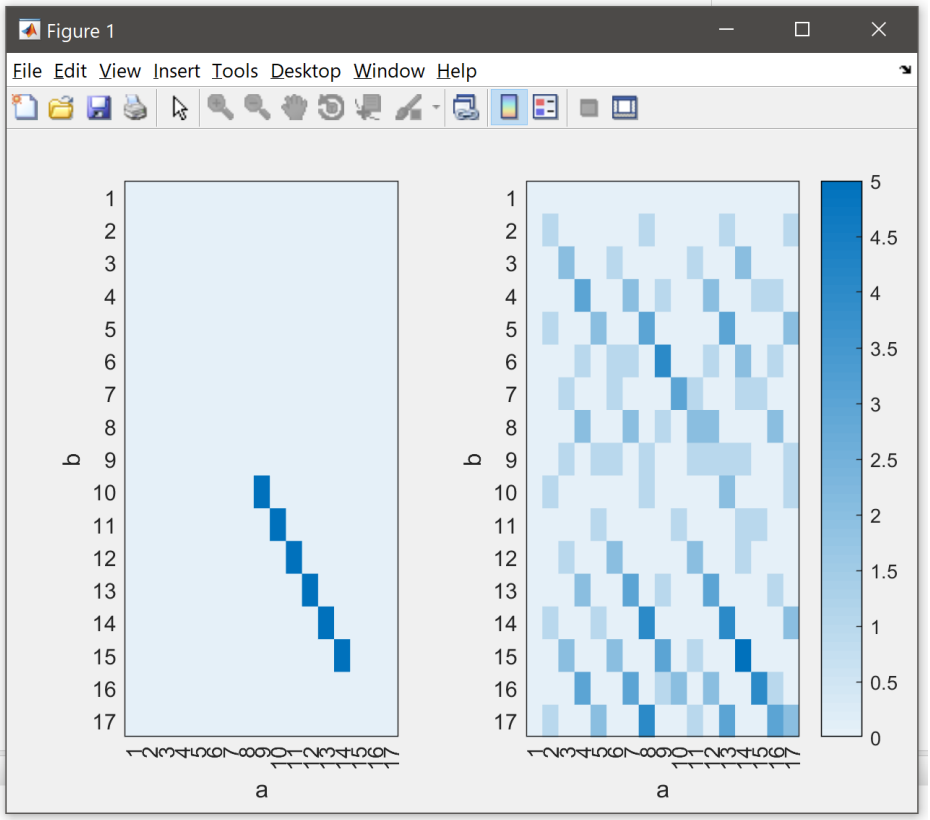
Zadanie 3

Wojciech Miśta, 236453

Algorytmy znajdują się w osobnych plikach w repozytorium.

Działanie:

```
Gap: -2
ID: a
ATCACTCTAGTCATCA
ID: b
ATCGTCACGTCATGCA


AGTCAT
CGTCAT

***
```




```
mmand Window
ans =

  1×2 table

    seq1       seq2
    _____      _____

    AGTCAT     CGTCAT
```

Analiza złożoności obliczeniowej:

scoreMatrix.m

```
function [scoredMatrix, indexMatrix] = scoreMatrix(scoredMatrix, match, mismatch, gap, m, n)
    indexMatrix = zeros(size(scoredMatrix));
    for k = 1:m%wiersze
        for p = 1:n%kolumny
            if (scoredMatrix(k+1,p+1) == 1)
                val1 = scoredMatrix(k,p) + match;
            else
                val1 = scoredMatrix(k,p) + mismatch;
            end
                valGap1 = scoredMatrix(k,p+1) + gap; %one up
                valGap2 = scoredMatrix(k+1,p) + gap; %one left
                [maxValue,index] = max([val1 valGap1 valGap2]);
                scoredMatrix(k+1,p+1) = maxValue;
                %if 1 - match/mismatch
                %if 2 - gap up
                %if 3 - gap left
                indexMatrix(k+1,p+1) = index;
        end
    end
end
```

m,n – długość sekwencji wejściowej

Złożoność obliczeniowa: O(mn)

Złożoność przestrzenna: O(mn)

findMatch.m

parseFasta.m | testing.m | Main.m | findPath.m | smithWaterman.m | Mai

```
function point = findMatch(substitutionMatrix,nuclOne,nuclTwo)

vecRow = substitutionMatrix(1,:);
vecCol = substitutionMatrix(:,1);

x = char(vecRow) == nuclOne;
y = char(vecCol) == nuclTwo;

point = str2double(char(substitutionMatrix(x,y)));

end
```

p – rozmiar zmiennej 'substitutionMatrix'

Złożoność czasowa: O(p)

Złożoność przestrzenna: $O(p^2)$

findCooridnates.m

```
function [XCor,YCor] = findMaxCoordinates(scoredMatrix,maxValue)
%Finds coordinates of the max value and stores it in two separate matrices.

XCorLength = length(scoredMatrix(:,1)); %substitution +1
YCorLength = length(scoredMatrix(1,:)); %substitution +1

XCor = []; %substitution +1
YCor = []; %substitution +1

%find occurances of the max value
for m = 1:XCorLength %incrementation, checking condition, n*x; 2 + n*x
    for n = 1:YCorLength %incrementation, checking condition, m*x; 2 + m*x
        if scoredMatrix(m,n) == maxValue %checking condition +1
            XCor(end+1) = m; %substitution +1
            YCor(end+1) = n; %substitution +1
        end
    end
end

end
```

x – rozmiar zmiennej ‘XCor’

y – rozmiar zmiennej ‘YCor’

Złożoność czasowa: O(xy)

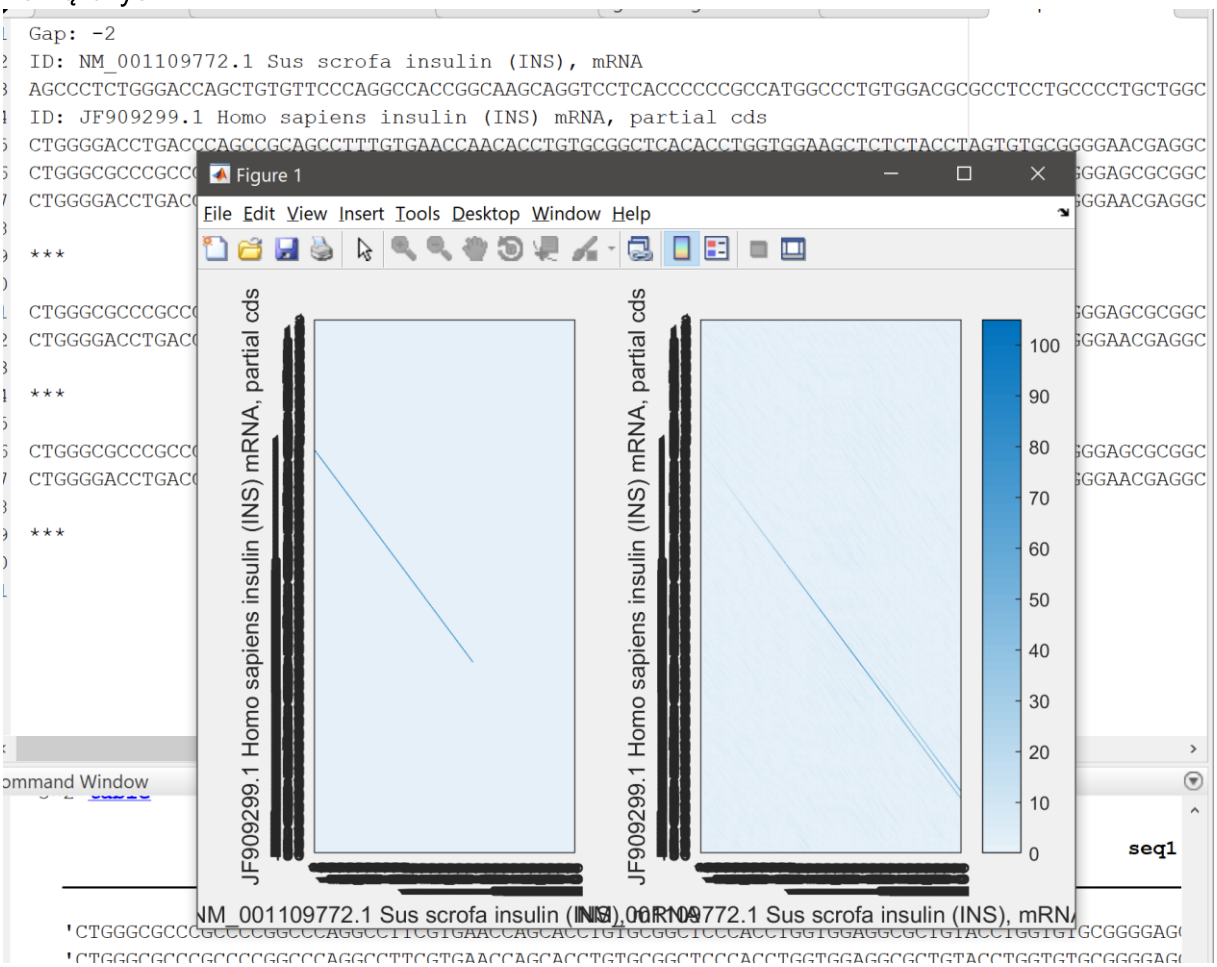
Złożoność czasowa: O(xy)

findPath.m

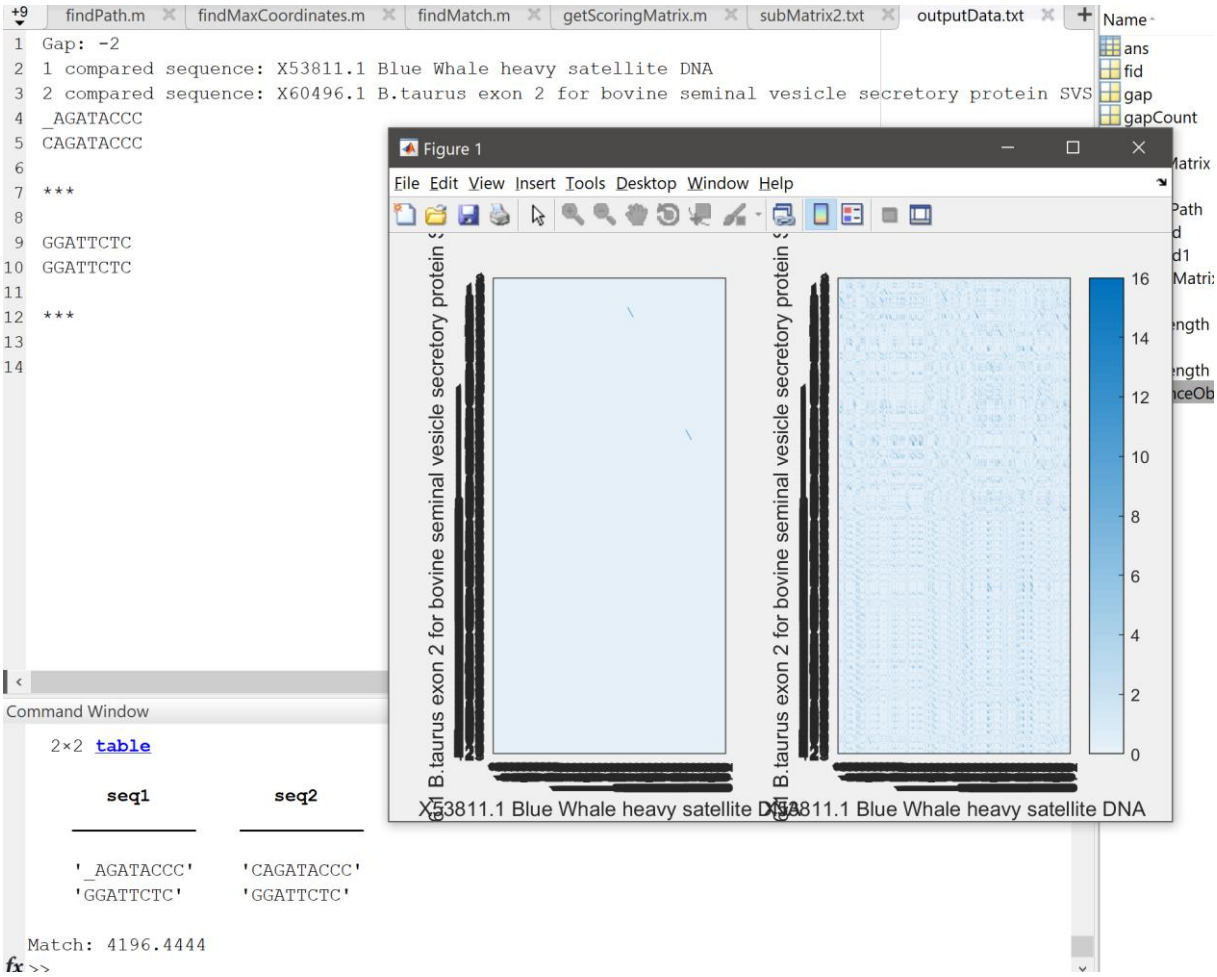
```
function [matrixPath,sequenceObject] = findPath(scoredMatrix,indexMatrix,XCor,YCor,seq1,seq2)
%FINDPATH Summary of this function goes here
%   Detailed explanation goes here
matrixPath = zeros(length(scoredMatrix(:,1)),length(scoredMatrix(1,:))); %substitution +1
index = 1; %substitution +1
sequenceObject = struct;
while index <= length(XCor) %nie ma znaczenia czy X czy Y
    curRow = XCor(index); %substitution +1
    curCol = YCor(index); %substitution +1
    index = index + 1; %substitution +1
    curIndex = indexMatrix(curRow, curCol); %substitution +1
    substitutionMatrix = getScoringMatrix('subMatrix.txt'); %substitution +1
    vecRow = substitutionMatrix(1,:); %substitution +1
    vecCol = substitutionMatrix(:,1); %substitution +1
    charArray1 = ''; %substitution +1
    charArray2 = ''; %substitution +1

    while (curIndex ~= 4) && (curIndex ~= 0)
        matrixPath(curRow, curCol) = 1; %substitution +1
        curIndex = indexMatrix(curRow, curCol) %substitution +1
        if(curIndex == 1) %checking condition + 1
            charArray1 = strcat(charArray1, seq1(curRow)); %substitution +1
            charArray2 = strcat(charArray2, seq2(curCol)); %substitution +1
            %check if mismatch?
            curRow = curRow - 1; %substitution +1
            curCol = curCol - 1; %substitution +1
        elseif(curIndex == 2) %checking condition
            charArray1 = strcat(charArray1, seq1(curRow)); %substitution +1
            charArray2 = strcat(charArray2, '_'); %substitution +1
            %gap up
            curRow = curRow - 1; %substitution +1
        elseif(curIndex == 3) %checking condition +1
            charArray1 = strcat(charArray1, '_'); %substitution +1
            charArray2 = strcat(charArray2, seq2(curCol)); %substitution +1
            %gap left
            curCol = curCol -1; %substitution +1

        end
    end
    charArray1 = strcat(charArray1, seq1(curRow)); %substitution +1
    charArray2 = strcat(charArray2, seq2(curCol)); %substitution +1
    sequenceObject(index-1).a = flip(charArray1) %substitution +1
    sequenceObject(index-1).b = flip(charArray2) %substitution +1
end
end
```

Porównanie par sekwencji

Powiązanych



Niepowiązanych



Wnioski:

- Zauważamy, że sekwencje niepowiązane wykazują znacznie krótsze odcinki dopasowania, w porównaniu do sekwencji powiązanych.