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Bioinformatics II

Assignment No. 3

Global variables:

Int[][] blosum62 – BLOSUM62 substitution matrix

**Class blast**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name: | Private buildWords |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| String sequence | Hash() hSW | Hash.insert() | doMSA() | none |
|  |  | p() |  |  |
| Processing: | Fills a hash table with Words() containers | | | |

Variables:

String word – three letter trimer of amino acids

Hash() hSW – Hash Table with high scoring words

String tempx, tempy, tempz, tempi, tempj, tempk – holds one amino acid each from looped sequences and possible high scoring matchs

Int tempScorex, tempScorey, tempScorez – holds similarity scores from calls to p()

Int tempScore – holds total score

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| --- | --- | --- | --- | --- |
| Name: | Private findMatchs |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| Hash() highScoringWords | Int ‘high score sequence name’ | Hash.find() | doMSA() | none |
| String querySeq | String ‘high score sequence’ | Hash.retrieveWord() |  |  |
|  | String ‘query sequence’ | Words.getLocations() |  |  |
|  |  | getLocalAlignmentScore() |  |  |
| Processing: | Loops through each trimer of AAs in each sequence in the database and calls to build alignment if the trimer is in the hash table | | | |

Variables:

String[] dataBase- holds 9 sequences for comparisons

Int maxScore – holds max score of local alignments

Int score – holds temp score for an alignment to check against max score

Int maxSeq – holds the index for the sequence with the max score

Words() currentWord – holds container for currently looped over word

Int[] locations – holds the locations word exists in

Int counter – keeps position in the locations array

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| --- | --- | --- | --- | --- | --- |
| Name: | Private getLocalAlignmentScore | |  |  |  |
| Inputs | Outputs | Calls | | Called by | Files |
| String tarSeq | Int ‘score’ | p() | | findMatchs | none |
| Int posTar |  |  | |  |  |
| String querySeq |  |  | |  |  |
| Int posQue |  |  | |  |  |
| Processing: | Extends each match to the left and right of the match and returns the alignment score | | | | |

Variables:

Int score – holds the score for the alignment

Int currPosTar, currPosQue – holds current position in respective sequence

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| --- | --- | --- | --- | --- |
| Name: | Private p |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| String aminoA1 | Int ‘substitution score’ | none | buildWords | none |
| String aminoA2 |  |  | getLocalAlignmentScore |  |
| Processing: | Compares amino acids and returns substitution score | | | |

Variables:

Int x, y – holds current position in BLOSUM matrix

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| --- | --- | --- | --- | --- |
| Name: | Private doMSA |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| ‘query sequence’ | none | buildWords() | none | none |
|  |  | findMatchs() |  |  |
| Processing: | Takes the input and drives the program | | | |

Variables:

String sequence – holds the query sequence

Hash() highScoringWords – Hash table that holds the high scoring words

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| --- | --- | --- | --- | --- |
| Name: | Private clearForm |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| none | none | none | none | none |
| Processing: | Clears the form | | | |

**Class Hash**

Global Variables:

Words[] wordsList – array that holds hash table

Int tableSize – holds the size of the table

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| --- | --- | --- | --- | --- |
| Name: | Public New |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| none | none | none |  | none |
| Processing: | Constructor for the class | | | |

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| --- | --- | --- | --- | --- |
| Name: | Public hash(String key) |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| String key | none | Hash(String key, Int tableSize) | Hash.insert() | none |
|  |  |  | Hash.find() |  |
| Processing: | Base case for recursive call to hash function | | | |

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| --- | --- | --- | --- | --- | --- | --- |
| Name: | Private Hash(String key, Int tableSize) | | |  |  |  |
| Inputs | Outputs | Calls | Called by | | | Files |
| String key | Int hashVal | none | Hash(String key) | | | none |
| Int tableSize |  |  |  | | |  |
| Processing: | Hash function | | | | | |

Variables:

Int hashVal – holds the index for the array from the hash function

Int charVal – holds the ASCII value for the current AA

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| --- | --- | --- | --- | --- |
| Name: | Public insert |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| String key | none | Words.getWord() | buildWords | none |
| Int loc |  | Words.insert() |  |  |
| Processing: | Inserts new Words() container or adds to the locations of one | | | |

Variables:

Int homeLocation – holds the value from the hash function

Int location – holds the index for the value from the quadratic probe

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name: | Public find |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| String key | Int location | Hash.hash(key) | Words.getWord() | none |
|  |  |  | findMatchs() |  |
|  |  |  | Hash.retrieveWord() |  |
| Processing: | Finds the hashVal for a word | | | |

Variables:

Int homeLocation – holds the value from the hash function

Int location – holds the index for the value from the quadratic probe

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name: | Public length |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| none | Int tableSize | none | none | none |
| Processing: | Accessor for tableSize | | | |

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| --- | --- | --- | --- | --- |
| Name: | Public retrieveWord() |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| String word | Words() container | Hash.find() | findMatchs() | none |
| Processing: | Retrieves the appropriate container for input word | | | |

**Class Words**

Global Variables:

String word – holds the three letter high scoring word

Int[] locations – holds the locations of the word

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| --- | --- | --- | --- | --- |
| Name: | Public New() |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| String Value | none | none |  | none |
| Int locat |  |  |  |  |
| Processing: | Cosntructor for words container | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name: | Public getWord |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| none | String word | none | Hash.insert() | none |
|  |  |  | Hash.find() |  |
| Processing: | Accessor for the word String | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name: | Public getLocations |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| none | Int[] Locations | none | findMatchs() | none |
| Processing: | Accessor for the integer array locations | | | |

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| --- | --- | --- | --- | --- |
| Name: | Public insert |  |  |  |
| Inputs | Outputs | Calls | Called by | Files |
| Int loc | word | none | Hash.insert() | none |
| Processing: | Inserts a new location into the locations array | | | |

Variable:

Int i – counter used to find the end of the array