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\* @Professor : Cong Pu

\* @Marshall ID : 901881363

\* @Date : 10 Nov 2018

\* @Course : CS620 Applied Algorithms

\* @Program : Clustering Algorithm

\*/

**import** java.util.ArrayList;

**public** **class** ClustersK {

// Give Number of Clusters required to be 2

**private** **static** **int** *NumofClusters* = 2, *randomNum1*, *randomNum2*,*status*;

**private** **static** **float**[] *mean*= **new** **float**[*NumofClusters*],*prevmean* = **new** **float**[*NumofClusters*];

**private** **static** **int**[] *inputsequence* = {3,15,2,5,17,1,18,4,20,16};

**private** **static** ArrayList<Integer> *Array1* = **new** ArrayList<Integer>();

**private** **static** ArrayList<Integer> *Array2* = **new** ArrayList<Integer>();

// Function to generate Random Number

**public** **int** randomGen()

{

**int** randomNum = (**int**) (Math.*random*()\*10);

System.***out***.println("Randomnly chosen Number is : "+randomNum);

**return** randomNum;

}

// Function to Calculate Mean of Each Cluster

**public** **static** **float**[] calculateMean()//(float old\_mean1,float old\_mean2)

{

**int** sum1 = 0, sum2 = 0;

**float** avg1, avg2, size1, size2;

size1 = *Array1*.size();

size2 = *Array2*.size();

**for** (**int** i=0; i< *Array1*.size(); i++)

sum1 += *Array1*.get(i);

avg1 = sum1 / size1;

**for** (**int** j=0; j< *Array2*.size(); j++)

sum2 += *Array2*.get(j);;

avg2 = sum2 / size2;

*mean*[0] = avg1;

*mean*[1] = avg2;

System.***out***.println("Mean 0 is : "+*mean*[0]);

System.***out***.println("Mean 1 is : "+*mean*[1]);

**return** *mean*;

}

// Function to Calculate the Array with Nearest mean for Each element of the InputSequence Array

**public** **int** calculateNearestMean(**int** inputseqnum)

{

**float** minmean = Math.*abs*(*mean*[0]-inputseqnum);

**int** array=0;

System.***out***.println();

System.***out***.println("Number is "+inputseqnum+"\nMinmean is "+minmean);

**for**(**int** d=0;d<*mean*.length;d++)

{

**float** temp = Math.*abs*(*mean*[d]-inputseqnum);

**if** (temp<minmean)

{

minmean = temp;

System.***out***.println("Minmean is "+minmean);

array = d;

}

}

**return** array;

}

// Function to add Elements Initially

**public** **void** addElements()

{

**for** (**int** i=0; i< *inputsequence*.length; i++)

{

// Add Elements to Array1

**int** arr = calculateNearestMean(*inputsequence*[i]);

**if**(arr==0 && i!=*randomNum1* && i!=*randomNum2*)

{

*Array1*.add(*inputsequence*[i]);

}

// Add Elements to Array2

**else** **if**(arr==1 && i!=*randomNum1* && i!=*randomNum2*)

{

*Array2*.add(*inputsequence*[i]);

}

}

}

// Function that adds elements to array in each iteration until mean remains same

**public** **void** continueLoopAddElements()

{

{

**for** (**int** i=0; i< *inputsequence*.length; i++)

{

// Add Elements to Array1

**int** arr = calculateNearestMean(*inputsequence*[i]);

**if**(arr==0)

{

**if**(*Array1*.contains(*inputsequence*[i]))

{

*Array1*.remove(*Array1*.indexOf(*inputsequence*[i]));

}

**if**(*Array2*.contains(*inputsequence*[i]))

{

*Array2*.remove(*Array2*.indexOf(*inputsequence*[i]));

}

*Array1*.add(*inputsequence*[i]);

}

// Add Elements to Array2

**else** **if**(arr==1)

{

**if**(*Array1*.contains(*inputsequence*[i]))

{

*Array1*.remove(*Array1*.indexOf(*inputsequence*[i]));

}

**if**(*Array2*.contains(*inputsequence*[i]))

{

*Array2*.remove(*Array2*.indexOf(*inputsequence*[i]));

}

*Array2*.add(*inputsequence*[i]);

}

}

}

}

/\* Function to check if mean remains SAME

\* If mean remains same stop the loop

\* If mean is different for all elements of sequence, calculate minimum mean distance and add element to that array

\*/

**public** **static** **int** checkstatus(**float**[] prevmean)

{

*mean*=*calculateMean*();

**for**(**int** l=0;l<*mean*.length;l++)

{

**if**(*mean*[l]!=prevmean[l])

{

**return** *status*=0;

}

}

*status*=1;

**return** *status*;

}

// MAIN Function where program starts Execution

**public** **static** **void** main(String[] args) {

// **TODO** Auto-generated method stub

// Instantiate the Clustering Algorithm class

ClustersK ca = **new** ClustersK();

*randomNum1* = ca.randomGen();

*Array1*.add(*inputsequence*[*randomNum1*]);

System.***out***.println("Array 1 is "+*Array1*);

*randomNum2* = ca.randomGen();

**while**(*randomNum2*==*randomNum1*)

{

*randomNum2* = ca.randomGen();

}

*Array2*.add(*inputsequence*[*randomNum2*]);

System.***out***.println("Array 2 is "+*Array2*);

*calculateMean*();

ca.addElements();

System.***out***.println("Array 1 is "+*Array1*);

System.***out***.println("Array 2 is "+*Array2*);

**while**(*status*!=1)

{

*prevmean* = *calculateMean*();

ca.continueLoopAddElements();

*status* = *checkstatus*(*prevmean*);

System.***out***.println("Array 1 is "+*Array1*);

System.***out***.println("Array 2 is "+*Array2*);

// ca.calculateMean();

}

}

}

Randomnly chosen Number is : 6

Array 1 is [18]

Randomnly chosen Number is : 8

Array 2 is [20]

Mean 0 is : 18.0

Mean 1 is : 20.0

Number is 3

Minmean is 15.0

Number is 15

Minmean is 3.0

Number is 2

Minmean is 16.0

Number is 5

Minmean is 13.0

Number is 17

Minmean is 1.0

Number is 1

Minmean is 17.0

Number is 18

Minmean is 0.0

Number is 4

Minmean is 14.0

Number is 20

Minmean is 2.0

Minmean is 0.0

Number is 16

Minmean is 2.0

Array 1 is [18, 3, 15, 2, 5, 17, 1, 4, 16]

Array 2 is [20]

Mean 0 is : 9.0

Mean 1 is : 20.0

Number is 3

Minmean is 6.0

Number is 15

Minmean is 6.0

Minmean is 5.0

Number is 2

Minmean is 7.0

Number is 5

Minmean is 4.0

Number is 17

Minmean is 8.0

Minmean is 3.0

Number is 1

Minmean is 8.0

Number is 18

Minmean is 9.0

Minmean is 2.0

Number is 4

Minmean is 5.0

Number is 20

Minmean is 11.0

Minmean is 0.0

Number is 16

Minmean is 7.0

Minmean is 4.0

Mean 0 is : 3.0

Mean 1 is : 17.2

Array 1 is [3, 2, 5, 1, 4]

Array 2 is [15, 17, 18, 20, 16]

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avg2 = sum2 / size2;

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System.***out***.println("Mean 0 is : "+*mean*[0]);

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**return** *mean*;

}

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**public** **int** calculateNearestMean(**int** inputseqnum)

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**float** minmean = Math.*abs*(*mean*[0]-inputseqnum);

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System.***out***.println();

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**float** temp = Math.*abs*(*mean*[d]-inputseqnum);

**if** (temp<minmean)

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minmean = temp;

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array = d;

}

}

**return** array;

}

// Function to add Elements Initially

**public** **void** addElements()

{

**for** (**int** i=0; i< *inputsequence*.length; i++)

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// Add Elements to Array1

**int** arr = calculateNearestMean(*inputsequence*[i]);

**if**(arr==0 && i!=*randomNum1* && i!=*randomNum2*)

{

*Array1*.add(*inputsequence*[i]);

}

// Add Elements to Array2

**else** **if**(arr==1 && i!=*randomNum1* && i!=*randomNum2*)

{

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}

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// Function that adds elements to array in each iteration until mean remains same

**public** **void** continueLoopAddElements()

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{

**for** (**int** i=0; i< *inputsequence*.length; i++)

{

// Add Elements to Array1

**int** arr = calculateNearestMean(*inputsequence*[i]);

**if**(arr==0)

{

**if**(*Array1*.contains(*inputsequence*[i]))

{

*Array1*.remove(*Array1*.indexOf(*inputsequence*[i]));

}

**if**(*Array2*.contains(*inputsequence*[i]))

{

*Array2*.remove(*Array2*.indexOf(*inputsequence*[i]));

}

*Array1*.add(*inputsequence*[i]);

}

// Add Elements to Array2

**else** **if**(arr==1)

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**if**(*mean*[l]!=prevmean[l])

{

**return** *status*=0;

}

}

*status*=1;

**return** *status*;

}

// MAIN Function where program starts Execution

**public** **static** **void** main(String[] args) {

// **TODO** Auto-generated method stub

// Instantiate the Clustering Algorithm class

ClustersK ca = **new** ClustersK();

*randomNum1* = ca.randomGen();

*Array1*.add(*inputsequence*[*randomNum1*]);

System.***out***.println("Array 1 is "+*Array1*);

*randomNum2* = ca.randomGen();

**while**(*randomNum2*==*randomNum1*)

{

*randomNum2* = ca.randomGen();

}

*Array2*.add(*inputsequence*[*randomNum2*]);

System.***out***.println("Array 2 is "+*Array2*);

*calculateMean*();

ca.addElements();

System.***out***.println("Array 1 is "+*Array1*);

System.***out***.println("Array 2 is "+*Array2*);

**while**(*status*!=1)

{

*prevmean* = *calculateMean*();

ca.continueLoopAddElements();

*status* = *checkstatus*(*prevmean*);

System.***out***.println("Array 1 is "+*Array1*);

System.***out***.println("Array 2 is "+*Array2*);

// ca.calculateMean();

}

}

}