Data Structure Lab Assignment Mid Term

Submission date: 12.12.2024

Submission: put all C++ files and data files(.txt) in a folder (folder name: your_ID) and zip the folder and upload in portal.

1. 40 students in a class appeared in their examination. Their mark sheets have been given to you that contains student ID, student Name and Grade. The grade column of the mark sheet contains the Grade (A, B, C or F) obtained by the student. Write a function to calculate the total number of students who got F grades. Use appropriate data structure.

   studentData.txt

2. Write C++ functions to matrix addition, transpose and multiplication. Use dynamic 2D array.
3. Write C++ functions to find magnitude of a vector, Dot Product of two vectors and angle between them. Use 1D dynamic array.

   $A = [a_1, a_2, \ldots\ldots, a_n]$
   $B = [b_1, b2, \ldots\ldots, b_n]$
   $\left||A|\right| = \sqrt{(a_1)^2 + (\mathrm{a}_2)^2 + \cdots\ldots + (\mathrm{a}_\mathrm{n})^2}$
   $A.B = a_1.b_1 + \cdots \ldots + a_n.b_n$
   $\theta = \cos\ \hat{}\ -1(A \cdot B)/(|A||B|)$

4. There are several coordinate points in a plane. The size of the data set n=100. Create an appropriate Data Structure to store the points information. Write a C++ function to find the point which distance is maximum from origin. Formula: distance between two points $P_1 = (x_1, y_1)\ and\ P_2 = (x_2, y_2)\ D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

   Point.txt

5. Country information is provided in country.txt file as country code, Latitude, Longitude and Name. Use a Country class with data member: code, latitude, longitude, countryName, store the data on appropriate data structure and write a function to find distance between any two-country using haversine distance formula.
   $d = 2rsin^{-1}\left(\sqrt{sin^2\left(\frac{\Phi_2-\Phi_1}{2}\right) + cos(\Phi_1)cos(\Phi_2)sin^2\left(\frac{\lambda_2-\lambda_1}{2}\right)}\ \right)$

   Country.txt