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//
//  CS75301 System Modeling and Performance Eval
//
//  File:     utilization.cpp
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//  Abstract: This program generates a data file with x ranging from
//            0.1 to 0.9 (representing propagation delay in ms),
//            and y ranging from 0.1 to 1.0 (representing frame size in bytes),
//            both as inputs to produce z (representing channel utilization).
//            Output file is utilization.txt with this format:
//            x, space, y, space, z, endline
//
//  Revision History:   Date           Who      Description
//                --------------------------------------------
//                      12/7/03        KWS      Initial Release

#include <fstream.h> //to write to a file
#include <math.h>

ofstream writeFile; // to write to a file

int main()//build a list of values in triplets x=0-4pi, y=sin x, z=cos x
{
  double c = 10.; //channel speed (Mbps)
  double p = 0.; //propagation delay (ms)
  double f = 0.; //frame size (bytes)
  double a = 0.; //ratio of frame size to propagation delay to frame size
  double u = 0.; //channel utilization

  writeFile.open ("utilization.txt", ios::out); //to overwrite to a file

  if (!writeFile)
  {
    cout << "can't open the file to be written to" << endl;
    return 1;
  }

  for ( p = 0.1; p <= 0.9; p += 0.1 )
  {
    for ( f = 0.1; f <= 1.0; f += 0.1 )
    {
      a = p / ( f / c );// f/c= frame time (bytes/Mbps = sec), p/frame time = ratio (ms/sec)
      u = 1 / ( 1 + 2 * a );//U = Tframe / (2Tpropagation + Tframe)
                            //Let a = Tpropagation / Tframe
                            //then U = 1 / (1 + 2a)
      writeFile << p << " " << f << " " << u << endl;
    }
  }

  writeFile.close (); //to close the writeFile

  return 0;
}
```