Programming Lab – Assignment 7

Tathagata Ghosh

2020ITB065

HY

```c
//Assignment - 7 - Programming Lab
//Assignment - 7 - Programming Lab
/* Tathagata Ghosh - 2020ITB065 - HY*/

/*Q1. The power of any arbitrary square matrix A, denoted
as An , for a nonnegative integer n, is defined as the matrix
product of n copies of A. This means An= A · · · A | A is multiplied
n times. Note that, a matrix to the zeroth power is defined to be the identity
matrix of the same dimensions, i.e. A0 = I. Given the square matrix
A and the nonnegative integer n, write a program that can recursively compute
An
involving minimal multiplications.*/

#include <stdio.h>
#include <stdlib.h>

int **solve(int **matrix, int size, int n)
{
    if (n == 1)
    {
        return matrix;
    }
    int **ans = (int**)malloc(size * sizeof(int));

    int **subans = solve(matrix, size, n - 1); //Recursive Subanswer

    for (int i = 0; i < size; i++)
    {
        int *ptr = (int*)malloc(size * sizeof(int));
        for (int j = 0; j < size; j++)
        {
            int x = 0;
            for (int k = 0; k < size; k++)
            {
                int *temp = subans[k];
                x += matrix[i][k] * temp[j];
```

```c
                }
                ptr[j] = x;
            }
            ans[i] = ptr;
        }
        return ans;

}
int main()
{
    printf("--------------------------------------------------------------
\n");
    printf("Enter the dimension of square matrix :");
    int d;
    scanf("%d", &d);
    printf("Enter the matrix :\n");
    int **matrix = (int**)malloc(d * sizeof(int));
    for (int i = 0; i < d; i++)
    {
        int *ptr = (int*)malloc(d * sizeof(int));

        for (int j = 0; j < d; j++)
        {
            scanf("%d", (ptr + j));
        }
        matrix[i] = ptr;
    }
    printf("Enter the power you want to calculate: ");
    int n;
    scanf("%d", &n);
    printf("--------------------------------------------------------------
=\n");
    int **ans = solve(matrix, d, n);
    printf("The given matrix raised to the power %d is :\n", n);
    for (int i = 0; i < d; i++)
    {
        int *ptr = ans[i];
        for (int j = 0; j < d; j++)
        {
            printf("%d ", ptr[j]);
        }
        printf("\n");
    }
    return 0;
}
```

OUTPUT:

```c
//Assignment - 7 - Programming Lab
/* Tathagata Ghosh - 2020ITB065 - HY*/

/*Q2.     Design a set of
functions (such as ADD, DIV, POWER (to do x^y), etc.) of your choice and store
them in an array of function pointers. Write a program that will use these
functions from the array, based on the user input. DO NOT USE
switch-case/if-else to solve this problem.*/

#include <stdio.h>

double ADD(double x, double y)
{
    return x + y;
}

double DIV(double x, double y)
{
    return x / y;
}

double POWER(double x, double y)
{
    if (y == 0)
    {
        return 1;
    }
    return x * POWER(x, y - 1);
```

```c
}

double SUBTRACT(double x, double y)
{
    return x - y;
}

double PRODUCT(double x, double y)
{
    return x * y;
}

double (*ptr[5])(double x, double y);

int main()
{
    ptr[0] = ADD;
    ptr[1] = DIV;
    ptr[2] = POWER;
    ptr[3] = SUBTRACT;
    ptr[4] = PRODUCT;
    printf("--------------------------------------------------------------\n");
    printf("Enter two numbers :\n");

    double x, y;
    scanf("%lf%lf", &x, &y);
    printf("--------------------------------------------------------------\n");
    printf("Enter 0 to Add %.2lf and %.2lf\n", x, y);
    printf("Enter 1 to Divide %.2lf by %.2lf\n", x, y);
    printf("Enter 2 to calculate %.2lf to the power %.2lf\n", x, y);
    printf("Enter 3 to subtract %.2lf from %.2lf\n", y, x);
    printf("Enter 4 to multiply %.2lf and %.2lf\n", x, y);

    int c;
    scanf("%d", &c);
    printf("--------------------------------------------------------------\n");
    double result = ptr[c](x, y);
    printf("Result = %.2lf\n", result);
    printf("--------------------------------------------------------------\n");

    return 0;
}
```

OUTPUT:

```
//Assignment - 7 - Programming Lab
/* Tathagata Ghosh - 2020ITB065 - HY*/

/*Q3.    Write a C program to read a binary file. Explore
the functions available in C library to read the data.  Take the
input as a.out file created after compilation of a C program after doing
addition of two integers.*/

#include <stdio.h>

int main()
{
    char buffer[10000];
    FILE *ptr;

    ptr = fopen("a.out", "rb"); // r for read, b for binary
    if (ptr == NULL)
    {
        printf("Error! File could not be opened.");
        return 0;
    }
    printf("Using fread()\n");

    //Function to read binary file and store it in
    fread(buffer, sizeof(buffer), 1, ptr);

    int i = 0;
    while (buffer[i] != EOF)
    {
        printf("%x", buffer[i]);
```

```c
        i++;
    }

    printf("\n");
    fclose(ptr);
    return 0;
}
```

```c
//Assignment - 7 - Programming Lab
/* Tathagata Ghosh - 2020ITB065 - HY*/

/*Q3.      Write a C program to read a binary file. Explore
the functions available in C library to read the data.  Take the
input as a.out file created after compilation of a C program after doing
addition of two integers.*/

#include <stdio.h>

int main()
{
    int a = 65;
    int b = 100;
    int res = a + b;
    printf("%d\n", res);
    return 0;
}
```

OUTPUT: