GPU - Programming
Homework - 3

Topic - Encryption - Decryption
Code -

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
#include<time.h>
#include<omp.h>

__global__ void encrypt_gpu(char *p)
{
	int tid = threadIdx.x+blockIdx.x*blockDim.x;
	p[tid] = 'a' + (p[tid]-'a'+1+tid)%26;
}

__global__ void decrypt_gpu(char *c)
{
	int tid = threadIdx.x+blockIdx.x*blockDim.x;
	int x = c[tid]-'a'-1-tid;
	if(x<0)
		x+=26;
	else
		x=x%26;
	c[tid] = 'a'+x;
}

void encrypt(char *pt,int n)
{
	int i,c;
	for(i=0;i<n;i++)
	{
		c = pt[i]-'a'+1+i;
		pt[i]='a'+c%26;
	}
}

void decrypt(char  *ct,int n)
{
	int i,c;
	for(i=0;i<n;i++)
```

```
	{
		c = ct[i]-'a'-i-1;
		if(c<0)
			c=c+26;
		else
			c=c%26;
		ct[i]='a'+c;
	}
}

void print(char *s,int n)
{
	int i;
	for(i=0;i<n;i++)
	{
		printf("%c",s[i]);
	}
	printf("\n");
}

int main(int argc,char *argv[])
{
	int N;
	clock_t start,stop;
	cudaEvent_t p1,p2;
	cudaEventCreate(&p1);
	cudaEventCreate(&p2);

	float ms;
	printf("Enter length of string:\n");
	scanf("%d",&N);
	char *message=(char*)malloc(N*sizeof(char)),*s;

	printf("For CPU\n");
	start = clock();
	//print(message,N);
	encrypt(message,N);
	//print(message,N);
	decrypt(message,N);
	//print(message,N);
	stop = clock();
	printf("Time taken for CPU implementation in milliseconds:
%lf\n",((double)(stop-start)/CLOCKS_PER_SEC));
```

```
    printf("For GPU\n");

    cudaMalloc(&s,N*sizeof(char));
    cudaMemcpy(s,message,N*sizeof(char),cudaMemcpyHostToDevice);
    cudaEventRecord(p1);
    //print(message);
    encrypt_gpu<<<(N+1024-1)/1024,1024>>>(s);
    //cudaMemcpy(message,s,N*sizeof(char),cudaMemcpyDeviceToHost);
    //print(message);
    //cudaDeviceSynchronize();
    decrypt_gpu<<<(N+1024-1)/1024,1024>>>(s);
    //cudaMemcpy(message,s,N*sizeof(char),cudaMemcpyDeviceToHost);
    //print(message);
    cudaEventRecord(p2);
    cudaEventSynchronize(p2);
    cudaEventElapsedTime(&ms,p1,p2);
    printf("Time Taken by GPU implementation in milliseconds: %lf\n",ms);
    cudaDeviceSynchronize();
    return 0;
}
```

Outputs -

```
budhwani1@BOSS8-DL02: ~/gpu_programming/homeworks
Enter length of string:
10
For CPU
Time taken for CPU implementation in milliseconds: 0.000004
For GPU
Time Taken by GPU implementation in milliseconds: 0.029696
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
100
For CPU
Time taken for CPU implementation in milliseconds: 0.000005
For GPU
Time Taken by GPU implementation in milliseconds: 0.038912
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
1000
For CPU
Time taken for CPU implementation in milliseconds: 0.000024
For GPU
Time Taken by GPU implementation in milliseconds: 0.042016
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
10000
For CPU
Time taken for CPU implementation in milliseconds: 0.000196
For GPU
Time Taken by GPU implementation in milliseconds: 0.034816
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
100000
For CPU
Time taken for CPU implementation in milliseconds: 0.002020
For GPU
Time Taken by GPU implementation in milliseconds: 0.041568
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
1000000
For CPU
Time taken for CPU implementation in milliseconds: 0.018378
For GPU
Time Taken by GPU implementation in milliseconds: 0.027808
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
```

```
budhwani1@BOSS8-DL02: ~/gpu_programming/homeworks
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
100000
For CPU
Time taken for CPU implementation in milliseconds: 0.002020
For GPU
Time Taken by GPU implementation in milliseconds: 0.041568
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
1000000
For CPU
Time taken for CPU implementation in milliseconds: 0.018378
For GPU
Time Taken by GPU implementation in milliseconds: 0.027808
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
10000000
For CPU
Time taken for CPU implementation in milliseconds: 0.114001
For GPU
Time Taken by GPU implementation in milliseconds: 0.241504
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
10000000
For CPU
Time taken for CPU implementation in milliseconds: 0.113148
For GPU
Time Taken by GPU implementation in milliseconds: 0.236320
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
100000000
For CPU
Time taken for CPU implementation in milliseconds: 0.860525
For GPU
Time Taken by GPU implementation in milliseconds: 2.274944
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$ ./e
Enter length of string:
10000000000
For CPU
Time taken for CPU implementation in milliseconds: 11.468408
For GPU
Time Taken by GPU implementation in milliseconds: 0.000000
budhwani1@BOSS8-DL02:~/gpu_programming/homeworks$
```