Text of exercise #4

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Laboratory #4 – System and device programming – A.Y. 2018-19

Implement a sequential program in C that takes a single argument k from the command line. The program creates two vectors (v1 and v2) of dimension k, and a matrix (mat) of dimension k x k, which are filled with random numbers in the range [-0.5 0.5], then it performs the product $v1^T$ * mat * v2 and prints the result. This is an example for k=5:

```
v1  = [-0.0613   -0.1184    0.2655    0.2952   -0.3131]
mat = [-0.3424   -0.3581    0.1557    0.2577    0.2060
        0.4706   -0.0782   -0.4643    0.2431   -0.4682
        0.4572    0.4157    0.3491   -0.1078   -0.2231
       -0.0146    0.2922    0.4340    0.1555   -0.4538
        0.3003    0.4595    0.1787   -0.3288   -0.4029]
v2  = [-0.3235    0.1948   -0.1829    0.4502   -0.4656]
Result: 0.0194
```

Perform the product operation in two steps: v=mat*v2, which produces a new vector v, and result =$v1^T$*v. Then, write a concurrent program using threads that performs the same task. The main thread creates the vectors, the matrix, and k threads. Then, it waits the termination of the other threads. Each thread i performs the product of the i-th row vector of mat and v2, which produces the i-th element of vector v. One of the created threads, the last one terminating its product operation, performs the final operation result=$v1^T$*v, and prints the result.