

CENG 322- Operating Systems

Homework #4

In this homework, you are expected to solve synchronization problem between threads that are responsible for different tasks. You will create 2 types of linked lists that are related with shopping products and favorites. (It can be thought as Trendyol, we have product lists which contain several varying types of products, and user favorite list which includes some of the products that belong to the products list) You should implement a multi-threaded program (whose tasks are given below) that operates on linked lists.. Your program requires 3 types of threads:

1. Cut and pasting thread
2. Price increasing thread
3. Product offering thread

In your program you will have 2 types of linked lists which are **products** (which contain all the products) and **favorites**(which are the favorites of the user).

Type '1' thread should use both of the linked lists (one of the products list and favorites list) at the same time. Without having both of the lists, it cannot perform its task. It should cut any 2 products from the products list with given product_type, paste it to the favorites list.

Type '2' thread increases the product_price %20 in one of the lists (products or favorites lists). The price of the product to be increased can be decided randomly among the products in the list.

Type '3' thread offers products which can be bought in the favorites lists for the user-specified money/budget.(You can print all the products which are less than given budget)

You should create 2 lists (products1 and products2) for the products lists, also 1 list for favorites list.

You should have 2 threads in type '1 thread', and 1 thread for type '2' and type '3' thread.

Your program can initialize the products lists with random products(at least 10 product for each). Favorites list is initially empty. Please use the data structure for product specified below:

```
Struct product{  
    int product_name; // (phone, tshirt, coke etc.)  
    char product_type[30]; //(electronicDevice, clothing, market etc.)  
    int price; // (can be integer between 1-1000)  
}
```

Your program should get the product_type which will be cut from products_list, and budget that is used to product offering(for thread type '3') from the user. When work with the lists is finished, print the contents of the lists to the console, or offered product that can be bought with the given budget. At the end of your program, products1 and products2 lists should be empty.

You should prevent any possible deadlocks in this homework. Therefore make sure that you follow synchronization methodologies like semaphore and mutex.

Example code output is given below:

Current products lists are:

Products1:

product_name: iphoneX, product_type: electronicDevice, price: 1000
product_name: shoes, product_type: clothing, price: 550
product_name: powerbank, product_type: electronicDevice, price: 100
product_name: detergent, product_type: market, price: 20
product_name: coke, product_type: market, price:5
product_name: tshirt, product_type: clothing, price: 70
%%%%%%%%%

Products2:

product_name: jean, product_type: clothing, price: 220
product_name: dress, product_type: clothing, price: 300
product_name: hairDrier, product_type: electronicDevice, price: 300
product_name: blender, product_type: electronicDevice, price: 500
product_name: coffee, product_type: market, price: 75

product_name: tea, product_type: market, price: 30

%%%%%%%%%

Favorites:

%%%%%%%%%

Please enter your favorite product_type (in lower case):

Product_type: market

%%%%%%%%%

Please enter your budget for shopping:

Budget: 150

%%%%%%%%%

Type 1 thread is performing.

Type 1 thread is performing.

2 products is cut from Products1 and pasted to favorites.

Type 3 thread is performing.

2 products is cut from Products2 and pasted to favorites.

Type 2 thread is performing.

Product price increased in products1: powerbank, 120

You can buy products which are less than your budget: detergent, tshirt

.....

SUBMISSION RULES

- Your code will be compiled using GCC on Linux. Indicate C version (e.g. C99)you used in the first line of your code as a comment. It can be written as follows:// This code compiled with C99
- You should submit your assignments through CMS until the due date. Your homework should be named as CENG322_hw4_studentID.zip, e.g. "CENG322_hw4_123456789.zip" in the following structure.
- You can create 1 or more source code files but do not forget to include the necessary header file for linking them. If you send 2 or more .c files with no .hfile (header file that does not work) the assignment will be evaluated as 0. So,make sure that your source code and header files work before submitting.
- Cheating will not be tolerated and will be evaluated as 0.

- Late submissions will not be allowed.
- Possible Grade reductions
 - Lack of Comment usage
 - Missing Controls
 - Unused/Dead Codes
 - Naming Conventions