System and device programming
29 Jun 2011

(C program: textbooks and/or course material allowed)

(18 marks) The final mark is the sum of the 1st > 8 and the 2nd part > 10 .

Write a C program (named **`file_concatenate`**) in the Unix environment using Pthreads, which behaves as follows.

The program creates **`K`** threads, where **`K`** is given as the first argument in the command line.

A variable number of text files are stored in the directory **`DIR`** given as the second argument of the command line. The main thread creates a subdirectory **`tmp`** in **`DIR.`**

Each thread cyclically reads from the directory two files and concatenates their content **creating a new file,** in the subdirectory **`tmp`**, with a filename composed by the concatenation of the filenames of the concatenated two files (if **`f1.txt`** and **`f2.c`** are concatenated the new filename in **`tmp`** will be **`f1.txtf2.c`**.

The two original files must be **immediately removed** from the directory after they have been opened to avoid conflicts among threads trying to read the same files.

When the new file created in **`tmp`** is complete and closed, a hard link to it must be set in **`DIR`**, and the file in **`tmp`** can be removed.

Care has to be taken to avoid deadlocks (for example, when two files remain **`DIR`**, and a thread read one of the files, and another one accesses the other).

The program terminates when a single file remains, which concatenates the content of all files originally included in the directory.

Line command example.

```
> file_concatenate 3 directory_name
```