

**Bilkent University**  
Computer Engineering Department  
CS 315 - Programming Languages  
Spring 2016  
Due Apr 29, 2016 23:59

**Note that plagiarism is not allowed and we will strictly check your codes.**

**Homework III**

In the class, as part of the concurrency topic, we have studied the implementation of a `search` method in the context of the *Needle in the Haystack* problem. The signature of the method was as follows:

```
static <T> List<Integer> search(T needle, T[] haystack, int numThreads)
```

The goal was to find all indices in the array `haystack` that contains a `needle`. As part of this homework, we are asking you to implement a similar search method that returns the index of the first needle found. Importantly, you should stop all the threads as soon as a needle is found, so as to minimize the search time. The signature for this new `search` method would look like as follows:

```
static <T> int search(T needle, T[] haystack, int numThreads)
```

A few hints on the implementation:

- You can use a conditional variable to signal the control thread that an item is found. This conditional variable could be created by the controller thread and passed as an argument to the constructors of the searchers.
  - You can stop a searcher thread from the control thread by making a function call that sets an atomic boolean variable named `done` maintained by the searcher to `true`. This same variable could be checked within the main search loop to early terminate the search.
- It is recommended that you implement the homework in Java or C++.

### Logistics

Put your code under a directory named `lastname_name_hw3` and make an archive from that directory. For example, the following Unix commands could be used:

```
mkdir lastname_name_hw3
cd lastname_name_hw3
...
(edit and test your files in this directory)
...
cd ..
tar -cvzf lastname_name_hw3.tar.gz lastname_name_hw3
```

Then e-mail this newly generated file (named `lastname_name_hw3.tar.gz`) to your TA Sureyya Emre Kurt [middlename].[lastname]@bilkent.edu.tr. Once again, Collaboration on the homework is not allowed. Reports in formats other than `.txt` and `.pdf` are not accepted.