KOÇ UNIVERSITY

COMP 201 - Fall 2021
Lab 2 - Data Lab: Manipulating Bits

1 Lab Assignment

1.1 Download lab2-assignment.zip from Blackboard

1.2 Unzip it

1.3 Copy "lab2-assignment" folder to linuxpool.ku.edu.tr servers

```
scp -r lab2-assignment USERNAME@linuxpool.ku.edu.tr:/Users/USERNAME/
```

1.4 Solve Puzzles

There are a number of files in the directory. The only file you will be modifying and turning in is `bits.c`.

The `bits.c` file contains a skeleton for each of the 2 programming puzzles. Your assignment is to complete each function skeleton using only *straightline* code for the integer puzzles (i.e., no loops or conditionals) and a limited number of C arithmetic and logical operators. Specifically, you are *only* allowed to use the following eight operators:

```
! ~ & ^ | + << >>
```

A few of the functions further restrict this list. Also, you are not allowed to use any constants longer than 8 bits. See the comments in `bits.c` for detailed rules and a discussion of the desired coding style.

1.4.1 The Puzzles

This section describes the puzzles that you will be solving in `bits.c`. You may also refer to the test functions in `tests.c`. These are used as reference functions to express the correct behavior of your functions, although they don't satisfy the coding rules for your functions.

Name	Description	Rating	Max Ops
`getByte(x,n)`	extract byte n from word x	2	6
`anyEvenBit(x)`	return 1 if any even-numbered bit in word set to 1	2	12
`addOK(x,y)`	determine if can compute x+y without overflow x	3	20

Table 1: Puzzles.

1.5 Copy "lab2-assignment" folder from linuxpool.ku.edu.tr servers to your local machine

```
scp -r USERNAME@linuxpool.ku.edu.tr:/Users/USERNAME/lab2-assignment .
```

1.6 Submit your bits.c file to Blackboard.

Autograding your work

We have included some autograding tools in the handout directory — `btest`, `dlc`, and `driver.pl` — to help you check the correctness of your work.

- **`btest`:** This program checks the functional correctness of the functions in `bits.c`. To build and use it, type the following two commands:

  ```
  $ make
  $ ./btest
  ```

  Notice that you must rebuild `btest` each time you modify your `bits.c` file.

  You'll find it helpful to work through the functions one at a time, testing each one as you go. You can use the `-f` flag to instruct `btest` to test only a single function:

  ```
  $ ./btest -f bitXor
  ```

  You can feed it specific function arguments using the option flags `-1`, `-2`, and `-3`:

  ```
  $ ./btest -f bitXor -1 7 -2 10
  ```

  Check the file `README` for documentation on running the `b`test program.

- **`dlc`:** This is a modified version of an ANSI C compiler from the MIT CILK group that you can use to check for compliance with the coding rules for each puzzle. The typical usage is:

  ```
  $ ./dlc bits.c
  ```

  The program runs silently unless it detects a problem, such as an illegal operator, too many operators, or non-straightline code in the integer puzzles. Running with the `-e` switch:

  ```
  $ ./dlc -e bits.c
  ```

  causes `dlc` to print counts of the number of operators used by each function. Type `./dlc -help` for a list of command line options.

- **`driver.pl`:** This is a driver program that uses `btest` and `dlc` to compute the correctness and performance points for your solution. It takes no arguments:

  ```
  $ ./driver.pl
  ```

  Your instructors will use `driver.pl` to evaluate your solution.

Academic Integrity

All work on lab assignments must be done individually unless stated otherwise. You are encouraged to discuss with your classmates about the given assignments, but these discussions should be carried out in an abstract way. That is, discussions related to a particular solution to a specific problem (either in actual code or in the pseudocode) will not be tolerated. In short, turning in someone else's work, in whole or in part, as your own will be considered as a violation of academic integrity. Please note that the former condition also holds for the material found on the web as everything on the web has been written by someone else. See Koç University - Student Code of Conduct.