# CSI 402 – Spring 2014

# Programming Assignment II

## Administrative Information

- **Deadline:** 11 PM, Friday, Feb. 28, 2014.
  **Cutoff:** 11 PM, Sunday, Mar. 2, 2014.
- The program must have two or more C source files.
- All the files (C source files, header files (if any) and the `makefile`) must be submitted together using the `turnin-csi402` command.
- README file

  ```
  ~csi402/public/prog2/prog2.README
  ```

  will be available by 10 PM on Saturday, Feb. 22, 2014.
- The `README` file will contain information regarding `turnin-csi402` and additional specifications for the `makefile`.

## Project Description

**Goal:** To provide some practice in handling binary files.

- Idea based on how Unix represents directory entries.
- Program should do two things:
  - Produce a binary ("unformatted") file from a text ("formatted") file and vice versa.
  - Go through a binary file and compute statistical information.

**Weightage:** 6%

**Total Points:** 100 (Correctness: 85, Str. & doc: 15).

## Project Description (continued)

**Form of each line of text file:**

*string*`<tab>`*integer*

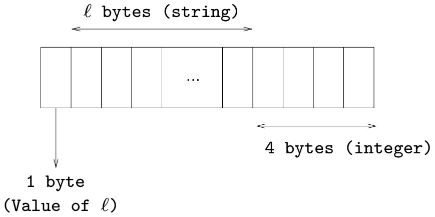
- The string and the integer on a line are separated by *exactly one* tab.
- The string does not contain any whitespace characters.
- The length of the string, denoted by $\ell$, satisfies the condition $1 \leq \ell \leq 255$.
- The integer is non-negative and its value can be stored in a variable of type `unsigned int`.

## Project Description (continued)

**Representation for each line in the binary file:**

**Line in the text file:** *string*`<tab>`*integer*

Let $\ell$ denote the length of the string.



Total length $= \ell + 5$ bytes.

**Note:** The `'\0'` character of the string is not stored in the binary file.

## Project Description (continued)

**Example:**

```
Line in Text File                Length in binary file
-----------------                ---------------------

input.dat<tab>14721                   14 bytes

output.c<tab>12                       13 bytes
```

Thus, for this example, the size of the binary file will be exactly 27 bytes.

**Unix Command Line:** Two forms are possible.

## Project Description (continued)

**Unix Command Line – First Form:**

% `p2` *flag* *infile* *outfile*

- `p2`: Executable version of your program.
- *infile*, *outfile*: Names of input and output files.
- *flag*: May be either `-t` or `-b`.
    - If *flag* is `-t`, then input file is a text file and output must be a binary file (i.e., the program must produce the binary file corresponding to the given text file.)
    - If *flag* is `-b`, then input file is a binary file and output must be a text file (i.e., the program must produce the text file corresponding to the given binary file.)

## Unix Command Line (continued)

**Unix Command Line – Second Form:**

```
% p2   -s   infile
```

- *infile*: Name of binary input file.
- The only flag allowed in this case is `-s`.
- In this case, the program should not produce an output file.
- The program must write to `stdout` the following values:
  1. The length of a shortest string in the input file.
  2. The length of a longest string in the input file.
  3. Value of the smallest integer in the input file.
  4. Value of the largest integer in the input file.

## Additional Notes

**Assumptions regarding input:**

- See the handout.

**Errors to be detected:**

- Usual command line errors; see the handout.

**Suggestions:**

**I. Converting a text file to a binary file:**

- Use `fscanf` to read the string and the integer on each line of the input file.
- Use a variable of type `unsigned char` to store the length of the string on each line of the input file. The length should be written to the output file using `fwrite`.
- Use a variable of type `unsigned int` to store the integer value from each line of the input file. This value should also be written to the output file using `fwrite`.

## Suggestions (continued)

**II. Converting a binary file to a text file:**

- Use `fread` to read the length of the string, the string itself and the integer from the input (binary) file.
- Be sure to add the `'\0'` character at the end of the string.
- Write to the text file using `fprintf`; be sure to add the tab character (`'\t'`) between the string and the integer.

**III. Processing the binary file (`-s` flag):**

- Proceed as though you are converting the binary file to the text file.
- Instead of producing a text file, keep track of maximum & minimum lengths of strings and maximum & minimum integer values.
- When you write to `stdout`, be sure to use `fflush(stdout)`.

## Other Suggestions

- Use the Unix `diff` command to check whether the output produced by your program is identical to the outputs of sample test cases. (Examples to show the use of `diff` will be presented in class.)

  **Note:** The grading script will use the `diff` command to check whether your program produces correct outputs when flags `-t` and `-b` are used on the command line.

- Consider the following organization for your C program.
  - A C source file containing the function `main`.
  - A C source file containing functions needed to convert a text file into a binary file.
  - A C source file containing functions needed to convert a binary file into a text file.
  - A C source file containing functions needed to produce outputs for the `-s` flag.