CENG 112 – DATA STRUCTURES
Homework 5

May 24, 2017

Due Date: June 5, 2017

Assignment 1 Generating Random Contact Items

Write a program that takes the name of a file containing names, the name of a file containing surnames, and the name of a file containing telephone numbers. The program should read the names, surnames, and telephone numbers. It should then generate 10000 contact items with randomly chosen names, surnames, and telephone numbers. This list should be printed to standard output in the following format:

```
<Name0>
<Surname0>
<Telephone0>
<Name1>
<Surname1>
<Telephone1>
```

Run the program to save the randomly generated data items in a text file "contact.txt".

Assignment 2 Tree Searching Contact Items

Modify the Left-Leaning Red-Black Tree search in `rb_tree.cc` to work with `ContactItem`'s instead of students. Read the `ContactItem`'s from the "contact.txt" file that you generated in the first part. You should be able to search contacts by name or surname.

Assignment 3 Hashing Contact Items

Write a hash function to hash a `ContactItem` to a given integer number range. The program should read the contact items from "contact.txt" and hash them into integers in the range $[0, 30]$. Print the number of contacts that hash into each integer. Try to obtain a uniform distribution of contact items into integers by playing with your hash function.

BONUS (25 pts + overall HW grade): Read about "Pearson's Chi-Squared test" for testing uniformity of a random number generator. Write a function that compares the distribution of contact items against a random uniform distribution and prints the results on standard error.

NOTE: This is a single part homework, there will be no late submission deadline. Check your programs with `valgrind` to ensure that they do not have memory leaks.