

UNIVERSITY OF REGINA
DEPARTMENT OF COMPUTER SCIENCE
C700 - Software Development Fundamentals
Assignment 5 - Fall 2024

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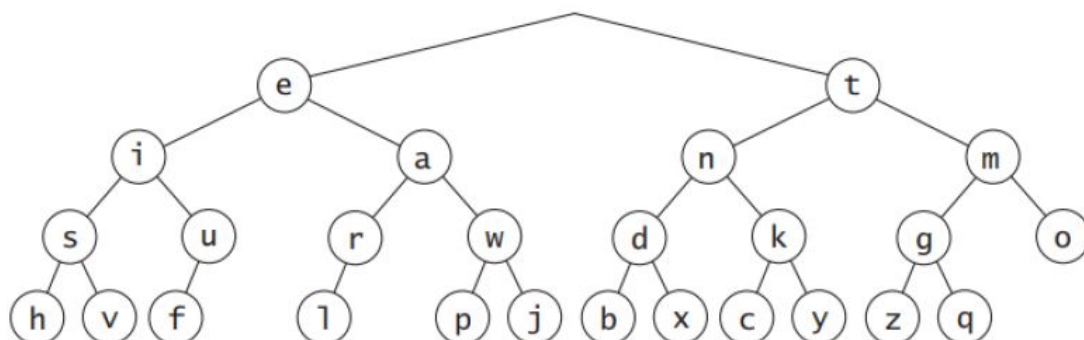
Note: No late submission.

Program (100 marks)

The Morse Code (see table below) is a common code that is used to encode messages consisting of letters and digits. Each letter consists of a series of dots and dashes, for example, the code for the letter **a** is **•–** (dot dash), and the code for the letter **b** is **–•••** (dash dot dot dot).

a	•–	b	–•••	c	–•–•
d	–••	e	•	f	••–•
g	––•	h	••••	i	••
j	•–––	k	–•–	l	•–••
m	––	n	–•	o	–––
p	•––•	q	––•–	r	•–•
s	•••	t	–	u	••–
v	•••–	w	•––	x	–••–
y	–•––	z	––••		

1. Store each letter of the alphabet in a node of a binary tree of depth 4 (see the following Figure). The root node is at depth 0 and stores no letter (*). The left node at depth 1 stores the letter **e** (code is •) and the right node stores the letter **t** (code is –). The four nodes at depth 2 store the letters with codes (••, •–, –•, ––).



To build the tree read a file in which each line consists of a letter followed by its code. The letters should be ordered by tree depth. To find the position for a letter in the tree, scan the code and branch left for a dot and branch right for a dash.

2. Encode a message by replacing each letter by its code symbol. Make sure you use a delimiter symbol between coded letters
3. Then decode the coded message using the Morse code tree.

A sample output could look like the following:

```
>
Enter a message
Hello World
Coded message
..... - - - - - . - - - - - . . . . . - . .
Decoded message
hello world
>
```

Note: Some source files, which may or may not be complete, are attached as a starting point. The students may complete the assignment by using these files.

Marking Scheme

1. **Working Program [50%]:** A working program which satisfies all of the requirements automatically receives 50% of the total assignment mark. Each element of non-compliance will be penalized with respect to its severity.
2. **Program Structure [25%]:** A program which follows principles of Object-Oriented Design and structured programming rules (procedural, modular, uses parameters) to perfection automatically receives 25% of the total assignment mark. Marks are deducted depending on the severity and number of occurrences of non-compliant elements.
3. **Program Documentation [15%]:**
 - (a) **Internal documentation [10%]:** Documentation should be complete and in a standard format. Every non-trivial part of the code should have a clear comment that explains it. In addition, every method or function, including the main program should have an explicative comment header. This header includes the module name, author, date of creation, and purpose. A description of parameters and method output is mandatory. Marks are deducted according to the absence of these elements.
 - (b) **External documentation [5%]:** HTML documentations generated by a program such as Doxygen should be provided.
4. **Program Style [5%]:** Style refers to Occam's razor principle. Code that is needlessly tricky, obscure, or difficult to read will be marked accordingly. Program text indentation is also an element of style and must be present. Significant constant, variable, and structure names must be used. Marks are deducted based on the frequency of these errors.
5. **Version Control System [5%]:** Track of changes that are made to a program should be kept in a private GitHub repository using an IDE integrated version control system. The teaching assistant must be invited as the collaborator to have access to the repository. **A link to the repository should be included in the submission.**
6. All files to be submitted should be placed in a single directory and zipped together into a single file for uploading to UR Courses. The zip file should include:
 - The source code files (.cpp and .h files)
 - A README file including your name and ID #; and explaining the compilation and execution of your program including the format of input and other details, along with a link to the Github repository of the assignment
 - Screenshots of test runs and the Github repository.