

Lab1

Purpose:

Use binary operations, bitsets and elementary containers

Background:

Data encryption and compression are major topics in software architecture. A technique often used to do encryption and compression is bit manipulations. The C language offers bit manipulation operations and C++ offers bit manipulation classes.

Specification:

The data file (Morse.bin) in the Lab Materials folder is a binary data file. See the BinaryFile example in the Review module for handling binary files. The data file is encoded using the first data encryption scheme based on "Morse Code". See the Morse Code encoding scheme listed below. The Morse Code data has been doubly encrypted to map to the ANSI Standard. This assignment is to decrypt the Morse.bin data.

Implementation:

Use Bitsets and Vectors as your primary data structures for this assignment. Students who have previously taken data structures may recognize that a Map would be an ideal data structure for this assignment. However, a Vector can be as effectively used as a HashTable once a hash-code is implemented.

Note:

At the end of the data file there may be some "extra" characters that get decrypted as "garbage" characters. You may ignore these characters.

Lab1 Encryption Bit Representation

Bits	Character
00	Letter Space
01	Dash
10	Dot
11	Word Space

Morse Text Example

Text	Morse Code
Morse Code	-- --- .-. /-.-. --- -. -/
Binary	0101000101010010
ASCII Representation	QRbC6a

Morse Codes

Letter	Morse
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	^-..
0	-----
1	..----
2	..----
3	...--
4^
5
6	^-....
7	^-...
8	^-..
9	^-..^
,	..----
@	..^..
:	^-...
,	^-..^
\$...^..^
=	^-..^
!	^-..--
.	..^..^
?	..^..
"	..^..

SAMUEL

Letter	Morse	Morse Binary
S	...	10 10 10
A	.-	10 01
M	--	01 01
U	..-	10 10 01
E	.	10
L	.-..	10 01 10 10

Morse Binary Encoded

S	^	A	^	M	^	U	^	E	^	L	^
1010	00	1001	00	0101	00	101001	00	10	00	10011010	00

Byte Boundaries

1010 1000	1001 0001	0100 1010	0100 1000	1001 1010
A 8	9 1	4 A	4 8	9 A
A8 (168)	91 (145)	4A (74)	48 (72)	9A (154)
"	'	J	H	š

Samuel Binary Encoded

""JHš