

ISE 208 Extra Credit Program

Due: Monday, December 14, at 11:59 PM

Submission Information

When you are finished with the assignment, send your completed Java source code (the .java file(s), **not** the compiled .class file(s)) as an e-mail attachment to the graduate TA (e-mail address: bhejakak AT gmail DOT com). **Be sure to put your name in your e-mail message AND in a comment at the top of your source code.** Include "ISE 208 Extra Credit" in the subject of your message.

Instructions

The Bifid cipher (see http://en.wikipedia.org/wiki/Bifid_cipher) is a simple technique for encrypting messages. It work by translating letters to their coordinates in a special grid, and then manipulating those coordinates in a particular way.

The Bifid cipher uses a 5x5 grid of letters agreed on by the sender and receiver. Each of the 25 letters (I and J are treated as being identical) is identified by its row and column number. For example, L is located at row 4, column 3:

```
 1 2 3 4 5
1 B G W K Z
2 Q P N D S
3 I O A X E
4 F C L U M
5 T H Y V R
```

Each letter in the unencrypted (*plaintext*) message is listed with its coordinates in the grid. The coordinates are listed in two rows: row, then column.

These numbers are converted into a single list (all rows followed by all columns). The values in the list are read as pairs of integers (i.e., the first two numbers in the list are read as a single row-column pair).

Finally, each new row-column pair is replaced by its matching letter in the grid. For example, if the new pair was 21, the encrypted message (*ciphertext*) would contain the letter Q.

Write a small Java program that prompts the user to enter a line of text. You may assume that this input only contains lowercase letters, with no spaces between words. Use the technique described above to encrypt the input string with the Bifid cipher, and print the resulting ciphertext. Your code should use one or more methods to carry out the algorithm; do not put everything into a single `main()` method! Use a two-

dimensional array of characters to store the grid; you may organize this grid in any way that you want.

Translation Example

Suppose that we are asked to encipher the plaintext "Hello world" using the Bifid cipher and the sample grid given above. We first create two lists, one for rows, and one for columns. "H" corresponds to grid coordinates (5, 2), so we add 5 to the rows list and 2 to the columns list. Continuing with the other letters in the plaintext, we get the following two lists:

rows: 5344313542

columns: 2533232534

Combining the two lists gives us:

53443135422533232534

Dividing the new list into pairs of elements gives us the following new grid coordinates:

(5,3), (4,4), (3,1), (3,5), (4,2), (2,5), (3,3), (2,3), (2,5), (3,4)

which correspond to the following characters in the grid:

YUIECSANSX

This is our enciphered text. Note that the space is ignored (and ultimately lost) in the translation process.

Extra Credit

Modify your program so that it can also decrypt messages encrypted using the Bifid cipher. This requires you to reverse the encryption process described above, which is slightly more complex than simply re-running the original process on the ciphertext. (+25%)