Data Structure 2018
Lab 05

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Array

1-dimensional array

Declaration in java: Object [] obj = new obj[size];

2-dimensional array

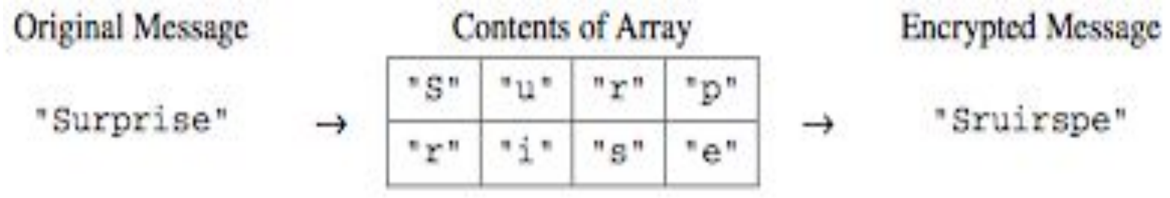
Declaration in java: Object [][] obj = new obj[column][row];

Today’s Work

Practice 1:

In this practice you will write two methods for a class Routcipher that encrypts (puts into a coded form) a message by changing the order of the characters in the message. The route cipher fills a two-dimensional array with single-character substrings of the original message in row-major order, encrypting the message by retrieving the single-character substrings in column-major order.

For example, the word “Surprise” can be encrypted using a 2-row, 4-column array as follows.



Today’s Works

Write the method `encryptMessage`, `fillBlock`, `encryptBlock`. The `encryptMessage` encrypts its string parameter message. The method builds an encrypted version of message by repeatedly calling `fillBlock` with consecutive, non-overlapping substrings of message and concatenating the results returned by a call to `encryptBlock` after each call to `fillBlock`. When all of message has been processed, the concatenated string is returned. Note that if message is the empty string, encryptMessage returns an empty string.

The following example shows the process carried out if `letterBlock` has 2 rows and 3 columns and `encryptMessage("Meet at midnight")` is executed.

Today's Works

Substring	letterBlock after Call to fillBlock	Value Returned by encryptBlock	Concatenated String
"Meet a"	"M" "e" "e" "t" " " "a"	"Mte ea"	"Mte ea"
"t midn"	"t" " " "m" "i" "d" "n"	"ti dmn"	"Mte eati dmn"
"ight"	"i" "g" "h" "t" "A" "A"	"itgAhA"	"Mte eati dmnitgAhA"

Today's Work

Practice 2: Matrix Multiplication

$$(m1m2)_{ij} = \sum_{k=1}^{m} m1_{ik} m2_{kj}$$

$$\mathbf{A} = \begin{pmatrix} A_{11} & A_{12} & \cdots & A_{1m} \\ A_{21} & A_{22} & \cdots & A_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ A_{n1} & A_{n2} & \cdots & A_{nm} \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} B_{11} & B_{12} & \cdots & B_{1p} \\ B_{21} & B_{22} & \cdots & B_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ B_{m1} & B_{m2} & \cdots & B_{mp} \end{pmatrix}$$

$$\mathbf{AB} = \begin{pmatrix} (\mathbf{AB})_{11} & (\mathbf{AB})_{12} & \cdots & (\mathbf{AB})_{1p} \\ (\mathbf{AB})_{21} & (\mathbf{AB})_{22} & \cdots & (\mathbf{AB})_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ (\mathbf{AB})_{n1} & (\mathbf{AB})_{n2} & \cdots & (\mathbf{AB})_{np} \end{pmatrix}$$