问题与反馈

2015.4.16

- Typos and errors in Abstract Algebra

32.1-2

Suppose that all characters in the pattern P are different. Show how to accelerate NAIVE-STRING-MATCHER to run in time $O(n)$ on an n-character text T.

32.1-4

Suppose we allow the pattern P to contain occurrences of a ***gap character*** $\diamond$ that can match an *arbitrary* string of characters (even one of zero length). For example, the pattern `ab`$\diamond$`ba`$\diamond$`c` occurs in the text `cabccbacbacab` as

$$\mathtt{c}\ \underbrace{\mathtt{ab}}_{\mathtt{ab}}\ \underbrace{\mathtt{cc}}_{\diamond}\ \underbrace{\mathtt{ba}}_{\mathtt{ba}}\ \underbrace{\mathtt{cba}}_{\diamond}\ \underbrace{\mathtt{c}}_{\mathtt{c}}\ \mathtt{ab}$$

and as

$$\mathtt{c}\ \underbrace{\mathtt{ab}}_{\mathtt{ab}}\ \underbrace{\mathtt{ccbac}}_{\diamond}\ \underbrace{\mathtt{ba}}_{\mathtt{ba}}\ \underbrace{\phantom{\mathtt{ba}}}_{\diamond}\ \underbrace{\mathtt{c}}_{\mathtt{c}}\ \mathtt{ab}\,.$$

Note that the gap character may occur an arbitrary number of times in the pattern but not at all in the text. Give a polynomial-time algorithm to determine whether such a pattern P occurs in a given text T, and analyze the running time of your algorithm.

32.2-3

Show how to extend the Rabin-Karp method to handle the problem of looking for a given $m \times m$ pattern in an $n \times n$ array of characters. (The pattern may be shifted vertically and horizontally, but it may not be rotated.)

32.2-4

Alice has a copy of a long n-bit file $A = \langle a_{n-1}, a_{n-2}, \ldots, a_0 \rangle$, and Bob similarly has an n-bit file $B = \langle b_{n-1}, b_{n-2}, \ldots, b_0 \rangle$. Alice and Bob wish to know if their files are identical. To avoid transmitting all of A or B, they use the following fast probabilistic check. Together, they select a prime $q > 1000n$ and randomly select an integer x from $\{0, 1, \ldots, q-1\}$. Then, Alice evaluates

$$A(x) = \left(\sum_{i=0}^{n-1} a_i x^i \right) \bmod q$$

and Bob similarly evaluates $B(x)$. Prove that if $A \neq B$, there is at most one chance in 1000 that $A(x) = B(x)$, whereas if the two files are the same, $A(x)$ is necessarily the same as $B(x)$. (*Hint:* See Exercise 31.4-4.)

32.3-5

Given a pattern P containing gap characters (see Exercise 32.1-4), show how to build a finite automaton that can find an occurrence of P in a text T in $O(n)$ matching time, where $n = |T|$.

18. Let C be a linear code. Show that either the ith coordinates in the codewords of C are all zeros or exactly half of them are zeros.

19. Let C be a linear code. Show that either every codeword has even weight or exactly half of the codewords have even weight.