

You Don't Say!

BY DENNIS E. SHASHA

But I repeat myself. But you repeat yourself.

You might have read the first sentence as an intriguing lead. What was there to repeat? In the second sentence, you might have observed the parallel structure but wondered what was going on.

In this puzzle, the goal is to study such parallel repetition. Let's call a sequence of symbols (each one representing a word or perhaps several words) "surprising" if, for every pair of symbols X and Y and every distance D , there is at most one position in the sequence where X precedes Y by distance D . The top two sentences have the same distance between "But" and "repeat," so the 10-word utterance they form would not be considered surprising.


Here are other symbolic examples: AAB is surprising, as is AABA, but AABB is not, because there are two instances when A is followed by B two symbols away (by distance 2). Similarly, AAXYBB is not surprising because A and B are separated by 4 two times.

To warm up, explain why the following sequence composed from the symbols A, B and C is not surprising: BCBABCC. And find a surprising sequence using A, B and C that is at least seven symbols long.

Here are three much harder challenges: Construct the longest surprising sequence you can that is composed from five distinct symbols. Then find the longest you can make using 10 and 26 distinct symbol, respectively. For convenience, use the letters of the alphabet as symbols (A through E, A through J, and A through Z, respectively). You will find that the length doesn't increase very fast, and I believe that even for 26 symbols, the longest sur-

prising sequence is less than 100 long.

The notion of surprise above is called 2-surprising because only pairs are involved. We could also define 3-surprising to mean that for any triplet of symbols and distances $D1$ and $D2$, there is at most one position in the sequence where the first symbol (X) precedes the second (Y) by distance $D1$ and the Y precedes the third (Z) by $D2$.

What is the longest 3-surprising sequence composed of the first five letters of the alphabet you can find? I know of no simple rule that will give the longest possible k -surprising sequences composed from sets of n symbols for any k and n . Can you find a pretty theory? 

Dennis E. Shasha is professor of computer science at the Courant Institute of New York University.

Surprising, or Not?

No: A A B B

No: A A X Y B B

No: C D A D B D C

Yes: A A B A C C

Answer to Last Month's Puzzle

The following permutations are not possible with three levels of switches:

A D E C B
A E D B C
B C D E A
C E D A B
D E A C B
E A B C D

All these permutations would be possible, however, if there were four levels of switches.

Web Solution

For more discussion of last month's problem and a peek at the answer to this month's problem, visit www.sciam.com