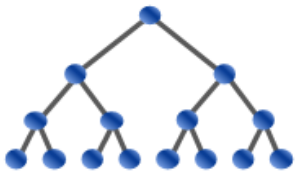
USA Computing Olympiad



USACO 2017 JANUARY CONTEST, BRONZE
PROBLEM 3. COW TIPPING

Return to Problem List

Contest has ended.

Submitted; Results below show the outcome for each judge test case

1	2	3	4	5	6	7	8	9	10
* 10.7mb 179ms	* 10.7mb 167ms	* 10.7mb 176ms	* 10.7mb 175ms	* 10.7mb 172ms	* 10.7mb 176ms	* 10.7mb 180ms	* 10.7mb 180ms	* 10.7mb 175ms	* 10.7mb 179ms

English (en)

Farmer John occasionally has trouble with bored teenagers who visit his farm at night and tip over his cows. One morning, he wakes up to find it has happened again -- his N^2 cows began the night grazing in a perfect $N \times N$ square grid arrangement ($1 \leq N \leq 10$), but he finds that some of them are now tipped over.

Fortunately, Farmer John has used parts from his tractor and forklift to build a glorious machine, the Cow-Untipperator 3000, that can flip over large groups of cows all at once, helping him put all his cows back on their feet as quickly as possible. He can apply the machine to any "upper-left rectangle" in his grid of cows -- a rectangular sub-grid that contains the upper-left cow. When he does so, the machine flips over every cow in this rectangle, placing tipped cows back on their feet, but unfortunately also tipping over cows that were already on their feet! In other words, the machine "toggles" the state of each cow in the rectangle.

Farmer John figures that by applying his machine sufficiently many times to the appropriate collection of rectangles, he can eventually restore all the cows to their rightful, un-tipped states. Please help him determine the minimum number of applications of his machine needed to do this.

Note that applying the machine to the same rectangle twice would be pointless, since this would have no net impact on the cows in the rectangle. Therefore, you should only consider applying the machine to each upper-left rectangle possibly only once.

INPUT FORMAT (file cowtip.in):

The first line of the input is the integer N.

Each of the N subsequent lines contains a string of N characters, each either 0 (representing an up-tipped cow) or 1 (representing a tipped cow).

OUTPUT FORMAT (file cowtip.out):

Please output the minimum number of times Farmer John needs to apply the Cow-Untipperator 3000 to restore all his cows to their feet.

SAMPLE INPUT:

```
3
001
111
111
```

SAMPLE OUTPUT:

```
2
```

In this example, if FJ applies his machine to the entire herd of cows (which is a valid upper-left rectangle), he will toggle their state to the following:

```
110
000

000
```

All that remains is to apply the machine to the upper-left rectangle containing the two 1s, and he is finished. In total, this is just 2 applications.

Problem credits: Nathan Pinsker

Language: C

Source File: Choose File No file chosen

Submit Solution

Note: Many issues (e.g., uninitialized variables, out-of-bounds memory access) can cause a program to product different output when run multiple times; if your program behaves in a manner inconsistent with the official contest results, you should probably look for one of these issues. Timing can also differ slightly from run to run, so it is possible for a program timing out in the official results to occasionally run just under the time limit in analysis mode, and vice versa. Note also that we have recently changed grading servers, and since our new servers run at different speeds from the servers used during older contests, timing results for older contest problems may be slightly off until we manage to re-calibrate everything properly.