§1 YPLAY INTRO 1

(Downloaded from https://cs.stanford.edu/~knuth/programs.html and typeset on September 17, 2017)

1. Intro. This simple program calculates Schensted's Y function. Consider the array

The first nine columns of these five rows were given as standard input; this array shows the standard output. In general the standard input should consist of n + 1 lines of 2n + 1 characters, for some n, using only spaces and \mathbf{x} 's and \mathbf{o} 's. (Otherwise who knows what might occur. I wrote this in a terrific hurry.)

```
#define maxn 100
#include <stdio.h>
  char a[maxn + 1][maxn + 1][maxn + maxn + 1];
  main()
     register int i, j, k, n, s;
     \langle \text{Read the input into a}[0], \text{ determining } n \ 2 \rangle;
     for (k = 1; k \le n; k ++) (Compute a[k] from a[k-1] 3);
     \langle \text{ Print the results 4} \rangle;
2. \langle \text{Read the input into a[0], determining } n \ 2 \rangle \equiv
  fgets(a[0][0], maxn + 2, stdin);
  for (n = 0; a[0][0][n] \equiv ' ; n++);
  a[0][0][n+n+1] = '\0';
  for (k = 1; k \le n; k++) {
     fgets(a[0][k], maxn + 2, stdin);
     a[0][k][n+n+1] = 0;
This code is used in section 1.
3. \langle \text{ Compute } a[k] \text{ from } a[k-1] \text{ 3} \rangle \equiv
  for (j = 0; j \le n - k; j ++) {
     for (i = 0; i \le n + n - k - k; i ++) \ a[k][j][i] = ' ' ;
     for (i = n - k - j; i \le n - k + j; i += 2) {
        if (a[k-1][j][i+1] \equiv '\circ') s++;
        if (a[k-1][j+1][i] \equiv '\circ') s++;
        if (a[k-1][j+1][i+2] \equiv '\circ') s++;
        a[k][j][i] = (s > 1 ? 'o' : 'x');
     }
  }
This code is used in section 1.
4. \langle \text{ Print the results 4} \rangle \equiv
  for (k = 0; k < n; k++) {
     printf(a[0][k]);
     for (j = 1; j \le k; j ++) printf("_\\\sum_ks", a[j][k - j]);
     printf("\n");
```

This code is used in section 1.

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5. Index.

stdin: 2.

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```
 \begin{array}{ll} \langle \ {\rm Compute} \ a[k] \ {\rm from} \ a[k-1] \ 3 \, \rangle & {\rm Used \ in \ section \ 1.} \\ \langle \ {\rm Print \ the \ results} \ 4 \, \rangle & {\rm Used \ in \ section \ 1.} \\ \langle \ {\rm Read \ the \ input \ into \ a[0], \ determining \ n \ 2 \, \rangle} & {\rm Used \ in \ section \ 1.} \\ \end{array}
```

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