**1* Introduction.** This is a hastily written implementation of the daghull algorithm.

```
format Graph int    /* gb_graph defines the Graph type and a few others */
format Vertex int
format Arc int
format Area int
#include "gb_graph.h"
#include "gb_rand.h"
#include "gb_miles.h"
int n = 128;
int mapping[10000];
⟨ Global variables 2 ⟩
⟨ Procedures 13* ⟩
main(argc, argv)
    int argc;
    char **argv;
{
  ⟨ Local variables 7 ⟩
  Graph *g;
  int kk, kkk, xrnd, yrnd;
  char str[10];
  if (argc ≠ 2) n = 100;
  else if (sscanf(argv[1], "%d", &n) ≠ 1) {
    printf("Usage: %s [n]\n", argv[0]);
    exit(1);
  }
  else if (n < 20 ∨ n > 10000) {
    printf("n should be at least 20 and at most 10000!\n");
    exit(1);
  }
  g = gb_new_graph(n);
  gb_init_rand(0);
  for (kk = 0; kk < n; kk++) mapping[kk] = kk;
  for (kk = 0, v = g→vertices; kk < n; kk++, v++) {
    kkk = gb_next_rand( ) % (n − kk);
    v→x.I = mapping[kkk];
    mapping[kkk] = mapping[n − kk − 1];
    sprintf(str, "%d", v→x.I);
    v→name = gb_save_string(str);
  }
  mems = ccs = 0;
  ⟨ Find convex hull of g 8 ⟩;
  printf("Total of %d mems and %d calls on ccw.\n", mems, ccs);
}
```

**13* Determinants.** I need code for the primitive function *ccw*. Floating-point arithmetic suffices for my purposes.

We want to evaluate the determinant

$$ccw(u,v,w) = \begin{vmatrix} u(x) & u(y) & 1 \\ v(x) & v(y) & 1 \\ w(x) & w(y) & 1 \end{vmatrix} = \begin{vmatrix} u(x)-w(x) & u(y)-w(y) \\ v(x)-w(x) & v(y)-w(y) \end{vmatrix}.$$

```
⟨ Procedures 13* ⟩ ≡
  int ccw(u, v, w)
      Vertex *u, *v, *w;
  { register det = 1, ux = u→x.I, vx = v→x.I, wx = w→x.I, t;
    if (ux > vx) {
      t = ux; ux = vx; vx = t; det = -det;
    }
    if (vx > wx) {
      t = vx; vx = wx; wx = t; det = -det;
    }
    if (ux > vx) {
      det = -det;
    }
    if (n < 150)
      printf("cc(%s; %s; %s) is %s\n", u→name, v→name, w→name, det > 0 ? "true" : "false");
    ccs++;
    return (det > 0);
  }
```

This code is used in section 1*.

## 14* Index.

The following sections were changed by the change file: 1, 13, 14.