Program Listings

A Reference Implementation of the S-ring

The C program "sring.c":

```
/*
 * sring.c - reference implementation of an S-ring
 * (C) 1999 - 2006,  S. Markon, Osaka, Japan. Released under the GPL
 * This is a fragment, for complete source see the book's web site.
 */

#define N 32
static int s[N], c[N], p, pa, r, n, m, nw, it;
static double w[N+N],l;

/* Utility: return TRUE with probability p */
static int prob(double p) {
  return ((double)(rand()) / (double)RAND_MAX) < p;
}

/* Initialize parameters and work variables */
static void init_ring(int nx, int mx, double lx, int sd) {
   int i;

   srand(sd);                    /* seed from user */
   n = nx;                       /* number of sites */
   m = mx;                       /* number of servers */
   l = lx;                       /* probability of arrivals */
   r = n;                        /* free sites initialized */
   for (i=0;i<n;i++) {
     s[i] = c[i] = 0;
     if (prob(l)) {
       c[i] = 1;                 /* generate customers */
       r--;                      /* and decrease free count */
```

```
      }
    }
    for (i=0;i<m;i++) {
      s[i] = 1;                  /* generate m servers */
    }
    p = 0;                       /* current site position */
    pa = 1;                      /* next site for server */
}

/* Step the ring from s to s1; a: decision  d: customer arrival */
static int step_ring(int a, int d) {
  if (d && !c[p]) {              /* new customer? */
    c[p] = 1; r--;               /* decrease free site count */
  }
  if (s[p]) {                    /* a server here? */
    if (c[p]) {                  /* and also a customer? */
      if (a || s[pa]) {          /* and to be served? */
        c[p] = 0; r++;           /*   serve; increase free sites */
      } else {                   /* or not to be served? */
        s[pa] = s[p]; s[p] = 0; /*   pass by */
      }
    } else if (!s[pa]) {         /* server free to proceed? */
      s[pa] = s[p]; s[p] = 0;    /*   go ahead */
    }
  }
  pa = p; p = (p + n - 1)%n;     /* move current-site-position */
  return r;                      /* number of free sites now */
}

/* Calculate decision by a single-layer perceptron */
static int perceptron(int n, double *w) {
  int i,j;
  double x=0.0;

  for (i=0,j=p;i<n;i++,j=(j+1)%n)
    x += (double)s[j]*w[i]       /* contribution of servers */
       + (double)c[j]*w[i+n];    /* contribution of customers */
  return x>0.0;                  /* Heaviside function */
}
```

A simple shell script "sring.sh" for exercising "sring.c":

```
#!/bin/sh
echo -n "greedy policy: "
./sring n6 m2 i1000000 p0.3 r0$1  1 1 1 1 1 1  1 1 1 1 1 1
echo -n "balance policy: "
./sring n6 m2 i1000000 p0.3 r0$1 -1 3 3 3 3 -1 0 0 0 0 0 0
echo -n "optimal policy: "
./sring n6 m2 i1000000 p0.3 r0$1 -15 33 33 33 21 -3 0 -8 -4 -4 12 4
```

An Implementation of the Simple Stochastic Search

The C program "sss.c":

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
#include <float.h>
#include <unistd.h>
#define  DEBUG 0
#define Z (rand()/(RAND_MAX+1.0))
/* Utility: return TRUE with probability p */
static int prob(double p)
{
  return ((double)(rand()) / (double)RAND_MAX) < p;
}
double uni(double a, double b)
{
  return a + (b-a) * (drand48()) ;
}

void main(int argc, char *argv[])
{
  double e=1.0; /* step size */
  double d=0.5; /* distance delta */
  double p=0.4; /* probability of generating a better candidate */
  double tau=0.811; /* threshold value */
  int steps, sim, l;
  double i, j, tmp_i, result;
  int seed = 13232; /*random seed */
  for (l=1;l<argc;l++) {
    switch ( argv[l][0] ) {
    case 'd': d = atof(argv[l]+1); break;
    case 'p': p = atof(argv[l]+1); break;
    case 't': tau = atof(argv[l]+1); break;
    case 's': seed = atoi(argv[l]+1); break;
    }
  }
  srand48(seed);
  for (sim=1; sim <= 1000; sim++){
      i = 0.0; tmp_i= 0.0;
      for (steps = 0; steps < 1; steps++){
          if (drand48() < p){
            j=(i+1)*d+uni(-e/2.0,e/2.0);
              tmp_i=i*d+uni(-e/2.0,e/2.0);
            if (j  > tmp_i + tau) i++;}
          else{
            j=(i-1)*d+uni(-e/2.0,e/2.0);
              tmp_i=i*d+uni(-e/2.0,e/2.0);
```

```
              if (j  > tmp_i + tau) i--;
            }
            steps++;
          } /* end steps */
        result = result + i;} /* end sim */
    result /=sim;
  }
```

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