

```

/*****
/*      GetInter.cpp      */
/*      Hui Jin          */
/*****
/*
file description:
    Get appropriate permutation for LDGM (LDPC) code for given
    degree sequence L and R.
    In first version. R sequence is constant.
Author: Hui Jin
date:   3/12/2000

modification:  3/12/2000  first version.
                    One important thing is, L and R should
be
                    in decreasing order.
                    4/5/2000  Second version. Leave GetInter() there.
                    implement new version newGetInter()
using
                    Gallager idea, similar to his ensemble
but has
                    variable and check nodes reversed. See
page 38
                    Book III.
                    4/9/2000  Method II has problems, return to
GetInter(),
                    but change the way the next number is
                    generated.
                    L and R should be
                    in decreasing order !!!!
                    And we should use the same .prm in
IRAsimu.
                    4/12/2000  We are going to arrange the degree 2
nodes on
                    the left, because those are causing
problems of
                    short cycles in decoding.
                    The main idea is to arrange them as a
path on
                    nodes 0, t, 2t, 3t, ... (n-1)t, where t
is an
                    integer that gcd(t,n)=1, and t is around
                    sqrt(n). So this is like the right part
except
                    in different order.
                    In this way, We can make sure the
                    shortest cycle consisting only degree 2
node is
                    around 2t. Which is good.
                    Degree sequence is still in decreasing

```

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order,
first. The
*/
```

but we take care of degree 2 nodes  
rest the same as 4/9/2000 version.

```
#include <iostream.h>
#include <fstream.h>
#include <stdlib.h>
#include <math.h>
```

```
#include "vector.h"
#include "ldpc.h"
#include "paramfio.h"
#include "datatype.hh"
#include "random.hh"
```

```
void printusage()
{
    printf("Usage: GetInter filename.prm infolen \n");
    exit(1);
}
```

```
void getLRdegree(degree_sequence& L, degree_sequence &R, char *
filename)
{
    ivector deg;
    vector fe;
    paramfio P;
    P.set_filename(filename);
    P.read("variable degree", deg);
    P.read("variable fraction", fe);
    L.init(deg.getsize());
    L.d = deg;
    L.fe = fe;
    P.read("check degree", deg);
    P.read("check fraction", fe);
    R.init(deg.getsize());
    R.d = deg;
    R.fe = fe;
    L.edge_to_node();
    R.edge_to_node();
}
```

```

/*
delete the index term from a list with length=len.
  index is in [0, len-1].
*/

void list_del(int list[], int len, int index)
{
  for(int i=index; i<len-1; i++)
    list[i]=list[i+1];
}

/*
3/12/2000  Hui Jin
get an interleaver for LDGM code.
Any two edge in the same variable node won't be in the same check
node, we
garantee the second part by imposing if two edges are adjacent to the
same
variable node, their permutation must be with distance >=k, which can
be
adjacent to the same check node.
help function: void list_del(int list[], int len, int index)
modification: 4/9/2000
              only check distance property in the same node.
*/
void getInter(int *_interleaver, degree_sequence & LV, int nv[], int
_len, int check_deg)
{

  //how many numbers left in the pool.
  int remain_len = _len;
  int k=0;
  int distance;

  int s_ch;

  //the set of all the numbers.
  int list[_len];
  int list_index;
  for(int m=0; m< _len; m++) list[m]=m;

  RandomGenerator rand;

  for(int i=0; i< LV.n; i++)
    for(int l=0; l< nv[i]; l++)
      for(int j=0; j<LV.d[i]; j++)
        {
          //randomly get a number in the remaining numbers.
          list_index = (int) floor(rand.UNI()*remain_len);

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        _interleaver[k]=list[list_index];
distance=2*check_deg;
//check if all the close positions have a permutation with
// appropriate distance.
s_ch=k-j;
while(s_ch<k)
    { //if degree 2 nodes, special care.
        if(LV.d[i]==2) distance = 200;
        if(abs(_interleaver[s_ch]-_interleaver[k])>= distance)
s_ch++;
        else
        {
            list_index = (int) floor(rand.UNI()*remain_len);
            _interleaver[k]=list[list_index];
            s_ch=k-j;
        }
    }
//we found the appropriate number, now delete that element
from the
// remain list.
list_del(list, remain_len, list_index);
k++;
remain_len--;
}
}

```

```

int main(int argc, char* argv[])
{

    if (argc !=3)
    {
        printusage();
    }

    degree_sequence LV;
    degree_sequence LC;
    int argcount = 1;

    getLRdegree(LV, LC, argv[argcount++]);

    int info_len= atoi(argv[argcount++]);

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int nv[LV.n];
int LEdge_num=0;
double s=0;
for(int i=0; i< LV.n-1; i++)
    {
        nv[i]= int(floor((s+LV.fn[i])*info_len) -
floor(s*info_len));
        s+=LV.fn[i];
        LEdge_num += nv[i] * LV.d[i];
    }

    nv[LV.n-1]= info_len -(int) floor(s*info_len);
    LEdge_num += nv[LV.n-1] * LV.d[LV.n-1];

//assume here LC.av_degree() is constant
int check_deg= (int) floor(LC. av_degree_node());

int _len= LEdge_num;

cout << "Total length permutation " << _len << endl;

int _Interleaver[_len];

getInter(_Interleaver, LV, nv, _len, check_deg);

for(int i=0; i< _len; i++)
    cout << _Interleaver[i]<< endl;

}

```

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