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DUMA - A PROGRAM TO DISPLAY DISTRIBUTIONS IN HEXAGONAL GEOMETRY

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DUMA - A PROGRAM TO DISPLAY DISTRIBUTIONS IN HEXAGONAL GEOMETRY

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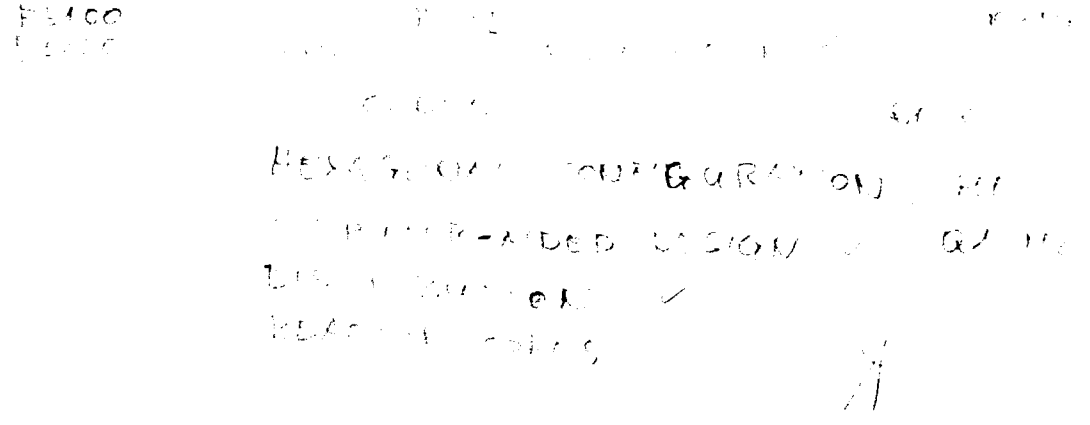
Tran Quoc Dung, M. Makai: DUMA - a program to display distributions in hexagonal geometry. KFKI-1987-58/G

ABSTRACT

DUMA program displays hexagonal structures for one or two distributions in them. It helps users to display either integer, literal or real arrays in an arbitrary hexagonal structure. Possible applications: displaying core layout, power distribution or measured activities.



Тран Куок Зунг, М. Макаи: DUMA - программа для отображения распределений в шестиугольниках. KFKI-1987-58/G

АННОТАЦИЯ

Программа DUMA позволяет отображать структуры и одно или два распределения в этой шестиугольной структуре. С помощью программы DUMA пользователь может рисовать целый, текстовый или два вещественных массива. Может применяться для представления картограмм, распределения мощности или измеренных активностей фольг.

Tran Quoc Dung, Makai M.: DUMA - Program eloszlások hatszögekben történő megjelenitésére. KFKI-1987-58/G

KIVONAT

A DUMA program hatszögekből álló szerkezetek és bennük egy vagy két eloszlás megjelenitésére szolgál. Segitségével a felhasználó megjelenithet egy egész, egy szöveg vagy két valós számokból álló eloszlást egy tetszés szerinti hatszöges szerkezetben. Alkalmazható zónatérképek, teljesitményeloszlások, aktivitás mérések megjelenitésére.

1.Introduction.

Reactor physics often deals with results of calculations or measurements related to hexagonal structures. Such is the case with ZR-6 measurements, WWER-440 calculations and in-core measurements and such will be the case with WWER-1000, too.

Making use of our CALCOMP plotter, the DUMA program offers users a convenient way of displaying

-structures;
-distributions;
-comparisons of two distributions.

Both of the widely used modes of positioning the hexagons are included in DUMA (see next section). The user can either magnify or rotate the drawing with built in facilities. The present material discusses the basic concepts of the DUMA program and gives a sufficiently detailed description for the users to introduce additional features or minor alterations.

2.Elements of a drawing

Let us consider a structure composed of hexagons and every hexagon may optionally have

-a serial number;
-a first item (either a floating point number or an at most 4 character long text);
-a second item (a floating point number).

The floating point numbers are assumed to be in the range [0,9.999] and will be displayed in 1PF5.3 format. The drawing to be displayed has the following elements:

-heading (1);
-box(2);
-horizontal scale(3);
-vertical scale(4);
-hexagon boundaries(5);

and in every hexagon optionally we may have

-a serial number(6);
-a first item(7);
-a second item(8);

as shown in Fig.1. Any item may be omitted exept the hexagon boundaries. Whatever the drawing, it consists of hexagons arranged into a structure. The position of a hexagon inside the structure is identified by a pair of numbers formed from its rows and columns. Hexagons belong to the same column if the coordinates of their centres have identical x (horizontal) coordinates; and belong to the same row if their centres have identical y (vertical) coordinates.

We describe the structure as follows. First of all, DUMA accepts two orientations of hexagons: it may stand either on a side or on a corner point.The orientation is characterized by the variable LORI. The lowest and highest position in row i are denoted by II(i) and JJ(i), respectively. S is the side length of a hexagon. We shall need the coordinates of the hexagon centre and of the corner points. The former is given by

$$x=(n-1)*1.5*S$$

the latter by

$$y=(m-1)*SQRT(3.0)/2.0*S \quad .$$

The coordinates of the corner points are

$$y_i = y + S*\cos((i-1)*\pi/3.0)$$
$$x_i = x + S*\sin((i-1)*\pi/3.0)$$

for i=1,...,6. Here m is the x coordinate (row) and n the y coordinate (column).
When drawing an arbitrary hexagonal structure, we have only 8 different hexagon positions, they are given in Fig.2. The two most widely used positionings of a hexagon (see Fig.3) differ solely in the position of rows and columns and are identical if rows and columns are interchanged.

3. DUMA Program

The drawing is composed of the elements given in Section 2. The structure of the program is briefly as follows.

DUMA PROGRAM	-organizes the work of subroutines;
INPUT	- reads in the input given in Table 1;
COLUM1	-draws the hexagons in the first column;
CASEI	-prepares for drawing hexagons when II(n)<II(n-1);
CASEII	-prepares for drawing hexagons when

II(n)>II(n-1);

CASE1,...	-draws the sides of the hexagons corresponding
CASE8	to the 8 cases of Fig.2.
COORDI	-determines the coordinates of the centre of hexagons.
NUMB	-displays distribution in the hexagons.
BOX	-displays the title, box, column and row numbering indicator of the hexagonal structure.

DUMA makes use of the subroutines FACTOR, PLOTS, PLOT which are standard CALCOMP routines and reside in library LBO:[6,4] CALC77. Drawing is performed by a CALCOMP 104LGT plotter.

Figure.4 shows the flow chart of the DUMA program .

Fig.4 DUMA Flow chart

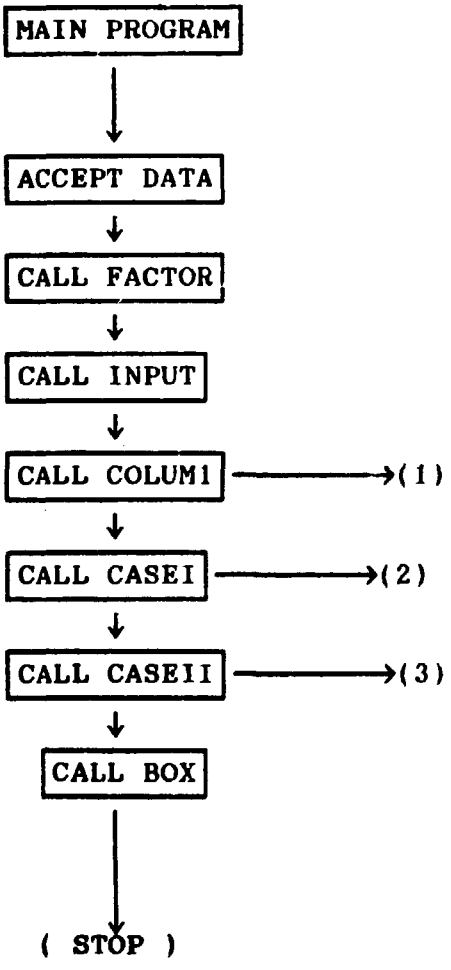


Fig.4. (continued)

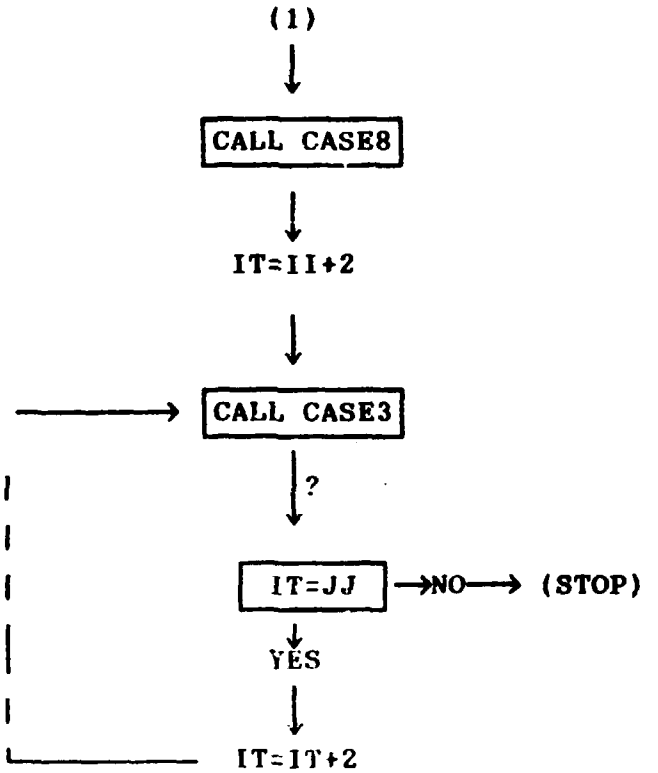


Fig.4 (continued)

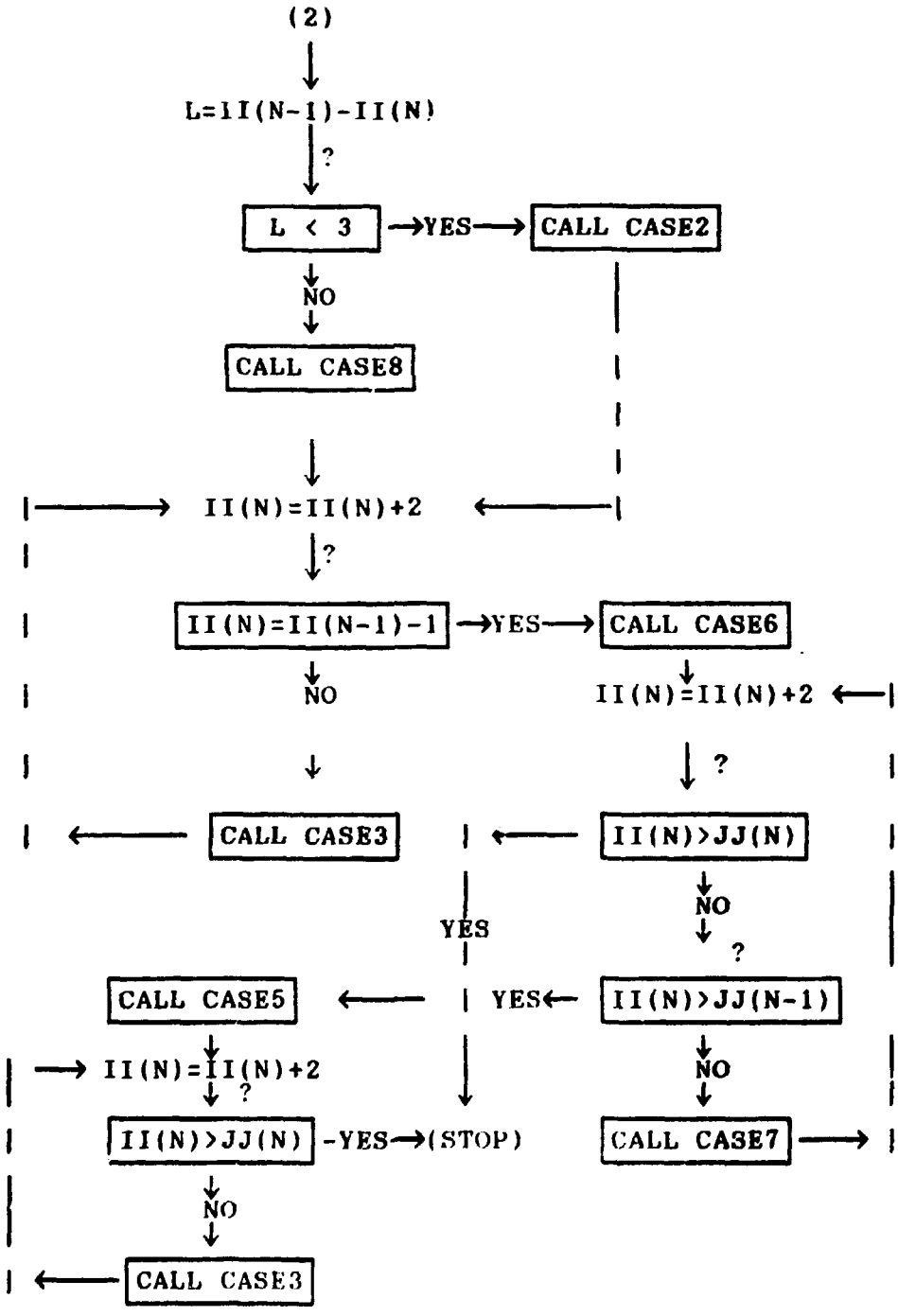
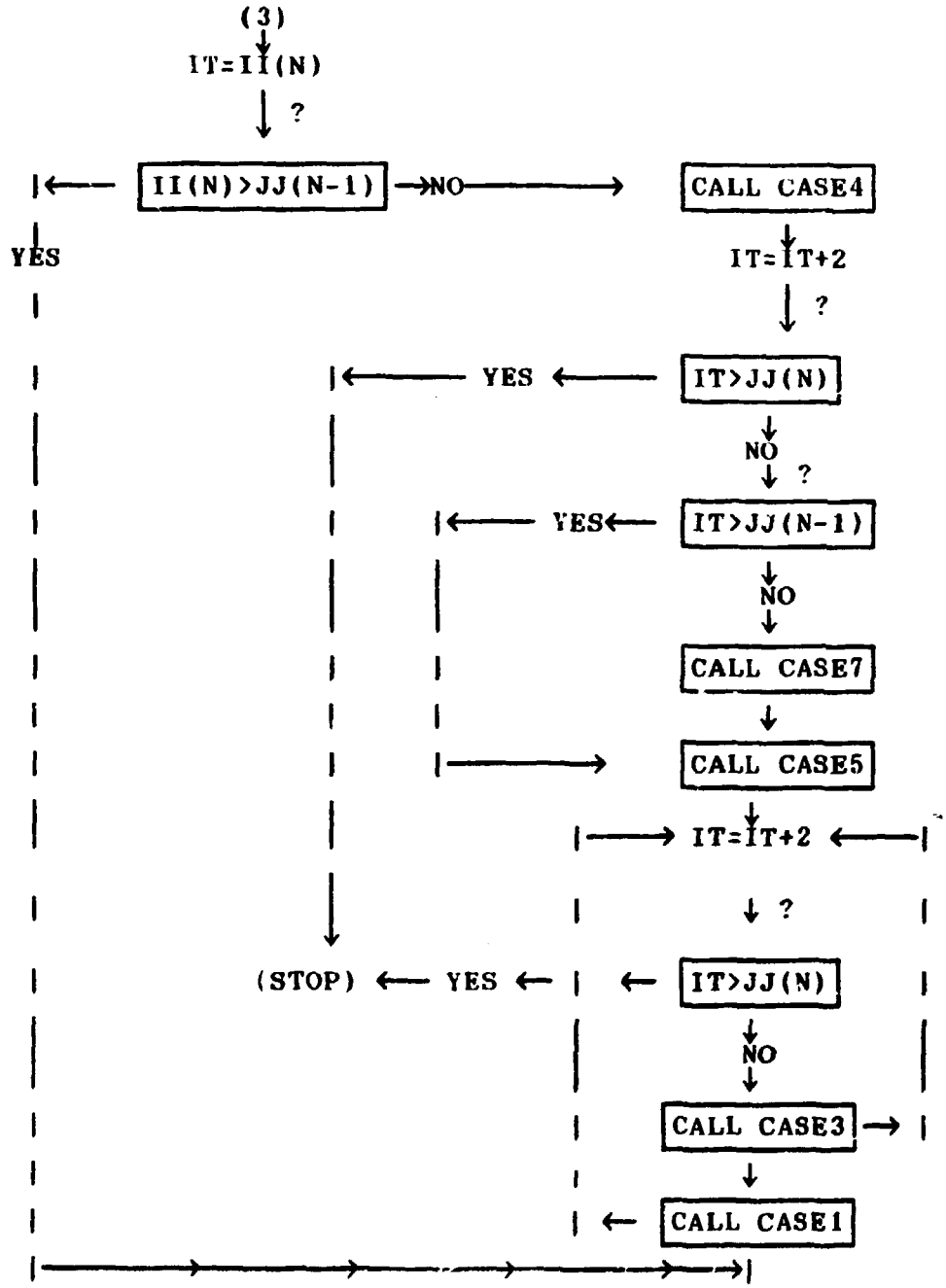


Fig.4. (continued)



4. Input description.

After the command RUN, the following variables must be given as input.

Variable	Questions (appear in display)	Meaning
LORI	ORIENTATION ?	LORI=1 If hexagon lies on its side. LORI=0 if it stands on cornerpoint
FACT	FACT ?	Ratio of the desired plot size.
NCOL,NROW	NUMBER OF COLUMN AND ROW ?	Input number of column and row of hexagonal structure
II(N), JJ(N)	INPUT II(N) AND JJ(N) WITH N=L (1,2,... NCOL)	Give the first and last positions in column L.
LA,LC,LR, LB,HLINE	LA,LC,LR,LB,HLINE ?	LA-Number of arrays to be displayed =1 only sequential numbering =2 1st item =4 2nd item e.g 7=4+2+1 ; LA < 8 If LA=0 no display If LA=-1 text is displayed LC-column numbering indicator (1/0 =yes/nc) LR-row numbering indicator (0/1=no /yes) LB= 1 box is drawn =0 no box HLINE headline indicator =1 write title =0 no title
CBEGI, CSTEP	FIRST NUMBERING AND STEP OF COLUMN	CBEGI-first column NUM numbering indicator CSTEP-step of column numbering indicator (plus or ms)u)
RBEGI, RSTEP	FIRST NUMBERING AND STEP OF ROW ?	RBEGI-first row numbering indicator RSEPT-step of row numbering indicator (even,plus or minus)
	READ HEADLINE ?	Input the content of title (max. 80 characters)
SENU(I,J)	COLUMN NO : ROW NO : READ THE SEQUENTIAL NUMBERING	Input the sequential numbering of hexagon in column I and row J (corresponding A=1)
FISTAR(I,J)	READ FIRST ARRAY	Input the first array of hexagon in column I and row (corresponding LA=2)

Variable	Questions (appear in display)	Meaning
SECOAR(I,J)	READ SECOND ARRAY	Input the second array of hexagon in column I and row (corresponding LA=4) (for LA=3,5,6,7, similar questions also appeared in display)
TEXT(I,J)	READ TEXT	Input the content of text in hexagon in column I, row J

REFERENCES

[1]. M.MAKAI In aid of in-core measurement processing. KFKI-1986-15/G ,Budapest,1986.

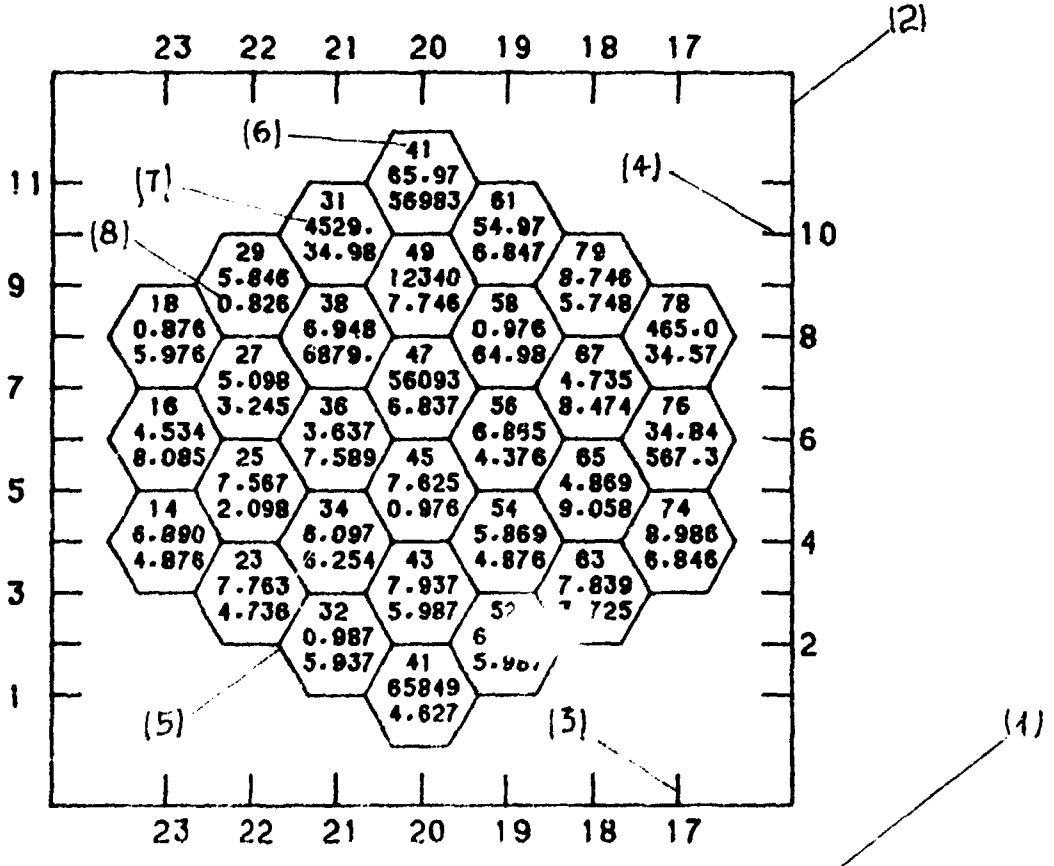


Fig. 1. Main constituents of drawing

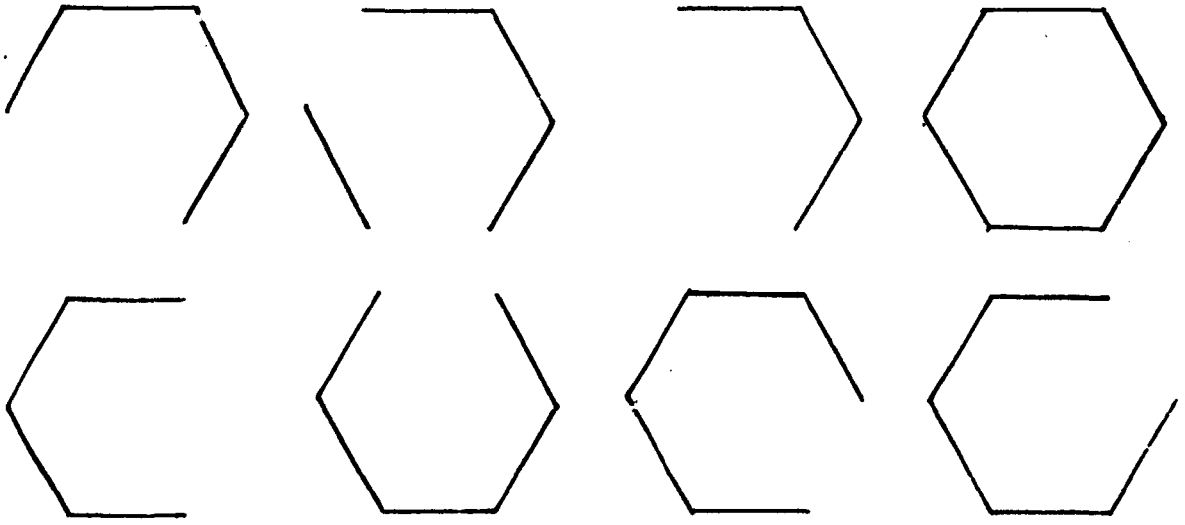


Fig.2. Hexagon positions in a drawing.

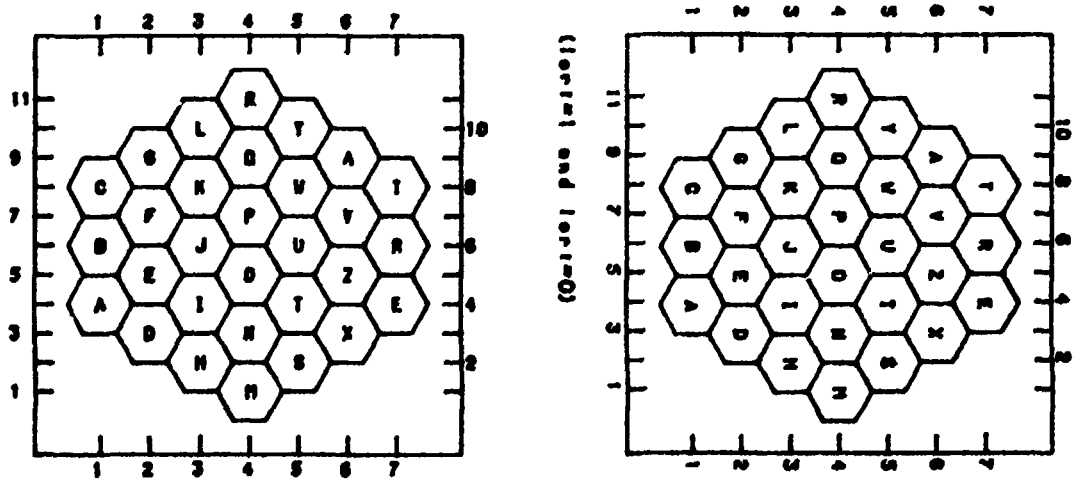
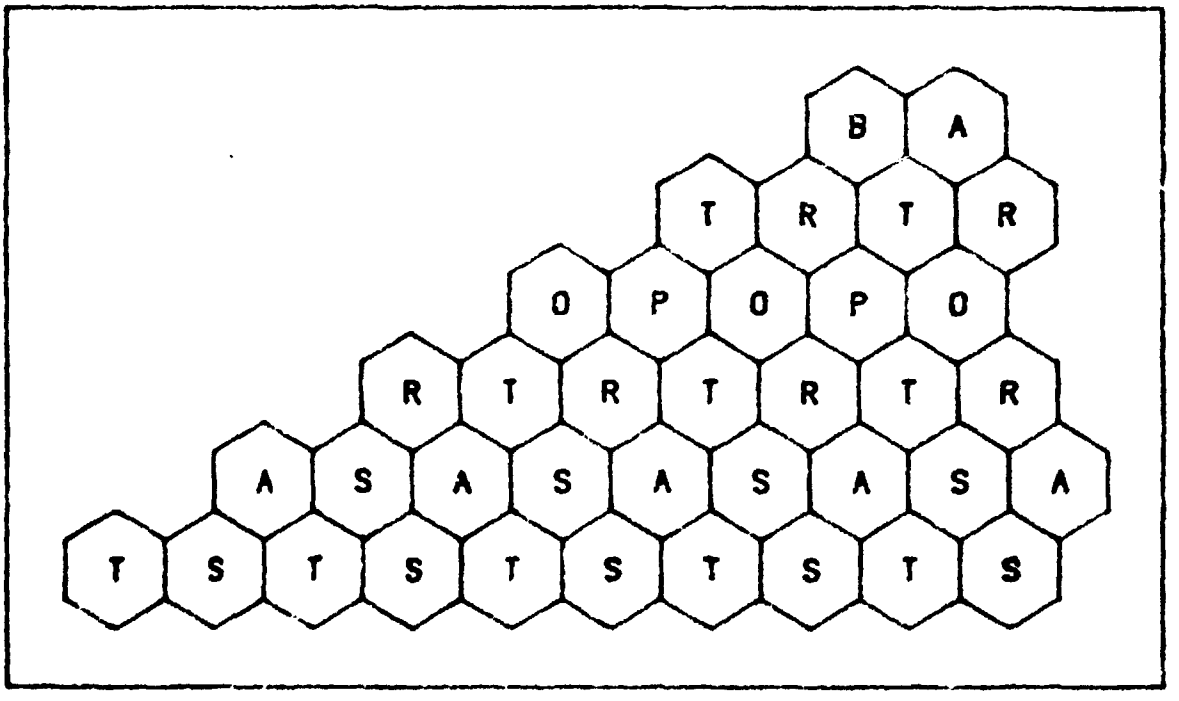
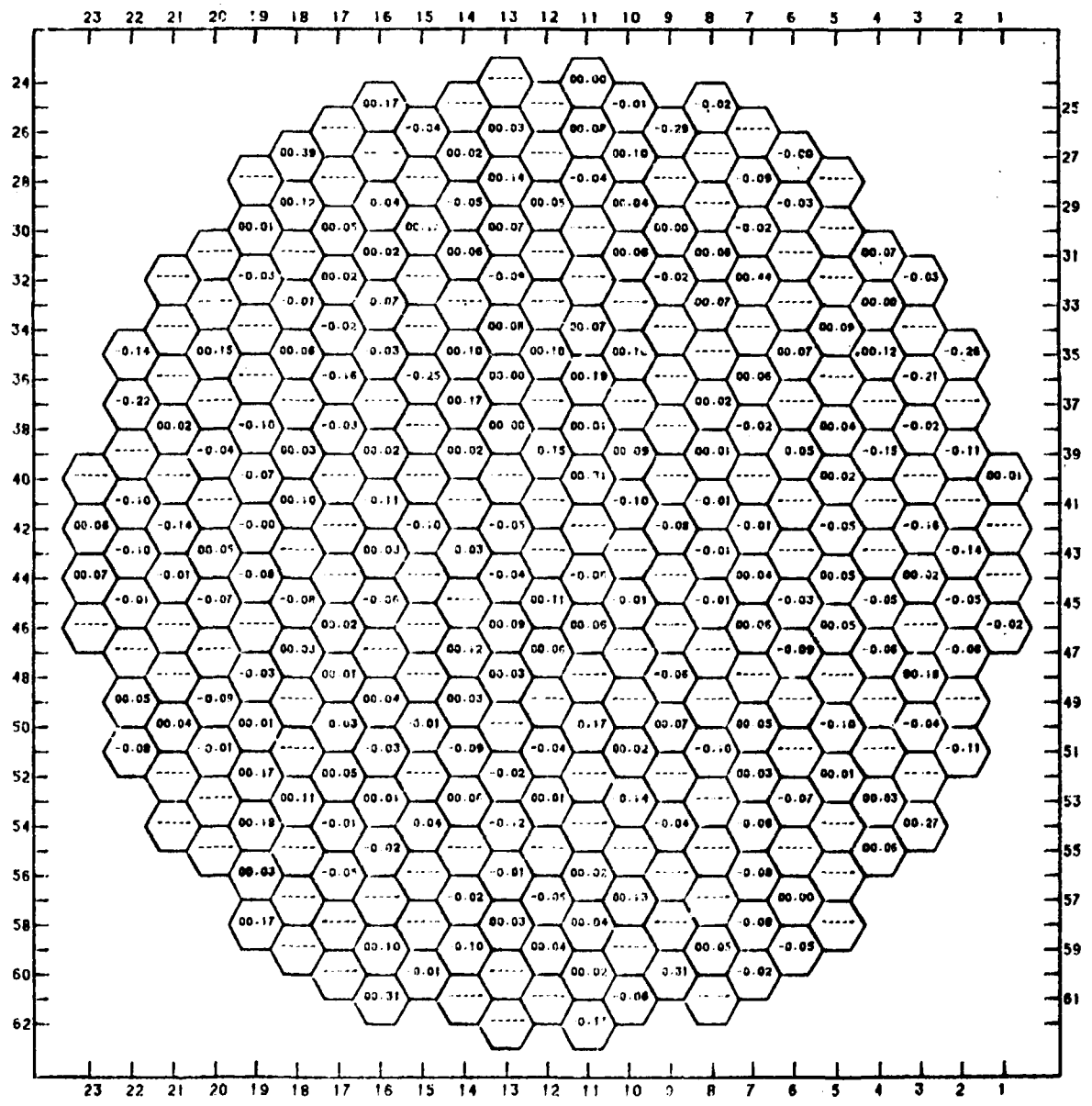


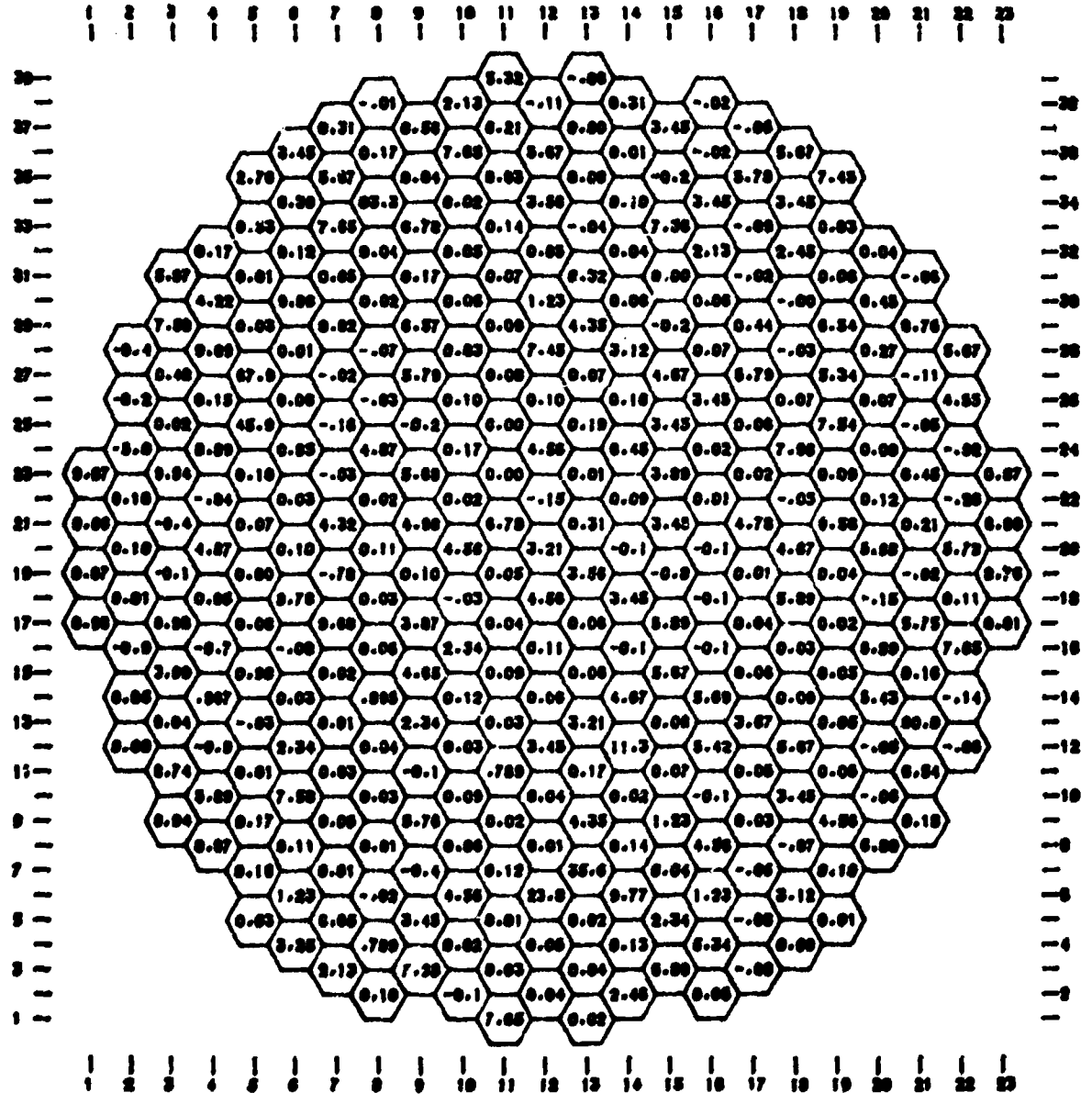
Fig.3. Two ways of positioning a hexagon in the DUMA program.



Ex.1 LORI=0,LB=1,LA=-1,LR=LC=0,HLINE=1,FACT=0.7



Ex.2. A distribution taken from [1], LORI=1.



Es.3 LOAD1=1.,LB=0.,LA=-1.,LR=LC=1.,NLINE=1.,FACT=0.4 .

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