APPLICATION OF DIRECT DIGITIZATION ON STEREOPLOTTING INSTRUMENTS FOR ORIGINAL MAPPING SYSTEMS

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1. The need to acquire further informations on the various realities of the territory and on its elements of development is the emerging characteristic in Development Programs and Territorial Plannings of towns, districts, regions, etc., in the last few years. Therefore the numerical information on geometrical characteristics of environment consitute the informatic stand in which, in virtue of space position, all the data concerning social, economic, town-planning, demographic, ... sides of the territorial reality can be put.
It is necessary, then, to be able to have topographic elements produced in numerical form which is surely the most consistent with computers data banks.
The more widespread method which has been utilized till now to produce digital cartography is the digitization of pre-existent map elements, that makes possible to pass from map stand to informatic stand throught simple instruments (Digitizer) and manual proceedings of scanty specialization.
Automatic digitization is also made possible by instruments equipped with optical sensors but their use is still limited for their high price.
Such methodology however, shows the nonsense linked to a process like the following:
   - ground survey with numerical instruments (topographic or photogrammetric);
   - production of graphic elements, maps;
   - renumbering of maps throught digitization and shaping of Digital Terrain Model (D.T.M.);
   - building of geometrical stand for Data Banks.

   Obviously this causes repetitions and duplications of possible errors and personal interpretations in the following operations. On the contrary, in virtue of the new possibilities supplied by stereoplotters with automatic registration of coordinates, it is possible to obtain the D.T.M. directly during restitution, which will be used as geometrical reference in the Informatic Territorial System.
   Thus, it is more advisable a process like the following:

- numerical surveys (topographic or fotogrammetric);
- automatic recording of coordinates and building of D.T.M.;
- acquisition of D.T.M. in data bank;
- production of graphic maps throught automatic plotter.

A similar proceeding is already used to make "ortophotomaps" as it is necessary to know the difference in height among the projection centres for each one of the smallest element of the projection. The automatic tracing of countouring superimposed on the ortophotomaps make possible a remarkable reduction of working times and costs.
A previous experience has been built throught direct ground survey using an autorecording instrument.
The aim of this report is to illustrate a similar work made by computers graphic instruments using D.T.M. directly produced by analitical stereoplotter.

2. The D.T.M. has been made using an analitical stereoplotter OMI APC/4 kindly places at our disposal by "Tecnologie Avanzate s.r.l. - NOCI".
An area of about 42,25 Ha has been taken by a couple of aerial images from an heigth of about 1500 m obtained by camera with focal lenght of 153 mm, (see 1:2000 scale photo, FIG. 1).
In his software this analitical stereoplotter includes a program to order chosen automatic movement of the optic-mark on X and Y axes; the operator has only collimate the stereoscopic model and "to put on the ground" the optic-mark.
Thus, we get the three coordinates referring to each point located in the intersection of a regular gridding whose dimension and orientation is prefixed.
The numerical informations (D.T.M.) obtained by this program makes possible, throught computer and plotter, the automatic drawing of the following pictures:
   - map plotting of point with elevation numbers, 1:2000 scale (FIG. 2);
   - automated contouring map, 1:2000 scale (FIG. 3);
   - automated profiles on each axis (FIGG. 4 and 5);
   - automated drawing of terrain surface on assonometric projection of the obtained grid (FIG. 6);
   - automated drawing of the regular grid with altitude of each point (FIG. 7);
   - automated drawing on assonometric projection of approximate terrain surface using small prism for each point (FIG. 8).

We defer a metric comparison of the presented maps with the traditional maps to a forthcoming study, to analize

also economic and metric differences.

3. The presented maps, drawn by an automatic plotter using D.T.M. directly built during restitution, are only some examples of the possibilities offered by digital mthods.
The automatic tracing of contouring mentioned above, the plotting of videographic images and the various pictorial possibilities offered by computer graphic elements will be the future accomplishments of numerical cartography taking into consideration the diffusion of computers data banks.
Furthermore, the recording of D.T.M. in the memory of a computer allows the direct knowledge of each point's height (Z coordinate). Hitherto the only possible method to visualize on a plane this geometric element, in past were contouring maps with elevation points. Present topographic maps already have colour shades for orography and use several colours for peculiar characteristic such as roads, woods, rivers, lakes,.... Obviously that makes the reading of maps much more simple and allows an easy extraction of each above mentioned element.
Traditional contouring maps could be replaced by cartographic elements that can visualize each characteristic that has to be analized, since metric informations(distances, angles, profiles, cross-section, volumes, extc.) are obtainable directly by computers memory.

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FIG. 1

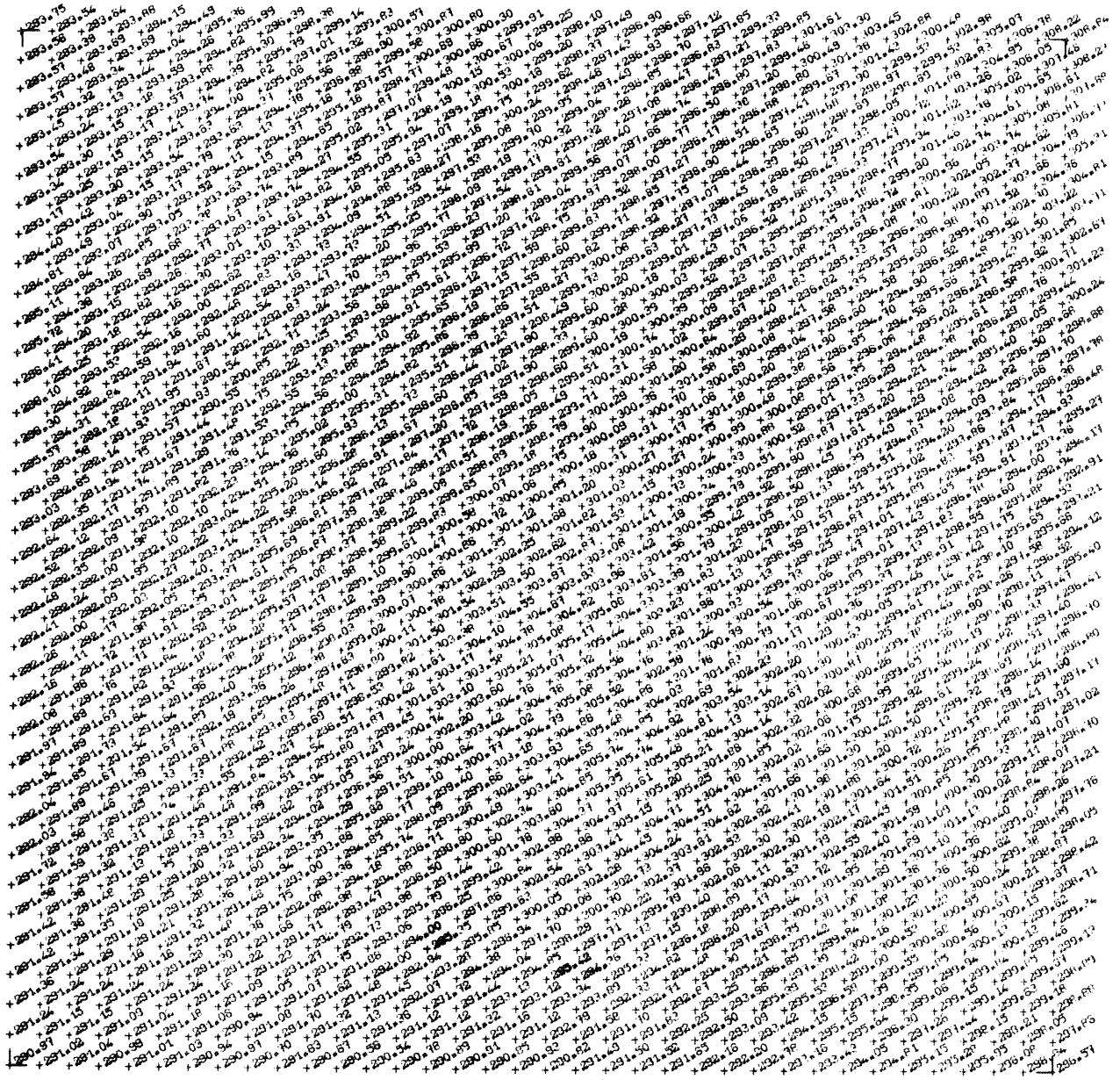

FIG. 2

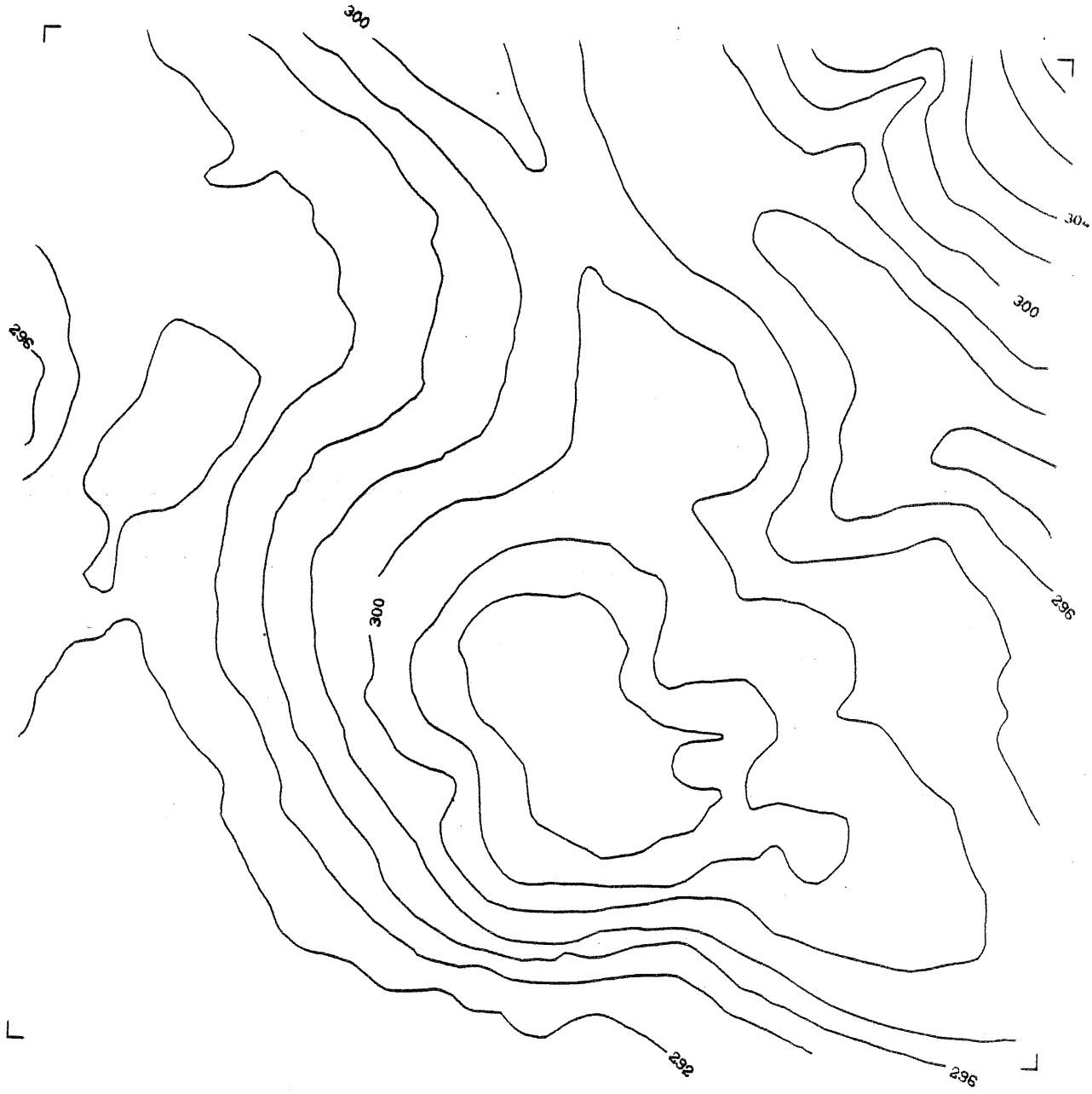

FIG. 3

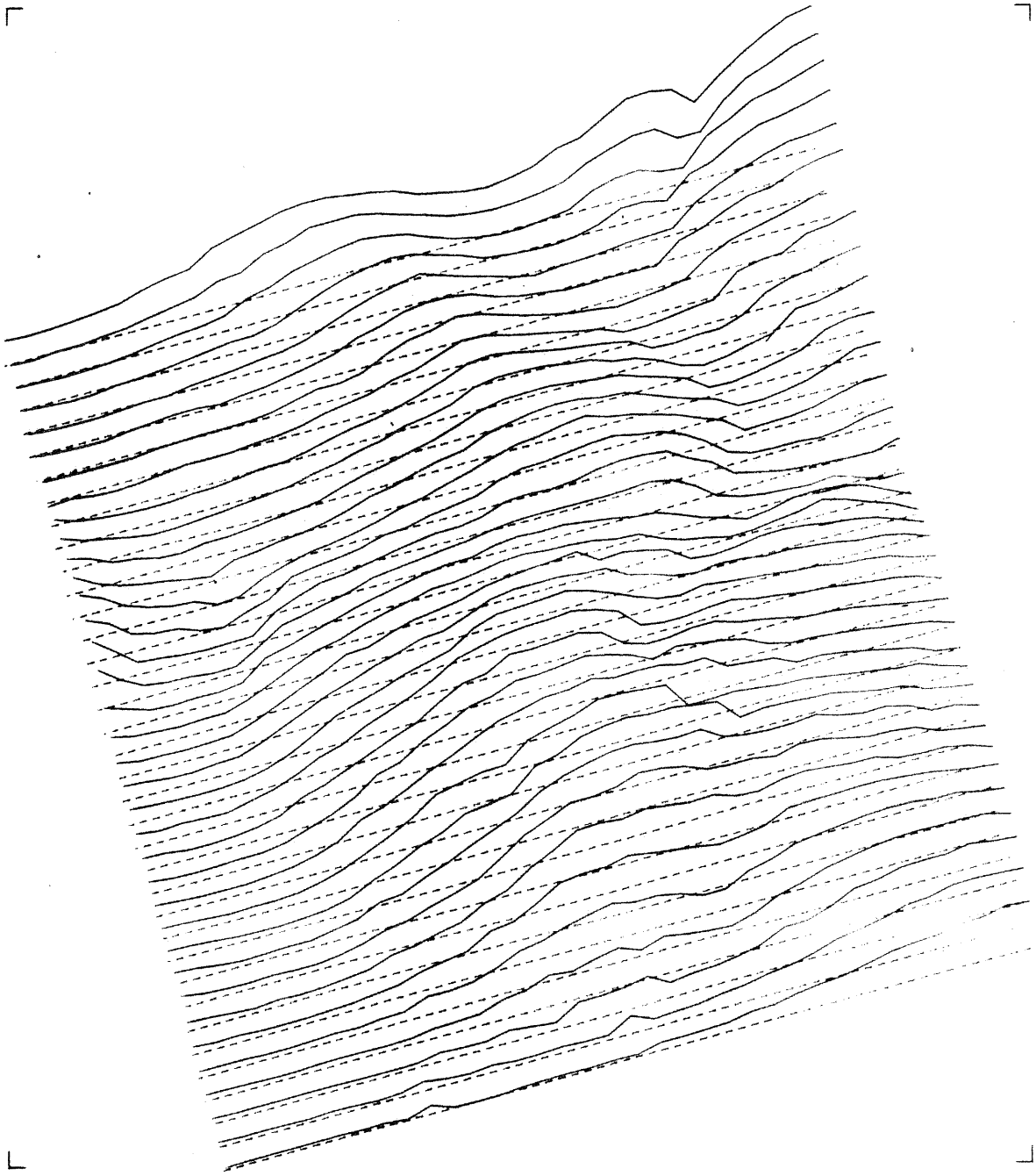

FIG. 4

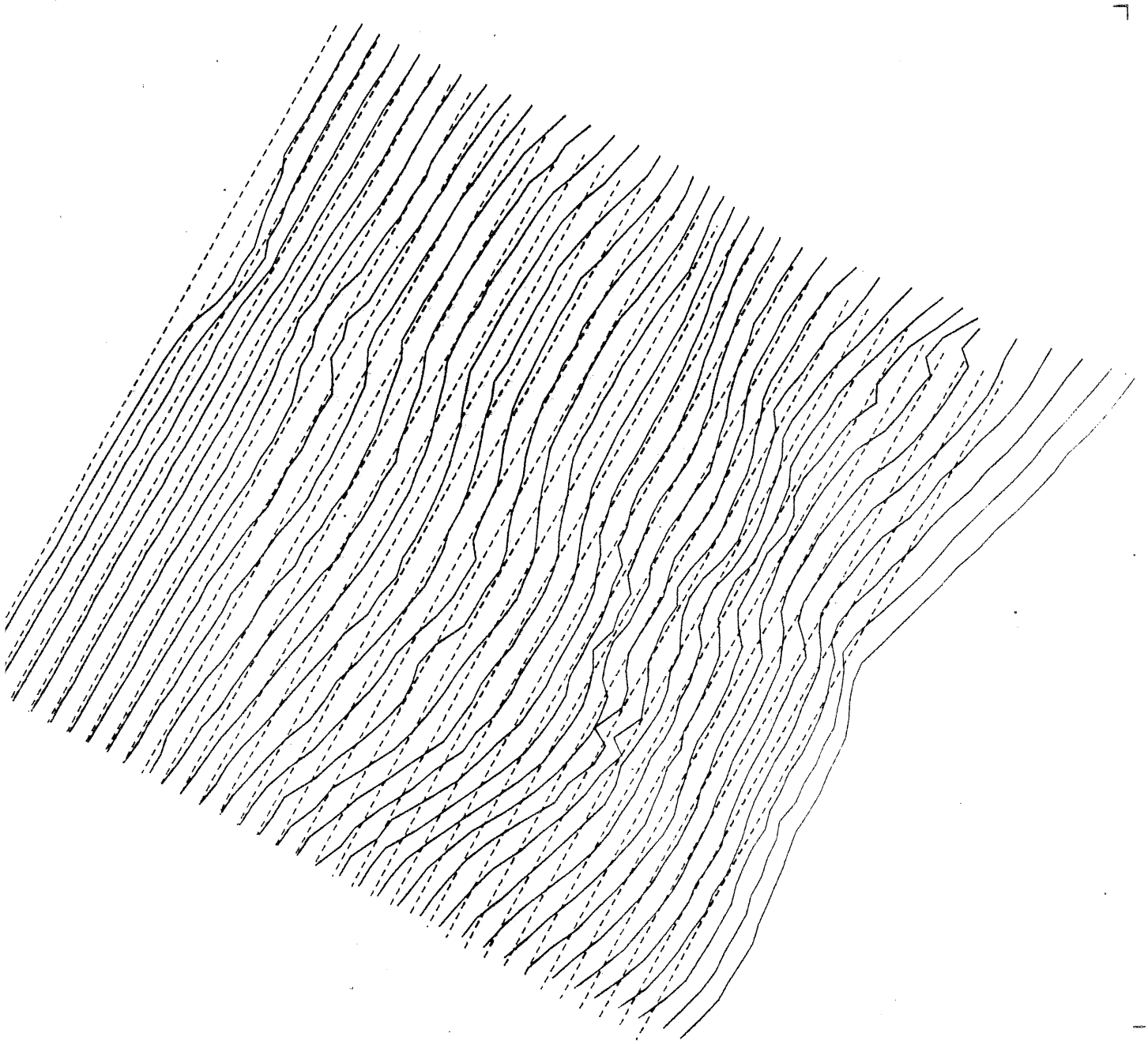

FIG. 5

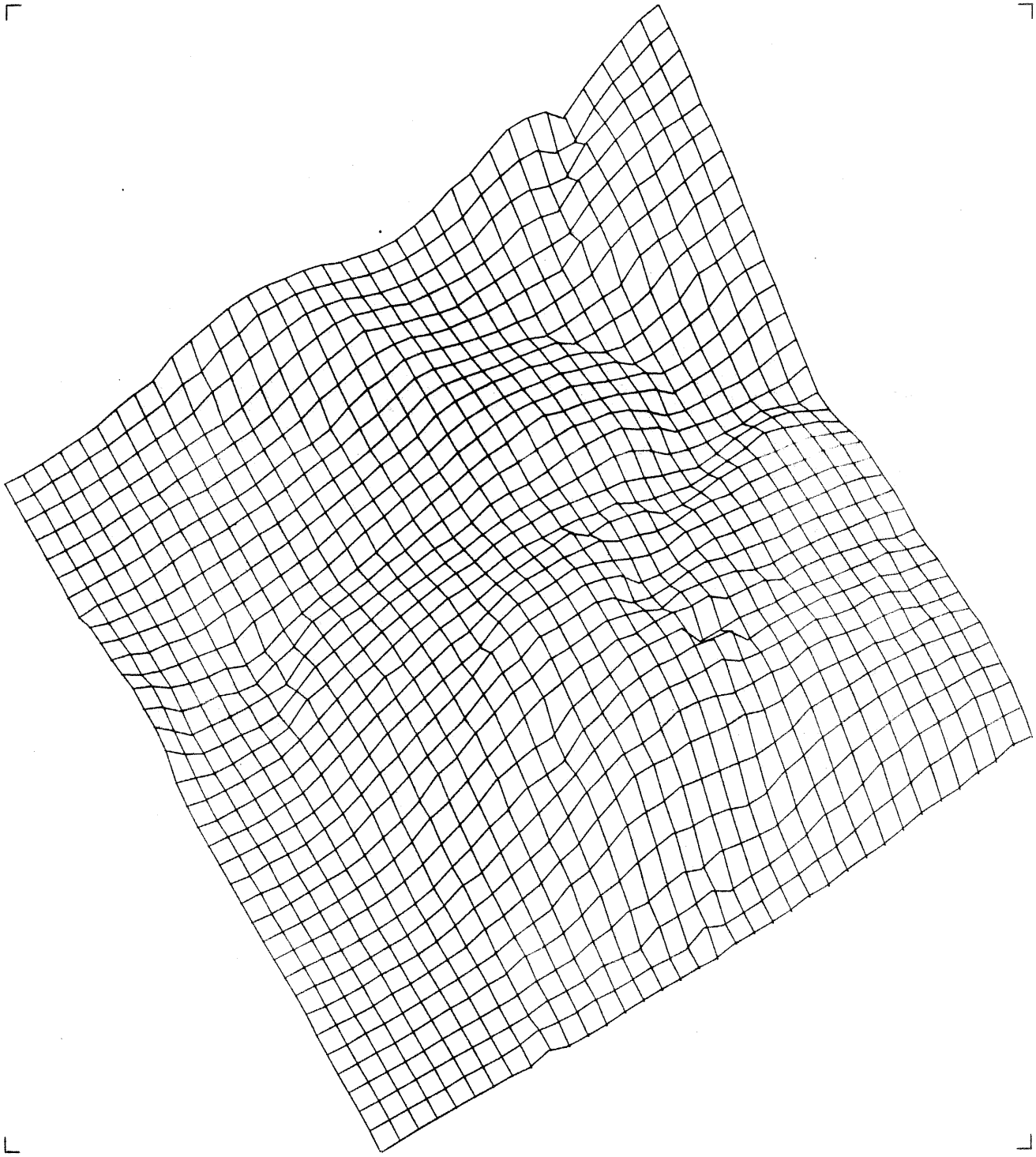

FIG. 6

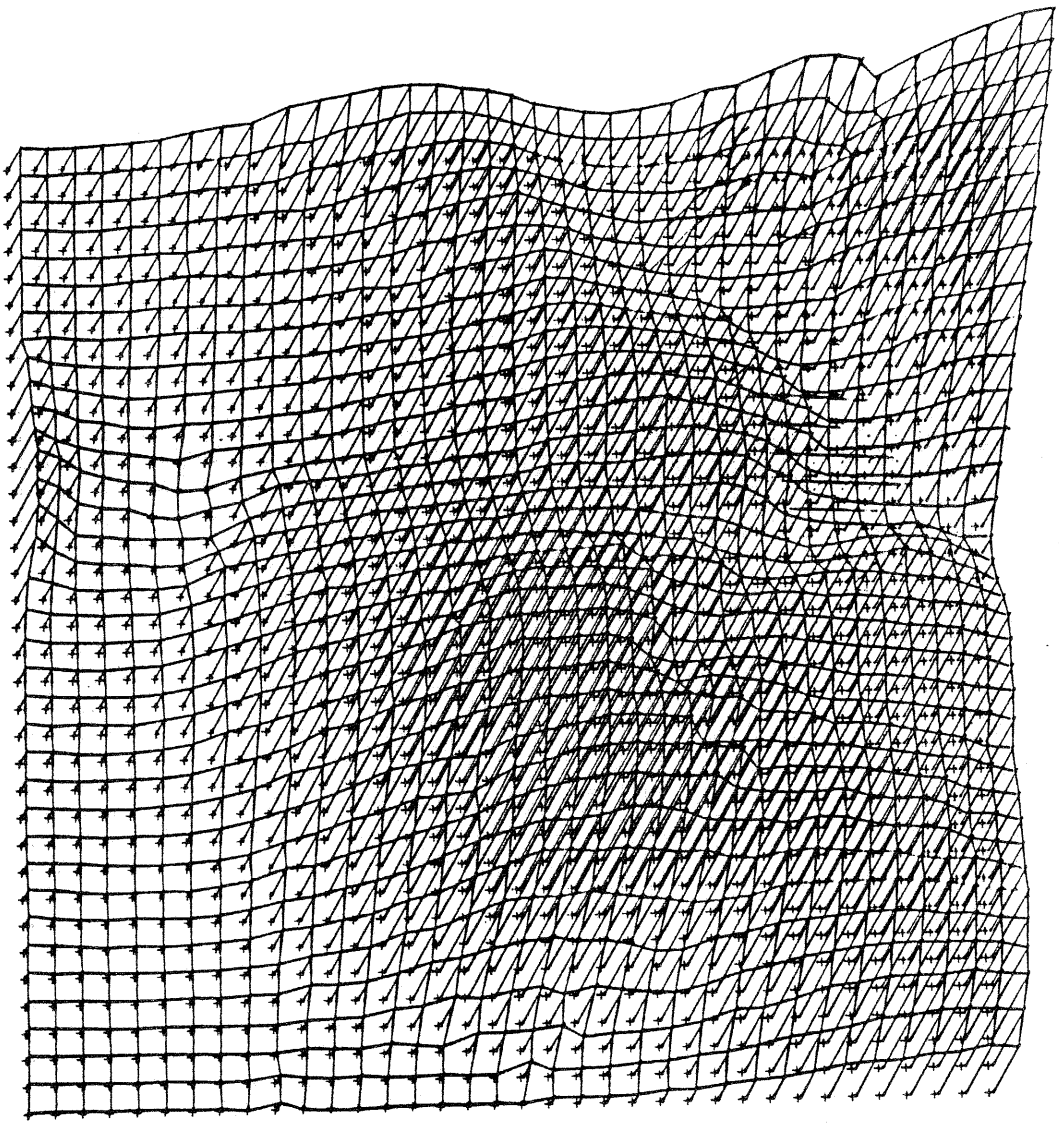

FIG. 7

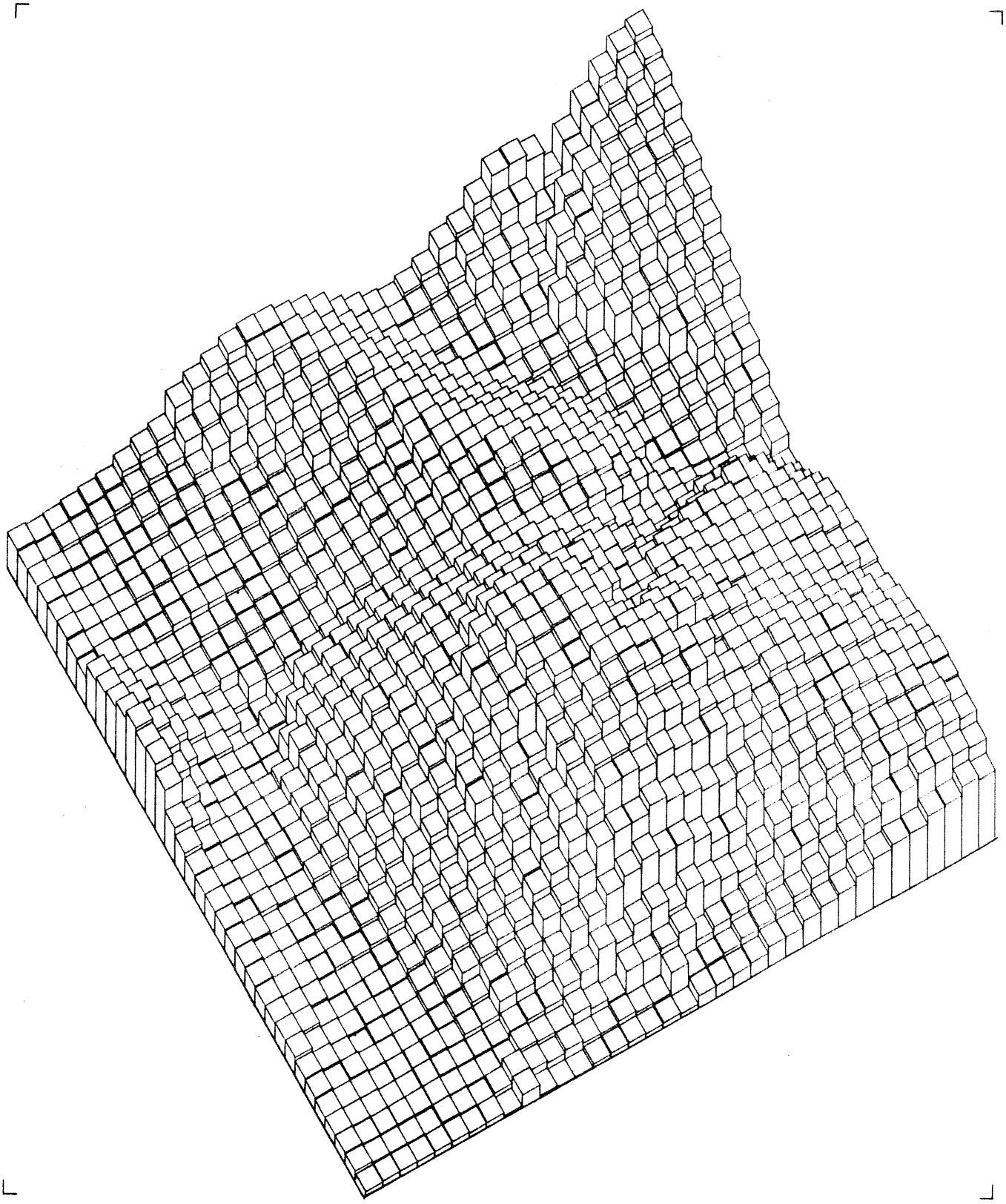

FIG. 8