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Digital Venus Surface Videomodel based on Satellite Data from VENERA-15 and VENERA-16.

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Nowadays we observe significant progress in the area of new computer technologies for creating high realistic terrain visualization based on remote sensing data. This kind of visualization can serve as a part of a virtual environment that is base of a new generation of simulators, training systems, computer games, etc.

Sometimes the kernel of a model virtual environment is named three- dimensional world. In essence this is a set of convenient geometric data that exist as three-dimensional descriptions of objects (for example, in the CAD- format DXF) and their texture maps in order to provide generation visible scenes from an arbitrary specified point of view in rate of real time.

The new opportunities of computer VR-technologies explain natural interest to new representation of earlier accumulated data of planet radar investigations from spaceborn sensors. In given work a problem was stated to create virtual videomodel of a part of Venus surface on the basis of radar data from satellites Venera-15 and Venera-16. Gypsometric maps and photomaps of Venus surface in normal equiangular conic Lambert-Gauss projection were used as input data for videomodel production *.

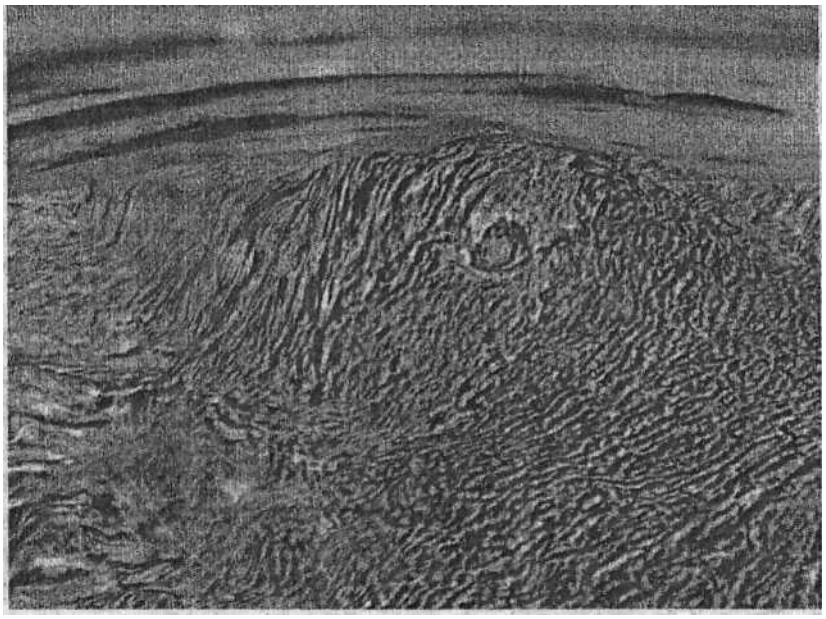
The data about Venus terrain existed in a kind of negatives, so that for producing a digital terrain model the program of semi-automatic vectorization was developed. This vectorizer transfers the raster scanned image of gypsometric map with horizontals to the digital relief map. As a result of negatives digitalization of gypsometric maps the greylevel images (byte/pixel), containing isolines and coordinate grid were received. Then coordinate grid was removed and adaptive threshold processing is conducted.

Automatic vectorization algorithms was developed with minimal operator influence in image processing at all stages: from low level preprocessing to obtaining final result. Mainly it has reached due to original algorithms tracking of connectivity and neighborhood of isolines as well as segmentation of node structures. Thus it is not required manually to track curve segments on the image, belonging to one isoline. Given software is designated for work on IBM-compatible personal computers for the MS Windows platform.

The initial data for vizualization of any three-dimensional relief are wireframe model of its surface and a texture map in a given system of [coordinates. The wireframe model of terrain represents a three-dimensional mesh, consisting from set of vertex and faces. Accuracy of restored terrain is

* Атлас поверхности Венеры.ГУГК, Москва, 1989, 328 с.

determined by quality and kind of survey, in our case six model patch of Venus surface (maps from B-2 up to B-7) were received. Their sizes are approximately 2500 km x of 2000 km and their meshes have 100 x 80 vertexes in the format AutoCAD DXF with overlapping for subsequent union whole hemisphere. Negatives of greylevel photomaps used for texturing were constructed also in the Lambert-Gauss projection. As base surface of a Venus the sphere was taken and necessary coordinate transformations were made. Technology of visualization of a Venus surface included so called mapping (superposition of a map and a surface), creation and setting of light sources, cameras and final rendering. With the purpose of increasing realistic image perception methods of ray-traced shadow, motion blur , as well as various atmospheric phenomena (wind, fog, sky, clouds, dust and etc.) were used. Special palette was used in order to transmit modern representation about a natural Venus colors. A frame sequence of animation (the flight trajectories) were chosen to provide the most interesting information about Venus landscape.



Videomodel of Maxwell mountains

In work presented standard Autodesk software under Windows 95 were used. Results of work are three-dimensional videomodel of a hemisphere surface of a Venus in a format 3D Studio MAX and computer animation sequences in the FLC and AVI formats. The given model can be used for geological and geomorfological planet surface interpretation, for optimal choice of landings places for space mission planning, in educational process in astronomy connected sciences, for computer games and etc.