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SOFTWARE IMPLEMENTATION LINE-ROTATIONAL MOVEMENT OF COMPLEX CHARACTERS MOVING OBJECTS BASED AFFINE TRANSFORMATIONS

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The problems of generating linear movement of the movable object of a complex character on the pitch, as well as its rotation by a specific angle. Describes current methods of organizing a combined linear and rotational movement of the complex character of the object, made an assessment of their shortcomings. To rotate raster and vector characters used method of sine-cosine transforms.

Key words: line-rotational movement, complex character of the object, the distortion of the image, the method of sine-cosine transformations, affine transformations.

Currently, there are systems that provide real-time display of spatial moving tractor or harvester over the field and inform farmers about the need to increase or decrease the flow of fertilizer on a particular area of the field.

In addition to applications in agriculture, methods of displaying linear and rotational movement of moving objects is also used in air navigation systems for military defense systems, in the models, animation, animated applications for a particular kind of activity, etc.

Complex methods of organization linear and rotational movement of the complex character of the object was considered in a number of scientists.

The purpose of research – the implementation of linear and rotational movement of the complex character of the object and an explanation of the causes of distortions.

For visualization of linear and rotational motion we have complex character that can be represented as a vector and raster form, a site map terrain, programming environment – Delphi.

In constructing the character of objects containing static and dynamic elements, often have to deal with situations where they include a number of components that differ from each other only in the location, orientation, size, ie, individual characters have a significant geometrical objects similarity.

In this case, it is advisable to describe a graphical object as a base, and then receive the remaining items required by the use of conversion operations.

With the transformation operations you can perform the following steps:

- moving objects from one place to another screen;
- create an object from smaller components (components);
- adding to an existing new elements;
- to increase the size of the object to improve its image or show a small parts;
- reduce the size of the object to make, for example, explanations or displayed on the screen of new facilities;
- create moving objects.

All submissions evolutions of characters can be performed using three basic operations:

- transfer (move) the character of the object;
- scaling (increase or reduce) the character of the object;
- rotate the symbol object (the terms are also used rotation, orientation).

These operations are called affine transformations, with distinguished two-dimensional and three-dimensional affine transformation.

As for our case study area is limited 2D space, we consider only the basic rules for the two-dimensional affine transformations:

- straight lines remain straight after the transformation;
- parallel lines – parallel;
- relations division of the segments remain unchanged.

The process of moving the object displayed on the screen of video terminal, consists of two basic components: the linear movement and rotation. More complicated is the process of the rotation (rotation by an arbitrary angle). It is this process requires significant computational resources.

It was established experimentally that the reaction to the change in direction of rotation symbol of a human operator is within ±8°–12°.

The challenge is to affine transformation using linearly move the object at a certain pitch, and also to rotate it around its axis in the turning points of the trajectory. This scene appears on the screen of video terminal, so you should take into account the features of the screen coordinate system.

The results of research. When you move an object you need to know the coordinates of the screen, which is attached to the displayed image of the object. One way transfer – it is for each symbol to fix the so-called "key point", while as the absolute coordinate system is selected grid intersections of rows and columns that match the pixels of the screen, and the origin coincides with its upper left corner. In the case of the character representation of the object in raster form, its display is performed using microraster. This provides a relative coordinate system is represented by grid, single cells which coincide with elements of the memory array symbol. It as a "key point" is chosen the upper left corner microraster.

To generate the dynamic scenario involves the following steps: forming and outputting visual static information, i.e. mapping a background, and dynamic, which is of moving objects on it.

Studies, showed that for the display moves relatively simple 8x8 matrix characters in dots and when a small amount of (3–5), it is quite possible to apply the sine-cosine transform.

Findings

Analyzed models, methods, algorithms and visualization tools linearly rotational movement complex symbol, a moving object in space. The algorithms of linear and rotational movement of the complex character of the object represented in raster and vector formats. For a linear movement and rotation by a specific angle investigated dimensional affine transformations. Revealed the cause of the distortion of a complex character of the object in the implementation of the rotation procedure and suggests methods to eliminate them.