

Computer Presentation of Four-Dimensional Spaces

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Abstract

The method of natural motion and search in four-dimensional space filled with solids is developed.

Keywords: *four-dimensional space, kinematics, computer, motion.*

1. INTRODUCTION

Using a computer to perform four-dimensional (4D) spaces was proposed for the first time in [1]. Any concrete problem "to thrust a 4D-body through the hole with 2D-border" which can be solved by a person-operator (but without any concrete way of presentation) was put in this book. Also, it used to be noted in literature that some 3D-images (see for instance [2]) may be considered as projections of 4D-bodies.

2. KINEMATICAL PRESENTATION

As a continuation of the approach of [3], we offer a kinematical presentation [4] of Euclidean 4D-space in its natural form. We use the following analogy. If we look at 3D-semi-space filled with translucent solids through a narrow horizontal slot (1D-line) with provision for perspective, we can form a notion of 2D-semi-plane further this slot. Rising and lowering, we get a notion of all 3D-semi-space for the plane which slot is moved in.

We propose the following. The user looks through "2D-slot" (screen) on 4D-space and forms a notion about 3D-semi-space further this slot. Moving "inward and outward" along the fourth coordinate, s/he gets a notion of all 4D-semi-space further the 3D-space which the screen "is moved" in.

3. EXAMPLE

The first version of computer program presents a 4D-pyramid base of which is a 3D-cube and each edge is a 3D-pyramid. Program gives to the user the opportunities "to move" in 4D-space on virtual "Airplane" around 4D-solid. "Airplane" can move and turn within three coordinates and move along the fourth one. This displacement is shown by means of variation of general luminosity.

3. POSSIBLE APPLICATIONS

Such software can be used for the following purposes:

- Additional instrument for researchers;
- Illustrative material for studying Linear algebra, Optimization, Combinatorial topology, Theoretical physics in colleges
- New type of computer games.

4. ACKNOWLEDGEMENTS

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5. REFERENCES

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