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IN THE FIELD OF GEARS**

**THE SPIROID WORM GEAR – MODELING AND SIMULATION
NUMERICAL WORK GEAR**

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Abstract: The paper presents a method of modeling and simulating the work of a spiroid worm gear by using the graphic environment of AutoCAD and 3Dstudio Max, including LISP programming.

Key words: worm gear, spiroid, modeling, simulation.

1. INTRODUCTION

The field of modeling and simulation, due to the significant number of specific working environments, has become relatively more accessible being widely used both in mechanical engineering and in industrial design, architecture, etc. From among the most frequently used modeling environments one can mention AutoCAD, 3DStudio Max, Microstation, Solid EDGE, and the more recent Catia, Autodesk Inventor, Mechanical Desktop etc.

The modeling and simulation of an industrial application means, as a rule, taking the following steps:

- Defining the mathematical model
- The three-dimensional modeling of composing elements
- Simulating the work of the designed model.

The paper presents a method of modeling and simulating the work of a spiroid worm gear using classical instruments that are widely used in design, e.g. AutoCAD, 3DStudio Max and LISP programming.

Modeling and simulating the work of a worm gear involves:

- a) Mathematic modeling of the cinematics of the gear;

- b) Numerical modeling of the cinematics of the gear;
- c) Tridimensional modeling of composing elements;
- d) Simulation through the animation of the designed model.

2. DESCRIPTION OF THE WORK STAGES

The creation of the mathematic model of the generation of a worm gear has been presented in detail in the papers [1,2,3]

To check the gear cinematics several programs have been created using GWBasic, Matlab and LISP, programs that have been presented in the papers [1,2,3]

Generating the spiroid worm gear in two constructive forms, that is with cone worm and with parallel type worm has been done with the help of the LISP-written “Spiroid gear” which allows the rapid generation of the desired gear through the alteration of parameters in the text box; it also facilitates the study of the influence upon the geometry of the gear of the alteration of entry parameters. Fig. 1

The image shows a software dialog box titled "Angrenaj spiroid" with a close button (X) in the top right corner. The dialog contains several groups of input fields for defining gear parameters:

- Punct de inserare:** X: 300, Y: 300
- Unghiurile de presiune:** a1: 30, a2: 10
- Inaltimea dintelui:** cap: 3.2, picior: 3.8
- Raportul de transmitere:** rap: 47
- Semiunghiul con melc:** b: 5
- Modulul axial:** ma: 2.5
- Diametrele rotii:** R_e: 87, R_i: 63.8
- Distanța axială:** A_y: 58
- Diametrul de referință maxim al melcului:** R₀: 22.3
- Inaltimea axei melcului fata de planul Oxy:** A_z: 60

At the bottom of the dialog, there are "OK" and "Cancel" buttons, and the text "UNIVERSITATEA PETRU MAIOR TÂRGU MURES" is displayed.

Fig. 1 Text Box

Fig. 2 presents two spiroid worm gears; one is a cone worm the other one a parallel type worm, both being generated by the “Spiroid gear” program.

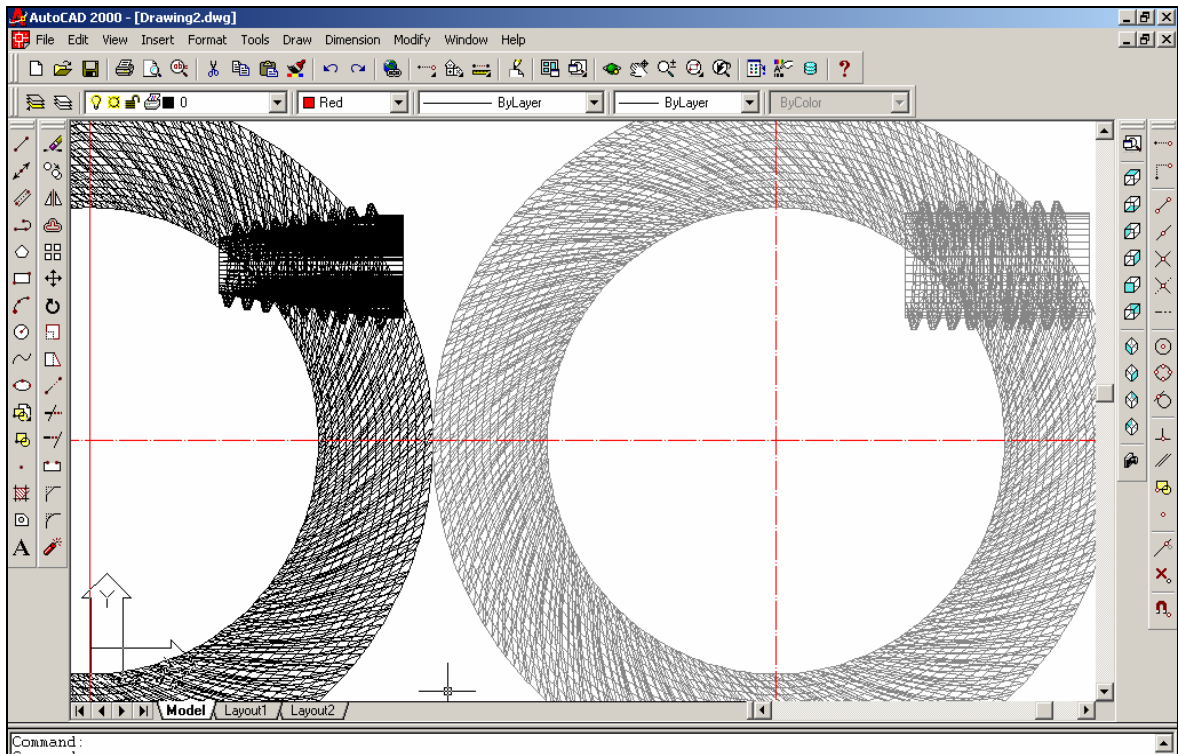


Fig. 2 *The numeric modeling of work spiroid worm gear*

The program 3DStudioMax was used for simulation with the help of animation of the work of the modeled gear. The connection between those two programs was made with the help of the files with the extension .dxf, files which ensure a complete compatibility in function for .3ds files, exporting and importing components of the gear. This command doesn't imply any difficulty, selecting the gearwheel out of the gear and exporting it and then the worm gear.

When the worm and the gear wheel is imported in 3DStudioMax the relative position of those two elements doesn't modify. (Fig. 3)

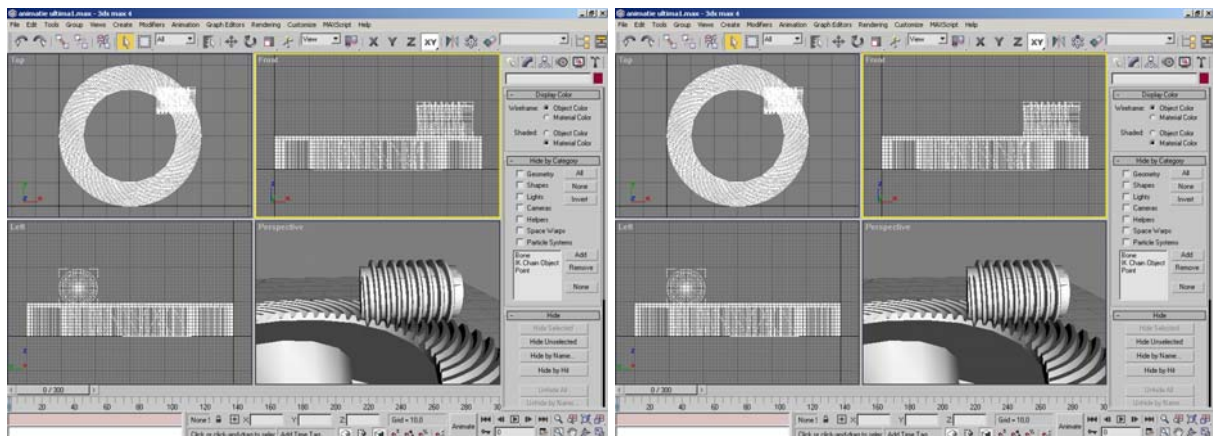


Fig. 3. *Gear simulation*

The worm gear animation was realized through classic animation procedure in this program. In Fig. 4 are presented the animations realized and visualized in Windows Media Player.

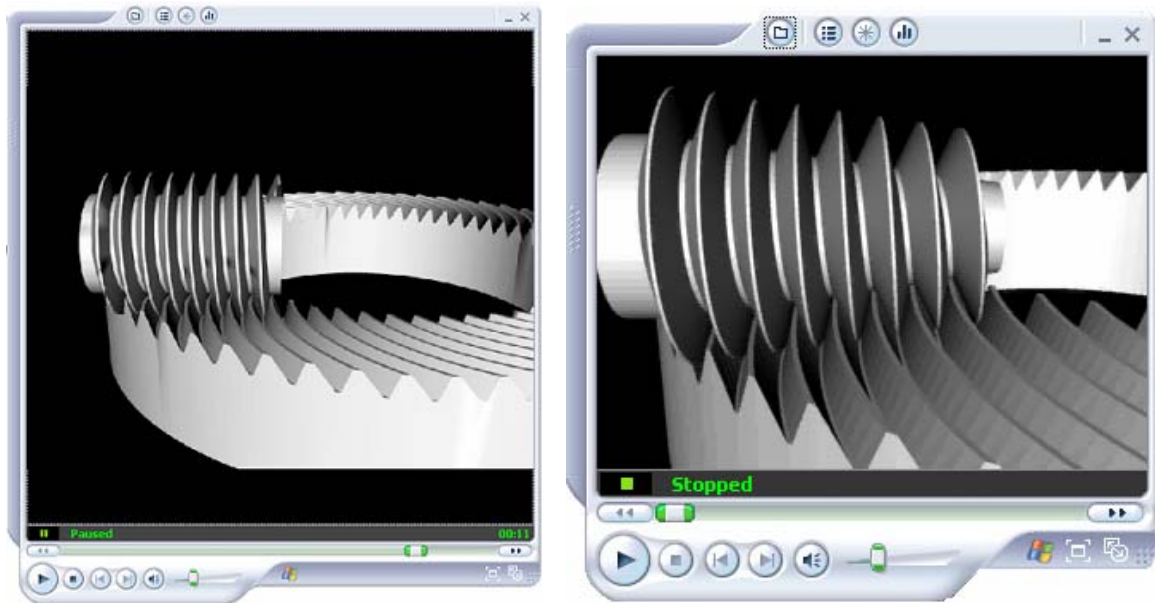


Fig. 4 Worm gear animation

3. CONCLUSION

- The use of this method implies an early realization of a correct mathematical model of worm gear elements;
- The modeling and simulation of worm gear offers to those interested in its geometrical optimization study solutions which are extremely practical;
- Elements of this method allow using other similar programs.

4. REFERENCES

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