

ART AND ENGINEERING IN METAL SCULPTURES

Abstract: This paper shows how engineering and art are combined in making metal sculptures, referring to artistic creations exhibited in the “Dunărea de Jos” University campus in Galați, in the tradition existing between the Faculty of Engineering and the Visual Art Museum of Galați, with a significant contribution of prestigious artists of Galați and beyond. In this context, in order to develop the conception and design of some artistic products, many 2D and 3D graphical representation systems of information have appeared in a virtual environment, in which shaping using dedicated software applications, required that these artworks can be described by a series of shaping operation sequences, package design tools Autodesk Inventor CAD being such a solution.

Key words: engineering, art, sculpture, metal, Autodesk Inventor

1. INTRODUCTION

Contemporary art begins to assume, more than ever, that in addition to traditional classical values and kinetics intervention, or engineering elements, that an artist is not always able to control, but he can combine, in as much as possible happy amount, both art and engineering [1].

Defining work steps of this paper is performed at the simplistic manner, in an attempt to transpose how art and engineering can coexist in a harmonious way, using three-dimensional graphic shaping, of some work of arts, monumental metal sculptures, existent in the inner courtyard of the “Dunărea de Jos” University campus in Galați.

The metal sculptures obtained by cutting and welding are made of materials which in spite of the fact that they may be considered rigid, in reality are very fluid, plastic, pleasant to construct a work of art. The sculptures can be translated into different metal symbols: plants, insects, geometrical shapes, and so on, providing the viewers a show of craftsmanship, by combining layers of metal, simplicity and safety of chromatic texture, in the light of the soul.

The cycle of a product, usually starts from design and graphical representation, using a computer in a virtual environment, using software applications like AutoCAD, Autodesk Inventor, Solid Edge, NX, Catia, [2], [3], but in the present paper the metal sculptures were graphically modeled after these were physically completed, subsequently offering the artists who have created them a whole new future perspective of work, thus having an optimized 3D virtual prototype.

Thus, it is provided an overview of the most important metal sculptures on campus: “Time listening instrument”, “The King’s Neuron”, “The Real Life”, “The Transition”, “The Crab”, “The Gate”, “Roots towards the Magnificent”, with a brief description of the commands, initiated in the Autodesk Inventor environment, for one of them, entitled “Time listening instrument”.

2. PHYSICAL AND VIRTUAL SCULPTURES

2.1 “Time listening instrument”- art

A simple and suggestive work of a graduate of the Faculty of Mechanical Engineering of Galați and of the National University of Arts in Bucharest, Eng. Mihaela Brumar, created to understand that the diversity of approaching the world's performance, the open or closed doors, the transition, of life, are all an invitation to knowledge, without needing a long exegesis.

The key elements of the artwork, the space and volumetry, find its balance and dynamics in a permanent game of alternating slender, simple forms, launched into space with the heavy weight of the hardly modeled metal.

The transformation of the metal into a work of art, through the magic of welding, of engineering, seeks the idea of transcendence, of opening to another dimension, to a world in which the artist is the master.

In figure 1, it is shows comparatively the actual model of the sculpture and also the virtual one.



Fig. 1a „Time listenig instrument”- physical model

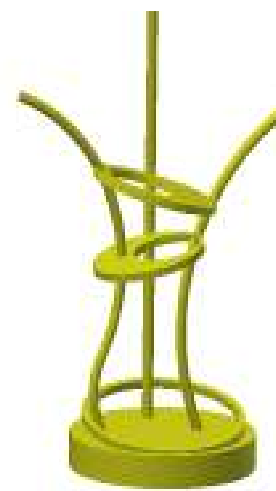


Fig. 1b „Time listenig instrument”- virtual model

2.2 “Time listening instrument”- virtual model:

Modeling the cylindrical base

The cylindrical base is modeled by choosing a projection plan (in this case, the XZ plane), in which is traced, using the *Circle* command, a 30 mm diameter circle.



- using the “*Finish Sketch*” command,  the sketch is finalized;
- thus obtained the circle in 3D space (cylinder with a base radius of 15 mm), which is attributable height;
- using the *Extrude* command,  it is given the virtual support base of the sculpture, figure 2.



Fig. 2 Support base of the virtual sculpture

Modeling the straight bar:

- it is initiated a new sketch (“Sketch 2”);
- it is drawn a circle with a 3 mm diameter;
- finalize the sketch and enter the “3D Model”;
- use the *Extrude* command to achieve a solid with a 45 mm height, figure 3.



Fig. 3 Straight bar of the virtual sculpture

Modeling the ring

- in the XZ plane *Offset from Plane* command is accessed, in which, in 2D, it will draw a straight line;
- it is passed in the “3D Model” and through the *Angle to plane around Edge* command, it is selected the previously created plan, the line drawn in 2D, and it is designed a new plan at an inclined at an 100 angle to the reference plan, figure 4.



Fig. 4 Shaping ring commands

- on this new plan, two circles are drawn with the diameters of 20 mm and 24 mm, that, in 3D, will be extruded over a height of 1.2 mm, figure 5.



Fig. 5 Ring

Modeling the body elements

- we return to the sketch that was done for the base circle;
- we draw two 3 mm diameter circles, at different distances;
- we return to the “3D Model”, and on plan that is perpendicular to the base (XY) will be drawn circular arcs, in 2D;
- before drawing the arcs, “*Project Geometry*” command will be launched for viewing the centers of the two circles in the XZ plane, verifying that the condition that the arcs intersect the centers;
- in “3D Model”, we use the “*Sweep*” command we select a circle;
- we define the profile hat will be moved;
- we press the “*Path*” button from the “*Sweep 1*” window and we select the outline of the circle, figure 6;
- proceed identically with the other circle.

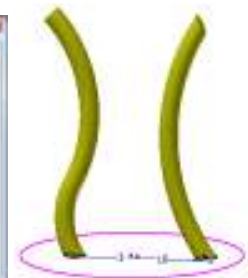


Fig. 6 „Sweep” command

Modeling the intermediate discs

- the two circles are modeled in different planes;
- we use the “*Offset from Plane*” and “*Angle to plane around Edges*” commands;
- using the extrusion command will result solids, at defined heights, figure 7.

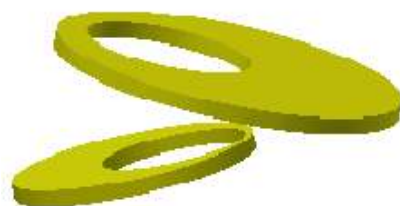


Fig. 7 Intermediate discs

2.3 „The King’s Neuron”

“The King’s Neuron” sculpture is a somewhat uncomfortable gaze, “an oppressive work, crushing the ground it walks on. Only a hideous and oversized neuron, in the absence of other criteria, could have led to the decision that an ensemble of monumental works of art, should not be found in the courtyard of an art museum” [4].

This artwork belongs to Mr. Eduard Costandache, author in which the micro and macro universe, are united in common points in genetics and quantum physics, establishing the “space, time, movement” relationship. In these works of art, have often been found elements of figurative art and traditional expression, in particular the one concerning the concept of “ecological art and environmental ecology through art”, so that it can be used as material, predominantly, metallic waste.

In figure 8 and figure 9 is presented “The King’s Neuron”, both physically and virtually modeled using Autodesk Inventor software package.



Fig. 8 “The King’s Neuron”- physical model



Fig. 9 „The King’s Neuron”- virtual model

2.4 „The Real Life”

Emil Curelaru’s work of art, “The Real Life”, is basically a fish skeleton, “strategically” placed in front of the Faculty of Food Science and Engineering.

“The fish skeleton, referring perhaps to Christian signs, has the monumentality’s sign of a no return transition, from human vanity, sometimes too easily manifested, into the naked nothingness. The bridge, after all, is for all of us, this “Real Life”, as the author chose for the name of the work of art. Positioning into a university’s campus of these works of art is a lesson, an invitation towards reflection. About truth, knowledge, ability to express yourself, understanding of other areas of intellectual manifestation” [4].

Figure 10 and figure11 presents “The Real Life” physical and virtual model.



Fig. 10 „The Real Life” – physical model


















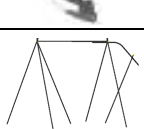


Fig. 11 „The Real Life” – virtual model

„The Real Life” is an assembly which is made of several components, table 1.

Table 1

The Real Life’s components

The first component		The tenth component	
The second component		The eleventh component	
The third component		The twelfth component	
The fourth component		The thirteenth component	
The fifth component		The fourteenth component	
The sixth component		The fifteenth component	
The seventh component		The sixteenth component	
The eighth component		The seventeenth component	
The ninth component		The eighteenth component	

2.5 „The Transition”

In figure 12 and figure 13 is shown a sculpture entitled “The transition”. “Liviu Turcanu’s work comes as an ice foam in the academic landscape of mechanical origin, with a different kind of understanding of the relationship between exact sciences and the accuracy of artistic phrensy. Liviu Turcanu’s silhouette passes through rigid spaces and it casts into somewhere in the nothingness” [4].



Fig. 12 „The Transition” – physical model



Fig. 13 „The Transition” – virtual model

Also as „The Real Life”, „The Transition” is an assembly which is made of several components, table 2.

Table 2

The Transition’s components

The first component		
The second component		
The third and fourth component		
The fifth and sixth component		
The seventh component		

2.6 „The Crab”

Eduard Costandache’s artwork was created within the creative camp “Student Art”, in 1998 and it represents, basically, a terrible effort of building the metal pieces of enormous proportions, with the role to reconfigure, to change permanently, in a more spectacular way the campus area in which is.

In figure 14 and figure 15, is presented the physical and virtual model of “The Crab”.



Fig. 14 „The Crab” – physical model



Fig. 15 „The Crab” – virtual model

2.7 „The Gate”

“Through Adrian his artwork, ‘The Gate’, Adrian Golban, creates, opens a world of fantasy.



Fig. 16 „The Gate” – physical model

Fantasies that give an ambience size. Maybe the pyramid supported by a thin metal wire communicate so much, speaks about our unquestioned and mysterious inner gates. Or maybe the mishmash of intertwined metals refers to the 'Gate' itself. The supreme "Gate".

The one that calls for reflection. Encourages passing through the "Time Gate" [4]. In figure 16 and figure 17 are presented the physical and virtual model of "The Gate".

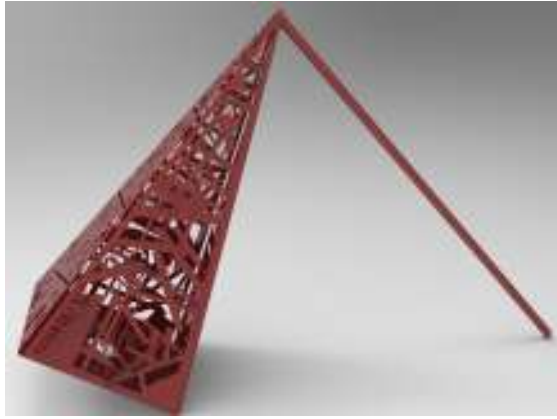


Fig. 17 „The Gate” – virtual model

2.8 „Roots towards the Magnificent”

“Sorina Fador Vădeanu’s “Roots towards the Magnificent” comes to underline the mingling confluence of the materials, the thought that the metal can round off and cut out a thought from a woven fabric” [4]. The artist, originally from Vatra Dornei, comes from the textile arts area and she is using with great mastery the series of experiences in the three-dimension area. She feels attracted to volumes that overlap different spatial structures.



Fig. 18a „Roots towards the Magnificent”– physical model

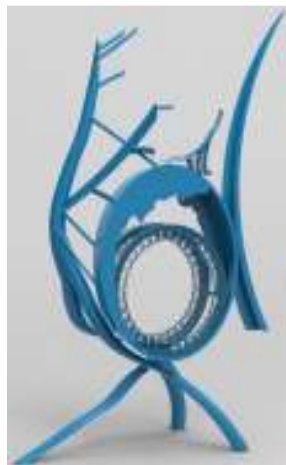


Fig. 18b „Roots towards the Magnificent”–virtual model

In “Roots towards the Magnificent” predominant are vegetal rhythms, the return to nature, translated into the metaphysical. The work is basically a tapestry designed and constructed in metal, sign of the connection between an institution specialized in a completely different work style than an art museum itself.

It follows, therefore, a joining of components that will balance the full with the empty into successful way with the desire to explore the “spiritual-concreteness”.

In figure 18a and figure 18b are presented the physical and virtual model of the sculpture.

Also as „The Real Life” and „The Transition”, „Roots towards the Magnificent” is an assembly which is made of several components, table 3.

Table 3

Roots towards the Magnificent's components			
The first component		The sixth component	
The second component		The seventh component	
The third component		The eighth component	
The fourth component		The ninth component	
The fifth component		The tenth component	

3. CONCLUSIONS

The beginnings of the sculpture camps in Galați date from 1976, when the biggest Romanian sculptors reunited on Danube's bank.

Over time there were, five editions of the camp - in 1976, 1977, 1991, 1995 and 1997, after which Galați was enriched with more than 40 monumental works of metal sculpture, located both on the upper and the lower promenade of the Danube, also on major boulevards of the city [5], [6].

After a 15 year break, in 2012, The Faculty of Mechanical Engineering of the “Dunărea de Jos” University, with the support of the Visual Art Museum, the City Council and the “Nicolae Măntu” Cultural Foundation, continued the tradition of these camps, so that the artworks conducted in the 2012 edition were placed in the “Nicolae Măntu” Open Cultural Space, from the university campus, adding to it both artistic and professional uniqueness [7], [8], [9].

Shaping the pieces presented in this paper has been made in a simplistic manner, highlighting Autodesk Inventor software package's capacity to apply its specific controls as to create harmoniously combined surfaces made by metal artists, through the development of virtual products that give meaning to the idea of applicability of the digital techniques in the metal art field.

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