American Journal of Engineering Research (AJER)
e-ISSN: 2320-0847 p-ISSN : 2320-0936
Volume-9, Issue-3, pp-131-133
www.ajer.org
Research Paper Open Access

Geodesic angle and technology

G.A. Korablev
Professor, Doctor of Science in Chemistry

***ABSTRACT**: The geometric-geodesic angle is the angle between the rotation axis and rotation vector. Inastationarysystemitcanbephysically foundthrough the triangle angle tangent, in which its legs are the components of corpuscular-wave process. Theequationofsuchfunctionaldependencieswasobtainedin kinetics of structural interactions of some macro- and microsystems (for gravitation, as well). Theequations of metamathematicalbondbetween "goldenratio" and geodesic angle, as well as with other fundamental values are given. AsapplicabletotechnicalcharacteristicsofEgyptianpyramids, it is demonstrated how their proportions correspond to the rule of "goldenratio".*
***Keywords**: Geodesic angle, "goldenratio", stationary state of systems, Egyptianpyramids.*

Date of Submission: 25-02-2020 Date of acceptance: 05-03-2020

I. INTRODUCTION

Kinematic,dynamicandangularparametersareappliedinthetechnologyofrotationalmotionstodescribetheir mechanism.Aso-calledgeodesicangle (φ) identified based on the laws of differential geometry is important among them [1,2,3]. Itispractically applied, forinstance, inthetechniqueofcalculating the armoring of rotation shells when producing cylindrical bodies of spaceships [4,5].

Basedonthistechnique the body cylindrical shell is armored along the geodesic line. "Geodesiclineisthecurveofcertaintype, generalization of the concept – straight line for curved spaces"[2].On the circular cylinder these are screwed lines providing the shortest distance between the points on the surface of rotation.

Ifpolymericthreadsarewoundontotheapparatusbase along the geodesic line, the angle between the rotation axis and winding vector is the geodesic angle equaled to 54°44´=54,733° [4,5]. Itisknownthata silkworm uses the same angle when winding the natural viscose thread onto the base. Thesameprincipleisusedinagricultural technology, for example, when winding linen threads onto the base. Itispossiblethatthisrulealsoworksinmicrostructuralprocesses, forinstance, in the process of winding or unwinding DNA molecule spiral. Thisinvestigationistargetedatrevealingthephysicalsense of geodesic angle and analyzing the possibilities of its technical application.

1. Geodesic angle in the conformation of stable systems

Basedontheanalysisofthe first law of thermodynamics the following was obtained [6]:

1.In the systems in which the interaction proceeds along the potential gradient (positive work), the resultant potential energy is found based on the principle of adding reciprocals of corresponding values of subsystems. This is the corpuscular process, in which entropy can serve as the theoretical concept.

2. In the systems in which the interactions proceed against the potential gradient (negative work) the algebraic addition of their masses, as well as the corresponding energies of subsystems is performed. This is the wave process, in which negentropy can serve as the theoretical concept.

3. Theresonancestationarystateofthesystemsisfulfilledundertheconditionofequality ofdegreesoftheir corpuscular and wave interactions. Theentropyproductsinstationarystate are completely compensated by the negentropy flow. Thus, "inthecircularprocessinthethermalmachinethesystementropyincrease due to the incoming heat is completely compensated by the entropy decrease during heat emission, and total entropy value equals zero"[7]:

$$\sum \frac{dQ_1}{T_1} = \sum \frac{dQ_2}{T_2}; ds = 0$$

Theserulesareappliedandrevealed in many micro- and macroprocesses.

Asapplicabletocorpuscular-waveprocesses,
theconditionofstationarystateistheconditionofequalityofdegreesoftheirstructural interactions:

$\rho_к = \rho_в$ (1)

Mathematicallyandgraphically (bynomograms) thestationarystateinmicrosystems is found by the following equation:

$\ln\left(\frac{\rho}{\alpha}\right) = tg\varphi$(2)

Whereφ–geodesic angle, α – relative difference of energy parameters of interacting systems.

Similarly, the equations for π are obtained:

$\ln(\frac{4\pi}{3})=tg\varphi\ \ln(\frac{4\pi^2}{g})=tg\varphi$ (3,4)

whereg – free fall acceleration.

In[4;5] thenotionofultimatebreakingstressduringthethreadplastics extension by its winding pitch is used: σ_α – axial, σ_β – circumferential stresses which are substituted by the proportional value N_α – axial "stress" and N_β – circumferential "stress". At the same time, the following is fulfilled in the kinematics of mechanical systems:

$\frac{\sigma_\beta}{\sigma_\alpha} = \frac{N_\beta}{N_\alpha} = tg^2\varphi \ = 2$ (5)

"Thisconditionallowsobtaining the equally stressed system of threads with the minimal product weight [4;5]".

Similarly, forthegravitationmechanism and preserving the formalism of equations (2,5) we have [8]:

$\ln(\frac{G}{\varepsilon_0})=tg^2(a_0\varphi)$(6)

Whereε_0–electricconstant,G–gravitationalconstant,$a_0 = 1.00233$ – quantumcorrectiontoelectrongyromagneticratioinanatom, whichmay, in this case,characterizetheinfluenceof particles motion precession.

Thus, the equality of corpuscular and wave interactions defines the resonance stationary state of the system. Atthesametime, thegeodesicanglenumericallydefinestheratiooftwolegsoftherighttriangle whose values characterize energy dependencies through axial and circumferential stressesin the system with corpuscular-wave processes. This condition corresponds to the most optimal technological options and is widely present in nature, as well as in fractal systems.

Thus, thousandsofyearsagoitwasfound: "Allphenomenaoftheworldaroundus, including a human and nature, are interpretedbyChinesemedicineastheinteractionbetweentwoorigins "Yin" and"Yang" representingop positeaspectsof unifiedreality" [9]. Fromthepointofthesenotionsphysiotherapyandreflexotherapy can be considered as the technique for equalizing the potentials of two manifestations of energy origins, which, according to modern notions, are entropy and negentropy(par. 3 of the initial provisions).

2. Golden rules of Egyptian pyramids

"TheproportionsofCheopsPyramid, cathedrals, bas-reliefs, householditemsandjewelry of the tombstestifythat Egyptiancraftsmenusedtheratioof "goldensection" when creating them" [10].

"Goldensection"or "goldenratio" (Φ) – the ratio at which the greater value correlates with the smaller one the same way as their total correlates with the greater value. Φ – irrationalalgebraicnumberwhose irrationalitymeasureequals 2. InthesecalculationsitsapproximatedvalueΦ=1.618034isused. This ratioiswidely presentinnature, engineering, science, art, biology and medicine. For instance, in physics for some oscillatory systems their technical characteristics are proportional to "golden ratio".

ItcanbeassumedthatwhenconstructingpyramidsEgyptiansknewnotonlyabout "goldensection" and π, but they also had the idea of geodesic angle. Butinthepyramidthegeodesicanglecanbetheonebetweenthepyramidedge acting as the "winding" vector and the base line which is parallel to the earth axis and goes between the northern and southern edges. Obviously, this was the reason for the pyramids to be constructed with the strict direction of edges to the cardinal points and even the location of stars in certain seasons was taken into account.

Suchinclinationangleoftheedgesinthelowerpartofthe curved pyramid is 54°34', i.e. it differs only by 10' from the geodesic angle. Suchcoincidencecannotbeaccidental, therefore, thesetwo multidimensional parameters: golden ratio and geodesic angle must have the mathematical bond. Byanalogywith (6) wehave:

$(4/3)\pi\ln\Phi=tg^2(a_0\varphi)$ (7)

Withrelativeerrorδ=0.13%.

Together with equation (6) we have:

$(4/3)\pi\ln\Phi=\ln(\frac{G}{\varepsilon_0})=tg^2(a_0\varphi)$ (8)

Equations(7,8)

givethefunctionaldependenceofgoldenratioandgeodesicanglenotonlybetweeneachotherbutalsowithotherf undamentalsvalues. Therefore, these equations reflect the multidimensional manifestations and applications of these parameters. The value 4/3 formally corresponds to the ratio of the legs of a classical triangle. But there is a more complete explanation based on two principles of adding energy characteristics of subsystems (par.1,2of the initial provisions). Whenaddingtwolike and similar energy parameters, their total value in the corpuscular

interaction increases twice, but in the wave one – decreases twice, and their ratio equals 4. In this spatial direction onepartofthisvalueequals 4/3. Suchnumbercanbealsofound in other equations, for instance:

$(4/\pi)^2 = \Phi$ (9)

whereδ=0.09%.

Inthisequation4/πcharacterizestheangulardistributionofcorpuscular-waveratios.

Did the Egyptians also plan to construct other pyramids with the geodesic inclination angle? Thousandsof years have passed since the construction of the pyramids and now it is impossible to precisely determine the initial dimensions and inclination angle. Many pyramids were considerably destroyed and partly deconstructed. Therefore, atpresent,theinclinationangleoftheedgesisnotthegeodesicangle (for the majority of the pyramids). In this investigation it is designated as α – inclination angle of the edges of the pyramids at present.

But in the technical characteristics of the pyramids the mathematical bond between angles φandαand "golden ratio" should be preserved, though approximately. Table 1 contains the most famous pyramids with the right pyramidal shapes and inclination angles of 51°-52°(forthreepyramids) and inclination angle of 43°21´ (fortwopyramids).It is also taken into account that ChephrenPyramidhas the edges with different inclination angles.

The calculations demonstrated (Table 1) that the functional bond is available:

1. For pyramids with the edge inclination angles of 51°-52°:

$<\operatorname{tg}\alpha>=\Phi^{\frac{1}{2}}=(\pi/4)\Phi$ (10)

where$<\operatorname{tg}\alpha>$– averagevalue for three pyramids equaled to 1.2679.

Since the value $(\pi/4)\Phi$=1,2708, we have δ=0.22%.

2. For pyramids with the inclination angle of 43°21´:

$(4/3)<\operatorname{tg}\alpha>=\Phi^{\frac{1}{2}}=(\pi/4)\Phi$ (11)

whereδ=0.96%.

Thevalue$(\pi/4)\Phi$indicatesthattheactualvaluesof$(\operatorname{tg}\alpha)$obtainedbythe edge inclination angle, at present, correspond to the rule of "golden ratio". MycerinusPyramid has the greatest deviation from this rule. But only in the Middle Agesthis pyramid was two times considerably destroyed and affected.

Table 1.Inclination angles of Egyptian pyramids

Pyramids	Cheops	Chephren	Mycerinus	Curved	Pink
α	51°50'	53°10' 52°02'	51°20'	54°34' 43°21'	43°21'
$\operatorname{tg}\alpha$	1.2723	(1.3351=4/3) 1.2815	1.2500	(1.4056) 1.2587	1.2587
$<\operatorname{tg}\alpha>$	1.2679			1.2587	
δ,%	0.22%			0.96%	

II. CONCLUSIONS:

1.The geometric-geodesic angle isthe angle betweenthe rotation axisand rotation vector.In a stationary system it can be physically found through the triangle angle tangent, in which its legs are the components of corpuscular-wave process.

2. The equation of suchfunctional dependencies was obtainedin kineticsof structural interactions of some macro- and microsystems (for gravitation, as well).3. The equations of metamathematical bond between "golden ratio" and geodesic angle, as well as with other fundamental values are given.

4. As applicable to technical characteristics of Egyptian pyramids, it is demonstrated how their proportions correspond to the rule of "golden ratio".

REFERENCES:

[1]. S.P. Finnikov. Differential geometry. M.: MSU Publishers, 1961.
[2]. Wikipedia, Geodesic line,https://ru.wikipedia.org/wiki/Геодезическая
[3]. Yu.M. Pidgainy, V.M. Morozova, V.A. Dudko. Mechanicsofpolymers. – 1967.– V. 6. – P. 1096-1104.
[4]. T.Yu. Ayusheev. Geometricissues of adaptive technology of structure production by winding from fibrous composite materials. – Ulan Ude: Buryat Research Center Publishers, SB RAS, 2005. – 212p.
[5]. V.I. Kodolov. Polymericcompositions andtechnology of aircraft engines production from them. Izhevsk Mechanical Institute, 1992. – 200 p.
[6]. G.A. Korablev. ON PROBLEMATIC ISSUES OF PHYSICAL CHEMISTRY, JMEST, v6, 2019, pp10320-10324
[7]. R.G. Gevorkyan, V.V. Shepel. Courseofgeneralphysics. M.: Vysshayashkola, 1972, 600 p.
[8]. G.A. Korablev.On the mechanism of gravitation processes, JMEST, v12, 2019, pp705-714.
[9]. Wikipedia, Traditional Chinese medicine, https://ru.wikipedia.org/wiki/Традиционная_китайская_медицина
[10]. Wikipedia, Egyptian pyramids, https://ru.wikipedia.org/wiki/Египетские_пирамиды