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ABOUT GEOMETRY OF TOPOGRAPHIC SURFACES

Abstract. This work is dedicated to build-up basis of the geometry of topographic surfaces using methods of general analysis situs.

1. Problem definition.

Problem concerning methodology of topographic irregular surfaces build-up development is topical in the system of technical knowledge. Build-up earth surface maps, maps of geological features, maps of atmosphere contamination, maps of marine shelf relief, maps of baromagnetic fields, physical state of bodies maps in physical mathematics tasks, etc, in spite of external differences has common feature – necessity to build some irregular surface based on its discrete values. Discriminate situations emerge because of specificity of initial data collection, their quantity, level of observation accident errors, peculiarities of surface under modeling, etc. Land use planning and management is connected with topographic surfaces build-up. Each map within the complex of land use planning and management is rather complicated, is considered separately and requires efforts of certain group of specialists. Necessity appears to create theory of topographic surfaces as methodological basis or solution methods unification for tasks of land use planning and management and single design scheme prerequisite.

2. Task definition.

Let us consider the theory of topographic surfaces build-up from two positions – topologic variety and topologic space. Let us consider two definitions of topologic surface, which mutually supplement each other.

Definition 1. Let us name multitude X of points (Xi) in R3 as topographic surface (TS) possessing the following features:

a) TS is inseparable topologic space with natural topology τ .

b) TS is metric space metrized with certain metric p

c) Each TS point possesses neighborhood, which is homeomorphic to circle

d) TS meets the first postulate of countability

e) Any two points (xi) $\in$X, {xj} $\in$X, can be linked with continuous curve.

From definition of topographic surface correctness of topology postulates: let τ is some assemblage of subpopulations of multitude X, then the following conditions are fulfilled:

1) empty multitude O and X belong to τ: 2) integration of any population of multitudes from τ is included in τ; 3) any population of multitudes crossing from τ is included in τ.

From features (d) appears existence of fundamental system of neighborhoods (FSN) on X and local base in each point x $\in$X-feature. Feature (e) guarantees linear topologic space connexion and, consequently, common connexion.

Definition 1. Let us name multitude X $\in$ R3 two-dimensional topographic subvariety in R3 of Cr class or Cr-subvariety if each its point has some Cr-map, r>0, at that mapping rank in each point can be equal subvariety dimensions or to be less.

On TS two types of points are distinguished – apexes of some metric metrized certain topologic space. Let us determine each point curvature.

{X;} $\in$X W=2π - θ where θ – sum of angles coming to apex.

Definition 2. Let us name essential apexes with positive or negative curvature and unessential apexes with zero curvature.

Definition 3. Introduce notion of point curvature degree. Essential apex possesses I degree curvature at π<W2<3/2π, 3 degree curvature at π<W4<π/2 (Fig.1a); b); c); d).

Definition is correct and for points with negative curvature. On TS six types of apexes are distinguished depending on point curvature place and its orientation relating base surface.

Definition 4. Let us name point by apex type α1 - if point has positive curvature W+ = 2 π -θ>0 together with neighborhood is located over base surface; apex type α2 - if point has positive curvature W+ = 2 π -θ>0 together with neighborhood is located over base surface; apex type γ1 - if point has negative curvature W+ = 2 π -θ<0; δ1 – if point has zero curvature W+ = 2 π -θ≈0 and incidence to base surface; δ2 – if point has zero curvature W+ = 2 π -θ≈0 and is located together with neighborhood under base surface; δ3 – if point has zero curvature W+ = 2 π -θ≈0 and is located together with neighborhood over base surface. Let us separate from population X subset A> X, which is subspace of space X, in which some metric δ induces inspired topology.