

THE EARTH AS A CARTOGRAPHIC PROBLEM

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Abstract:

The central problem of mathematical cartography is the problem of representing a portion of the curved surface of the earth on a flat piece of paper without introducing any more distortion than is absolutely necessary. The shape and size of the Earth-Reference systems coordinates systems projections classification of Projections commonly used Projections.

Introduction: Mapping the surface of the earth needs the determination of locations of surface features and plot them on the map paper. The plotting is done through use of map projections and also by the use of appropriately designed symbols to represent these features. Geographic locations can only be plotted on the basis of a reference system. This reference systems is called the Geographic coordinate system of latitudes and longitudes. But to establish the coordinate system we should know the exact shape and size of the earth.

Data Base & Methodology:

The data has been furnished from the related articles, research papers. Some data has furnished the websites & as well as time magazine. For the present research paper, the primary and secondary sources have been used. Materials from various libraries have been collected. The articles regarding to it have been read thoroughly. The descriptive and analytical research methods have been used for this research paper.

Study Objectives:

The present study has the following objectives explain the methods of transforming the spherical surface of the earth into a plane surface for purposes of mapping. The various types of projections are described and explained.

Discussion the earth as cartographic Problem :

We know that the earth is a smoothly curving geometrical body. Even though the surface of the earth appears to us rugged and rough, the highest peaks and deepest ocean trenches are barely noticeable irregularities on this smoothly curving surface, because of its relatively huge size. Notwithstanding this simplified view about the appearance of the earth



surface, the earth is in reality a complex geometric figure. It is in the first place a massive plastic body and is spinning through space on its axis.

Spherical Earth : The earth in the days of antiquity was believed to be a flat slab in shape. Later on it was assumed to be drum shaped or pillar shaped by such Greek scholars as Anaximander and Heacataeus sometime in the 6th Century B.C. But it is not known when the concept of the earth being spherical in form came into existence. The credit should go to the Pythagorean and Platonic Scholars of Greece as they were the scholars who accepted the spherical form of the earth for the first time. Aristotle thought that the sphere was a perfect shape for humans to live harmoniously and hence the earth should be round and spherical in shape.

Ellipsoidal Earth : The earth was considered to be a sphere until the 1600s. In 1670 Newton proposed his theory of gravity. Accordingly, as the earth is rotating on its axis, it generates centrifugal force causing a slight bulge at the equator. As a consequence of the equatorial bulging, the earth flattens slightly at the poles. This flattening was measured to be about 1/300th of the equatorial radius.

Geoidal Earth : For purposes of topographic mapping, a large number of ground measurements are made. When these measurements are compared to the measurements taken from astronomical observation, it was found that the oblate spheroidal form of the earth is deformed in various locations. This deformation is due mainly to the variations in the character of materials the earth is made up of. The result of such accumulation of data led to the concept of a third approximation called the Geoid. The geoid is considered as an even more faithful representation of the shape of the earth. Geoid means earth-like.

Size of the Earth : Now that the shape of the earth is determined and also accepted as being a sphere, an ellipsoid, and a geoid, we must know the exact size of the earth. Since ancient times, attempts have been made to measure and determine the size of the earth. But it was Eratosthenes, a Greek scholar, who made the first calculation and arrived at a much more convincing figure for the earth.

Cartographic Use of the sphere, Ellipsoid, and the Geoid : We have examined the three different shapes of the earth in considerable detail. All these three are considered as accurate approximations or models of the earth. In fact, all of them are used for purposes of mapping according to their suitability in terms of scales of mapping. The sphere is found suitable for small-scale mapping of countries and continents. The ellipsoid is used for large-scale mapping of small areas and in the preparation of topographic maps and nautical charts. The geoid is found to be more suitable for purposes of cadastral mapping where the concern is more on an accurate ground surveying of horizontal and vertical positions.

Reference Systems : Now that the shape of the earth has also been determined and the size of the earth has been accurately estimated, the basic issue of the earth as a cartographic problem must be resolved. Mapping of the surface of the earth involves the devising of methods of transforming the spherical surface into a plane surface, because maps are two-dimensional.



Geographical Coordinate System : This coordinate system is the primary locational reference system of the earth. It makes use of latitude and longitude for reference and is used for basic locational calculation in navigation and fundamental surveying. This reference system is useful for locating positions on the uniformly curving surface of the earth. It makes possible to make a unique statements of location for each earth feature. we know that the north and south poles are points where the axis of the earth intersects the earth surface and therefore they are used as starting points to base the system.

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